

1 Documents References

1.1 The following documents are referred to in Susan Tilbrook's Proof of Evidence and Rebuttal Proof of Evidence.

Tab	Paragraph	Document Name	Copies Provided
A	1.8.1 NR32/1 (PoE)	Network Rail Standard GRD007	Full Document
B	1.11.6 NR32/1 (PoE)	TD 9/93 Highway Link Design	Full Document
C	1.11.6 NR32/1 (PoE)	TD 27/05 Cross sections and headroom	Full Document
D	1.11.6 NR32/1 (PoE)	TA 90/05 The Geometric Design of Pedestrian, Cycle and Equestrian Routes	Full Document
E	1.14.6 NR32/1 (PoE)	TD 36/93 Subway for Pedestrians and Pedal Cyclists Layout and Dimensions	Full Document
F	1.15.1 NR32/1 (PoE)	HD 19/15 Road Safety Audit	Main Document, Annex A, Annex B, Annex C, Annex D, Annex I, Annex J
G	1.11.6 NR32/1 (PoE)	BD 29/04 Design Criteria For Footbridges	Full Document
H	1.11.6 NR32/1 (PoE)	DfT Inclusive Mobility 2005	Pages 1-15, 45-50, section 12 page 75-76
I	1.11.6 NR32/1 (PoE)	LTN 1/04 Policy Planning and Design for Walking and Cycling	Full Document
J	1.11.6 NR32/1 (PoE)	Manual for Streets	Cover, Contents Section C6-C7 Pages 61-97
K	1.11.6 NR32/1 (PoE)	Manual for Streets 2	Cover, Forward, Contents, Section A1 page 5-11, Section B5-B6 page 41-47, Section B8-B13 page 51-100

L	1.16.1 NR32/1 (PoE)	Equality and Diversity Overview Report	Full Document
M	1.16.5 NR32/1 (PoE)	Diversity Impact Assessments	Full Documents
N	2.1.5 NR/32/1 (PoE)	Guidance on The Ramblers walking speed	Extract from website
O	NR/32/4/1 3.3.5 (Rebuttal)	Chapter 8 Traffic Signs Manual	Pages 1-10
P	NR/32/4/7 2.2.8 (Rebuttal)	LTN 2/95 Design of Pedestrian Crossings	Full Document
Q	NR/32/4/3 2.2.3 (Rebuttal)	Planning application for S01 B/15/00263/FUL/SMC	Decision Notice
R	NR/32/4/3 2.2.3 (Rebuttal)	Planning application for S01 B/17/00441	Decision Notice
S	NR/32/1 2.8.50 (Rebuttal)	Planning application for S69 0764/15	Decision Notice

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A. Network Rail Standard GRD007

Appendix B

Level Crossing Census Requirements

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1.0 Scope

This specification details the type of census to be undertaken at individual level crossing sites which provide a road/rail interface between the public highway and Network Rail infrastructure. Within the specification are guidelines as to the type of data required. Network Rail (the Client) shall instruct those responsible for undertaking the census (the Supplier) to undertake the following types of data collection on a site specific basis:

- Road Traffic Census
- Train Census
- Pedestrian Census
- Road Closure Times
- Traffic Turning Analysis
- Blocking Back Analysis
- Road Speed Survey

The site specific requirements shall be supplied by the client in accordance with Supplement A.

The Supplier shall be responsible for undertaking an appropriate site specific risk assessment and any negotiations and agreements with third parties (e.g. private landowners, Local Authorities, Highway Agencies) as appropriate to ensure all activities are performed in a legitimate and safe manner.

2.0 Reference Documentation

The following documents have been referenced in the production of this specification:

- RSSB report T707: Analysis of the effectiveness of vehicle activated signs at public road level crossings.
- DfT document TA22/81: Vehicle Speed Measurement on All Purpose Roads.

3.0 Duration

The census will record the period on each specified day from 00:00 hours continuously to 24:00 for the Road Speed Survey and from 06:00 hours continuously until 24:00 hours for all other surveys unless otherwise stipulated on the site specific Supplement A.

The census is to be undertaken on consecutive days, for example;

- A nine-day census shall include two weekends.
- A five-day census shall commence on a Thursday and conclude on Monday.
- A three-day census shall commence on a Friday and conclude on Sunday.

The census is to be undertaken during local school term periods, unless otherwise specified.

4.0 Road Traffic Census

The road traffic census will be classified into the following categories for the entirety of the specified census duration:

- Number of cars utilising the crossing in each direction.

- Number of light goods vehicles utilising the crossing in each direction.
- Number of motor cycles utilising the crossing in each direction.
- Number of heavy goods vehicles utilising the crossing in each direction.
- Number of agricultural vehicles (tractors and vehicles with trailers) utilising the crossing in each direction.
- Number of buses utilising the crossing in each direction.
- Number of horse riders utilising the crossing in each direction.
- Number of pedal cycles utilising the crossing in each direction.
- Occurrences of herded animals utilising the crossing in each direction.

The following information shall also be supplied:

- Large or slow vehicles utilising the crossing or crossing lay-bys (where large is over 18.75m long, 2.9m wide or 44 tonnes total weight and slow vehicles are travelling at 5 miles per hour or less.)
- The weather conditions during the time period.
- General observations relating (but not restricted) to: crossing misuse or unusual occurrences; low vehicles or vehicles with overhanging loads, parked vehicles close to the crossing that change the crossing usage.

The data shall be recorded and tabulated for each category of crossing user in 15 minute periods. A summary sheet shall be included giving the overall totals for each category of crossing user per day.

The census is not to be undertaken on days of continuous extreme weather conditions when the normal level of use would be disrupted.

5.0 Train Census

The train census will record the following data for the entirety of the specified census duration:

- The number of trains (of all types) utilising the crossing in each direction.


The data shall be recorded and tabulated in 15 minute periods and summarised daily. Any occurrence of a train coming to a stand on the level crossing, or other unusual occurrence shall be recorded along with the time and duration of the incident.

6.0 Pedestrian Census

The pedestrian census will record the following data for the entirety of the specified census duration:

- Number of adult pedestrians and accompanied children utilising the crossing in each direction (non railway personnel).
- Number of railway personnel utilising the crossing in each direction (maintenance staff, crossing operator etc.)
- Number of unaccompanied child pedestrians utilising the crossing in each direction.
- General observations relating (but not restricted) to: crossing misuse or unusual occurrences; vulnerable users such as the elderly, impaired or mobility scooters; pedestrians utilising (or forced into) the carriageway.

The data shall be recorded and tabulated for each category of crossing user in 15 minute periods. Where the crossing has more than one footway the utilisation of each footway

	<p style="text-align: center;">Guidance Reference Document</p> <p style="text-align: center;">Product Descriptions</p>	<p>Ref No: GRD 007</p> <p>Issue: 3</p> <p>Page: E4 of E9</p>
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shall be recorded on the data sheets, where a separate wicket gate and footway is provided this shall also be recorded as separate entries.

A summary sheet shall be included giving the overall totals for each category of crossing user per day. The busiest 15 minute period for pedestrians (combined for all footways) shall be included on the summary sheet along with the date(s) and time(s).

7.0 Road Closure Times

‘Road closure time’ is the period during which movement of vehicles and pedestrians over the level crossing is impeded by the complete operational cycle of equipment. At most types of sites, recording of level crossing ‘down time’ shall be taken as the time in HH:MM:SS when the red road traffic lights start to flash. Where red road traffic lights are not fitted, recording of ‘down time’ shall commence when the gates / barriers start to move in order to close the road. Level crossing ‘up time’ shall be taken as the time in HH:MM:SS when the equipment has been fully relocated into the original start positions and the road is re-opened.

The road closure census shall include the following data for the entirety of the specified census duration:

- The timestamp of the barrier up times and down times (or gate open and closed).
- The duration of each time the road is closed to road users.
- A summary sheet including the total road closure time per hour and per day; the minimum, maximum and average road closure times per hour and per day.
- Occurrences where the road is closed to road users and no train utilises the crossing. Where there is an obvious reason (such as railway personnel maintaining the crossing for example) this shall be listed.

8.0 Traffic Turning Analysis

The activities of vehicular traffic utilising side roads, junctions or private entranceways in the vicinity of the crossing shall be included as a traffic turning analysis for the entirety of the specified census duration. The traffic turning analysis shall include a site specific map categorising all permissible traffic movements in and around the junction(s) in a clear and unambiguous manner.

The traffic turning analysis will record the following data for the entirety of the specified census duration:

- The number of agricultural vehicles, heavy goods vehicles or buses utilising the crossing and categorised by each of the permissible traffic movements.
- The number of all other vehicles not included above utilising the crossing and categorised by each of the permissible traffic movements.
- General observations relating (but not restricted) to: vehicles crossing over the road centre line to complete a permissible traffic movement, especially where this causes traffic in the opposite lane to adjust; vehicles reversing; misuse.

The traffic turning analysis shall be included as separate data to the road traffic census.

9.0 Blocking Back Analysis

A blocking back census and subsequent data analysis shall be undertaken for the entirety of the specified census duration.

All blocking back occurrences shall be categorised for each direction of travel into the following (and as depicted in diagram 1):

- **Amber 1:** A queuing event where the rear of the queue extends to between 11m and 50m downstream of the crossing barrier.
- **Amber 2:** A queuing event where the rear of the queue extends from the barrier to 11m downstream of the crossing barrier.
- **Red 1:** A queuing event where vehicles start to queue at the downstream barrier and foul the crossing but do not foul within 1.25m of the running line.
- **Red 2:** A queuing event where vehicles foul the running lines (or within 1.25m either side of running line) and are stationary for 3 or more seconds (any part of vehicle, anywhere in fouling zone).
- **Red 3:** A queuing event similar to Red 2, but where no escape route is available (either forward or backward) to vehicle(s) in the fouling zone (running lines plus 1.25m either side).

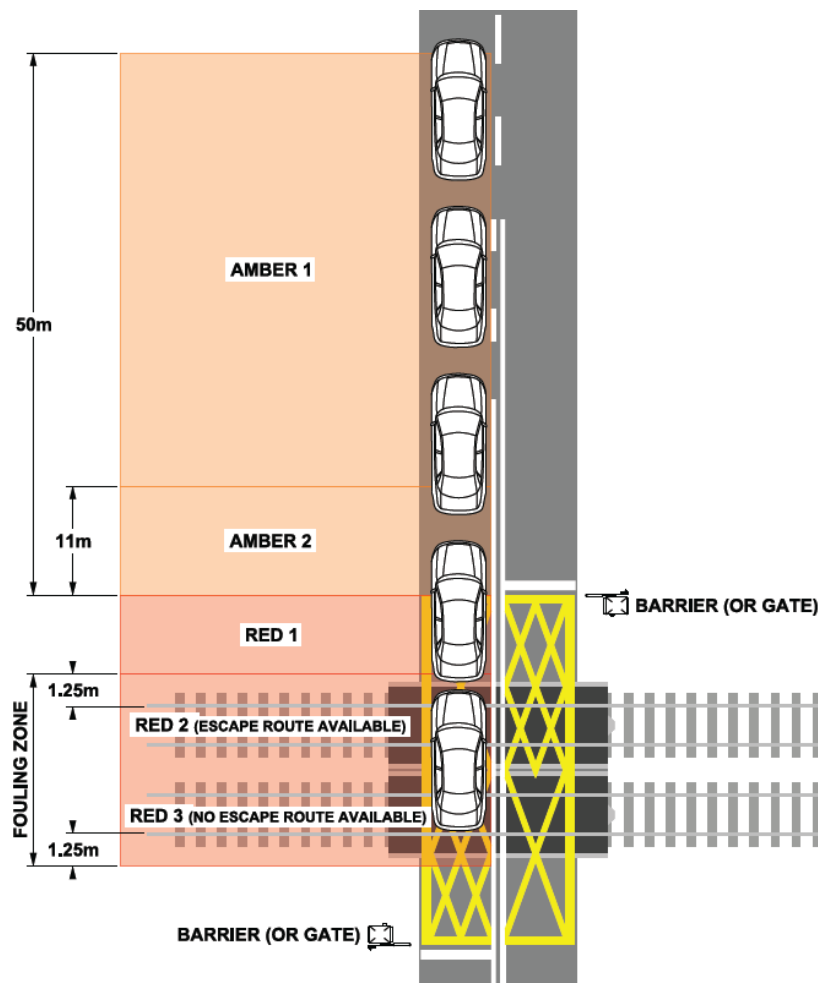


Diagram 1

Occurrences of each blocking back incident shall be listed individually with a date and location (including the direction of traffic), timestamp of the start and end times and the duration of the incident. The timestamps will be in the format HH:MM:SS.

A summary sheet shall be included listing the occurrences of each blocking back category, along with the average and maximum times of each category, for each direction of travel over the level crossing. Refer to Supplement B for a sample of a blocking back incident.

10.0 Road Speed Survey

An 85 percentile speed survey shall be included for the entirety of the specified census duration.

The speed survey shall encompass each road approach where level crossing specific signage is installed. As a minimum this shall be each road approach to the crossing and encompass side road(s) where level crossing signs are installed. Where additional side roads are to be included in the survey these shall be indicated on the Site Specific Requirements.

The speed detection equipment shall be placed on the approach side of each road approach to the level crossing where the level crossing ahead warning signs are positioned (either a TSR 770 or TSR 771 road sign in accordance with The Traffic Signs regulations and General Directions 2002). Where this sign is placed in a position where traffic slows down due to road conditions (such as a sudden bend) that is not consistent with the approach speed to the crossing then the speed detection equipment shall be placed in a position more indicative of the approach speed and this shall be noted in the survey report.

The surveyed data shall be presented in one hour increments and tabulated against 5mph speed categories for each day and for each road approach. This daily data shall also include the following: the mean speed of vehicles during that day, the 85 percentile of vehicles during that day, observations which may have adversely affected the speed of vehicles during that day such as inclement weather, road / crossing maintenance etc.


A summary sheet shall be included for each of the road approaches giving the following information as a minimum:

- The position of the speed survey.
- The direction of traffic.
- The speed limit of the road.
- The 85 percentile road approach for all vehicles utilising the surveyed road approach for the entirety of the census that are in free flowing conditions only.
- The mean speed for all vehicles utilising the surveyed road approach for the entirety of the census.

Where a day or days are a significantly different speed due to adverse conditions an additional 85 percentile road speed shall be provided excluding these day(s).

11.0 Deliverables

- 2 No. bound documents of the report, containing the census data and summaries.
- 1 No. electronic copy of the above.
- 1 No. electronic video of the busiest recorded day on DVD(s). Where the busiest day is defined as the day in which the busiest 15 minute period for pedestrians (refer to Section 5.0) occurs. When this occurs on a day where no trains run during the

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period (e.g. a Sunday) an additional DVD(s) shall be included of the next busiest period for pedestrians where trains do run.

Where specifically requested on the site specific Supplement A electronic data shall be provided for each day of the entirety of the specified census duration.

Supplement A: Site Specific Requirements

Level Crossing Name(s):

OS Map Location (AB 123 456):

Census Duration:

- 9 day ☐
7 day ☐
5 day ☐
3 day ☐
Other (specify) ☐

Census Times:

- 06:00 to 24:00 ☐
Other (specify) ☐

Road Speed Survey Times:

- 00:00 to 24:00 ☐
Other (specify) ☐


Types of Census to be undertaken:

- Road Traffic Census ☐
Train Census ☐
Pedestrian Census ☐
Road Closure Times ☐
Traffic Turning Analysis ☐
Blocking Back Analysis ☐
85 Percentile Road Speed Survey ☐

Deliverables (2 Number bound hardcopies and 1 electronic copy of the reports) plus additional:

- Electronic video of busiest day ☐
Electronic video of each day ☐

Additional Information:

	<p style="text-align: center;">Guidance Reference Document</p> <p style="text-align: center;">Product Descriptions</p>	<p>Ref No: GRD 007</p> <p>Issue: 3</p> <p>Page: E9 of E9</p>
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Supplement B: Sample blocking back incident

A blocking back event, peaking at Red 1 on the 10th February 2007. There was no queuing that day until 13:11:32 where a queue built up to Amber 1, then within eight seconds it had escalated to Amber 2 and then Red 1 within a further eight seconds. The queue peaked in severity at Red 1 (for a duration of nine seconds) before it started to subside from a Red 1 to Amber 1 at 13:11:57 and then disappeared entirely at 13:12:24.

Date	Green 1			Amber 1			Amber 2			Red 1		
	Start	Finish	Duration	Start	Finish	Duration	Start	Finish	Duration	Start	Finish	Duration
10 Feb 2007	07:00:00	13:11:32	06:11:32	13:11:32	13:11:40	00:00:08	13:11:40	13:11:48	00:00:08	13:11:48	13:11:57	00:00:09
							13:11:57	13:12:24	00:00:27			
	13:12:24	21:00:00	07:47:36									

B. TD 9/93 Highway Link Design



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE DEVELOPMENT DEPARTMENT



**THE NATIONAL ASSEMBLY FOR WALES
CYNULLIAD CENEDLAETHOL CYMRU**



**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

Highway Link Design

Summary: The Standards sets out the elements of design and principles for their co-ordination, for geometric design of an existing carriageway or new build situation. The Standards include a revised Chapter 5 and deletes Annexes B and C.

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 1

TD 9/93 - AMENDMENT NO 1

HIGHWAY LINK DESIGN

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0. FOREWORD

Introduction

0.1 This Standard applies to both single and dual carriageway roads in both urban and rural areas. It shall be used to derive the Design Speed, and the appropriate values of geometric parameters for use in the design of the road alignment. It states the basic principles to be used for coordinating the various elements of the road design, which together form the three dimensional design of the road.

0.2 This Standard replaces completely the following documents which are hereby withdrawn:

TD 9/81 Highway Link Design

TD 9/81 Amendment No 1 dated January 1985

TD 9/81 Amendment No 2 dated March 1991

Layout of Roads in Rural Areas (and metric supplement)

Roads in Urban Areas 1966 (and metric supplement)

Motorway Design Memorandum (1962 et seq)

TA 28/82 Layout of Roads in Rural Areas
A guide to revisions 1982

TA 32/82 Roads in Urban Areas
Revisions subsequent to "A guide to revisions 1979"

TA 43/84 Highway Link Design

Previous "Chapter 5. Climbing Lanes" has been revised and Annexes B and C deleted.

0.3 Sections of the Advice Note TA 43/84, Highway Link Design, are superseded by the changes to this Standard itemised in Paragraph 0.6 of the Foreword. The Advice Note is hereby withdrawn pending a review of this Standard.

0.4 Parts of Chapter 6 and Table 4 were superseded by TD 20/85 "Traffic Flows and Carriageway Width Assessment" (DMRB 5.1). The superseded text has been removed from Chapter 6 and Table 4.

0.5 The format has been changed to that required for the Design Manual for Roads and Bridges (DMRB).

The Paragraphs have therefore been renumbered. Except as noted in Paragraphs 0.6 and 07, the Standard is unchanged.

0.6 New material has been added to this edition of the standard updating the approach to be taken when considering the application of alignment parameter values less than Desirable Minimum. The following Paragraphs have been amended or added to reflect this and the changes identified in Paragraph 0.7:

0.3 0.4 0.5 0.6 0.7 0.8 0.14 0.15 0.16
1.9 1.12 to 1.25 inclusive
2.1 2.8 to 2.13 inclusive
3.3 3.4 to 3.6 inclusive
4.4 to 4.17 inclusive
Table 3

0.7 All parameters are now based upon Desirable Minimum values, except for Sag Curves which have not previously had Desirable Minimum values. Values below that are expressed in terms of numbers of Design Speed steps below Desirable Minimum. References to Absolute Minimum for other than Sag Curves have been deleted. Where existing Standards refer to Absolute Minimum values contained in this Standard, these shall be taken as one Design Speed step below Desirable Minimum values.

0.8 Certain editorial changes have been introduced to assist in the application of the Standards, but without changing the Standards.

Implementation

0.9 This Standard should be used forthwith for the design of all schemes for the construction and/or improvement of trunk roads currently being prepared provided that in the opinion of the Overseeing Department, this would not result in any significant expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Department.

Scope

0.10 A major objective of this Standard is to ensure that designs achieve value for money without any significant effect on safety. The design systems that

have been developed in relation to both Design Speed and the related geometric parameters will result in a much greater flexibility to achieve economic design in difficult circumstances. In addition, detailed attention is given to the design of single carriageway roads, where the previous recommendations have been considerably extended to allow greater flexibility for design, with particular emphasis upon the coordination of design elements to improve safety and overtaking conditions. Overall, the greater flexibility for design introduced by this Standard will enable more economic design, reducing both the construction costs and the impact of new roads and road improvements on the environment.

0.11 Throughout this Standard, there is a continual reference to the use of the cost/benefit programme COBA (Scotland - NESA), which shall be used at all stages to test the economic performance of alternative scheme designs.

Interpretation

0.12 The Standards contained in this document represent the various criteria and maximum/minimum levels of provision whose incorporation in the road design would achieve a desirable level of performance in average conditions in terms of traffic safety, operation, economic and environmental effects. In most cases, with care, designs can be achieved which do not utilise the lowest levels of design parameters given. At some locations on new roads or major improvements, however, it may not be possible to justify even the lowest levels of design parameters in economic or environmental terms, due to high costs, low traffic levels, and environmental damage etc. In such cases, sufficient advantages might justify either a Relaxation within the Standards, or in more constrained locations a Departure from the Standards. The various parameters quoted in this Standard are not, therefore to be regarded as sacrosanct in all circumstances. Relaxations and Departures should be assessed in terms of their effects on the economic worth of the scheme, the environment, and the safety of the road user. Further details on the use of Relaxations are given in Chapters 1 to 4.

0.13 Designers should always have regard to the cost effectiveness of the design provision. In some cases, such as gradients, DMRB Volume 13.1 provides a method of quantifying the economic trade-offs associated with Relaxations. In others, the implications, particularly in relation to safety may not be quantifiable and the Designer must apply the judgement of experience in proposing a Relaxation or Departure.

0.14 When issued in 1981, this Standard introduced the concept of a hierarchy of permitted values for geometric layout parameters (visibility, horizontal curvature & vertical curvature). This hierarchy was based upon Desirable Minimum Standards, with lower values being known progressively as Relaxations and Departures. Values equal to or higher than Desirable Minimum give consistently safe alignments and minimise journey times. Research had shown that in many situations safety was no worse with values lower than the rigid requirements of the previous Standards. The hierarchy of values enabled a flexible approach to be applied where the strict application of Desirable Minimum requirements would lead to disproportionately high construction costs or severe environmental impact upon people, properties and landscapes. Successive levels in the hierarchy invoked more stringent consideration in line with the need to carefully consider safety.

0.15 During the years since 1981 there have been many advances in road layout design. The procedures for the assessment of safety and operational aspects have improved. Further research has strengthened the understanding of driver behaviour. Safety audits and other initiatives in the mechanics of assessing and checking scheme layouts have made the design process more rigorous and reliable.

0.16 Since 1981, experience has been gained in the application of this hierarchy of values and this experience indicates that the environmental and financial benefits gained from this increased flexibility can be considerable. Against this background, the scope for Relaxations has been increased to allow Designers to consider alignment parameter values that would generally be approved if they were put to the Overseeing Department as Departure proposals. The scope for Relaxations is increased by 1 Design Speed step for Motorways and 2 steps for All Purpose Roads, except for Sag Curves where the increase is 1 step for All Purpose Roads alone. The Designer is required to carefully consider the benefits and any potential disadvantages of Relaxations. New additional guidance is included in Chapter 1 describing the approach to be taken to assessing Relaxations. Relaxations are considered to conform to Standards.

0.17 In Wales additional Design Guidance is provided in the publications "Roads in Upland Areas: A Design Guide" and "Roads in Lowland Areas: A Design Guide". These are to be treated as Relaxations which will be subject to the considerations described in Chapter 1 of this Standard.

1. DESIGN SPEED

General

1.1 The road alignment shall be designed so as to ensure that Standards of curvature, visibility, superelevation, etc. are provided for a Design Speed which shall be consistent with the anticipated vehicle speeds on the road. A relatively straight alignment in flat country will generate higher speeds, and thus produce a higher Design Speed than a more sinuous alignment perhaps located in hilly terrain, or amongst dense land use constraints. There is therefore always an inherent economic trade-off between the construction and environmental costs of alternative alignments of different Design Speeds, and their user benefits, which shall be tested by COBA (Scotland - NESAs).

Factors Affecting Speed

1.2 Speeds vary according to the impression of constraint that the road alignment and layout impart to the driver. This constraint can be measured by the three factors given in Paragraphs 1.3 to 1.5.

1.3 Alignment Constraint Ac: This measures the degree of constraint imparted by the road alignment, and measured by:

Dual Carriageways: $Ac = 6.6 + B/10$

Single Carriageways:
 $Ac = 12 - VISI/60 + 2B/45$

where:

B = Bendiness Degrees/km

VISI = Harmonic Mean Visibility m
(see Annex A).

1.4 Layout Constraint Lc: This measures the degree of constraint imparted by the road cross section, verge width, and frequency of junctions and accesses. Table 1 shows the values of Lc relative to cross section features and density of access, expressed as the total number of junctions, laybys and commercial accesses per km, summed for both sides of the road, where:

L = Low Access numbering 2 to 5 per km

M = Medium Access numbering 6 to 8 per km

H = High Access numbering 9 to 12 per km

Road Type	S2				WS2		D2AP		D3AP	D2M	D3M
Carriageway Width (Ex. Metre Strips)	6m		7.3m		10m		Dual 7.3m		Dual 11m	Dual 7.3m & Hard Shoulder	Dual 11m & Hard Shoulder
Degree of Access and Junctions	H	M	M	L	M	L	M	L	L	L	L
Standard Verge Width	29	26	23	21	19	17	10	9	6	4	0
1.5m Verge	31	28	25	23	There is no research data available for 4 lane Single Carriageway roads between 12 and 14.6m width (S4). In the limited circumstances for their use described in this document, Design Speed should be estimated assuming a normal D2AP with a Layout Constraint of 15 – 13 kph						
0.5m Verge	33	30									

Table 1 Layout Constraint Lc kph

1.5 Mandatory Speed Limits: On rural derestricted roads, ie. with national speed limits of:

	mph	kph
Motorways and Dual Carriageways	70	112
Single Carriageways	60	96

vehicle speeds are constrained only by the physical impression of the road alignment, as described by A_c and L_c . The use of mandatory speed limits (together with more confined urban cross-sections) however, restricts speeds below those freely achievable, and will act as a further constraint on speed in addition to that indicated by L_c .

Selection of Design Speed

1.6 New Rural Roads: Design Speed shall be derived from Figure 1, which shows the variation in speeds for a given L_c against A_c . The Design Speeds are arranged in bands, ie. 120, 100, 85, etc., within which suffixes A and B indicate the higher and lower categories of each band. An initial alignment to a trial Design Speed should be drawn

up, and A_c measured for each section of the route demonstrating significant changes thereof, over a minimum length of 2 km. The Design Speed calculated from the ensuing A_c and L_c should be checked against the initial choice to identify locations where elements of the initial trial alignment may be relaxed to achieve cost or environmental savings, or conversely where design should be upgraded, according to the calculated Design Speed. If any changes to road geometry result, then the Design Speed should be recalculated to check that it has not changed.

1.7 Existing Rural Road Improvements: (including short diversions or bypasses up to about 2 km in length) Design Speed shall be derived in a similar manner to Paragraph 1.6 above, with A_c measured over a minimum length of 2 km incorporating the improvement, provided there are no discontinuities such as roundabouts. The strategy for the contiguous sections of road, however, must be considered when determining A_c and the cross-sectional design. It might be unnecessary to provide a full Standard cross-section for a minor re-alignment within a low Standard route, unless it represented a stage of a realistic improvement strategy.

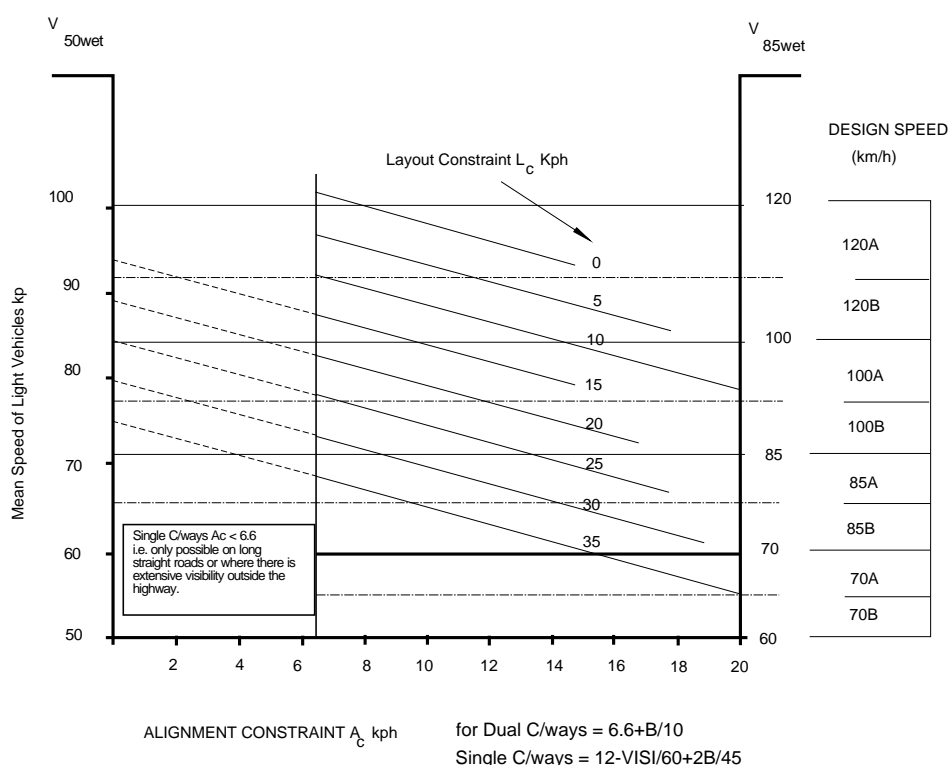


Figure 1 Selection of Design Speed (Rural Roads)

1.8 Urban Roads: Low speed limits (30-40 mph) may be required due to the amount of frontage activity, but also where physical restrictions on the alignment make it impractical to achieve geometry relative to a higher Design Speed. Design Speeds shall be selected with reference to the speed limits envisaged for the road, so as to permit a small margin for speeds in excess of the speed limit, as shown in Table 2. The minimum Design Speed for a primary distributor shall be 70A kph.

SPEED LIMIT		DESIGN SPEED
MPH	KPH	KPH
30	48	60B
40	64	70A
50	80	85A
60	96	100A

Table 2

Design Speed Related Parameters

1.9 The Design Speed bands 120, 100, 85 kph, etc dictate the minimum geometric parameters for the design, according to Table 3, which shows Desirable Minimum (Absolute Minimum For Sag Curves only) values and values for certain Design Speed steps below Desirable Minimum. Desirable Minimum values represent the comfortable values dictated by the Design Speed.

DESIGN SPEED kph	120	100	85	70	60	50	V ² /R
STOPPING SIGHT DISTANCE m							
Desirable Minimum	295	215	160	120	90	70	
One Step below Desirable Minimum	215	160	120	90	70	50	
HORIZONTAL CURVATURE m.							
Minimum R* without elimination of Adverse Camber and Transitions	2880	2040	1440	1020	720	520	5
Minimum R* with Superelevation of 2.5%	2040	1440	1020	720	510	360	7.07
Minimum R* with Superelevation of 3.5%	1440	1020	720	510	360	255	10
Desirable Minimum R with Superelevation of 5%	1020	720	510	360	255	180	14.14
One Step below Desirable Minimum R with Superelevation of 7%	720	510	360	255	180	127	20
Two Steps below Desirable Minimum Radius with Superelevation of 7%	510	360	255	180	127	90	28.28
VERTICAL CURVATURE							
Desirable Minimum* Crest K Value	182	100	55	30	17	10	
One Step below Desirable Min Crest K Value	100	55	30	17	10	6.5	
Absolute Minimum Sag K Value	37	26	20	20	13	9	
OVERTAKING SIGHT DISTANCES							
Full Overtaking Sight Distance FOSD m.	*	580	490	410	345	290	
FOSD Overtaking Crest K Value	*	400	285	200	142	100	

Table 3

* Not recommended for use in the design of single carriageways (see Paragraphs 7.25 to 7.31 inclusive)

The V²/R values shown in Table 3 above simply represent a convenient means of identifying the relative levels of design parameters, irrespective of Design Speed.

Changeover of Design Speed Standards

1.10 Transitions between sections with different Design Speeds shall be carefully designed so as not to present the driver suddenly with low radius curves, shorter sight distances etc. Where an alignment changes from a higher to a lower Design Speed, Relaxations should be avoided adjacent to the interface on the length of road with the lower Design Speed.

Connection to Existing Roads

1.11 Care shall be taken where an improved section rejoins an existing road, that the existing Standard of curvature and sight distance at the interface shall be subject to the same restrictions as would be relevant for the Design Speed of the improvement. Figure 2 shows the connection of an improvement to an existing road. Care must be taken that the curvature and sight distance at C is adequate for the approach Design Speed which has increased due to the improvement between A and B.

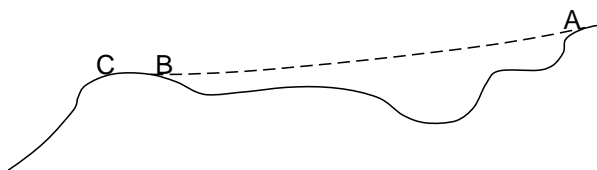


Figure 2

Selection of Parameter Values

1.12 Designers should normally aim to achieve at least Desirable Minimum values for stopping sight distance, horizontal curvature and vertical crest curvature. For sag curves, Designers should normally aim to achieve at least Absolute Minimum values. For single carriageways there are certain horizontal and vertical curve values which although exceeding the Desirable Minimum values are not recommended. See Paragraphs 7.25 to 7.31 inclusive.

1.13 Numerous accident studies have been carried out, both in this country and abroad, and it has always proved difficult to correlate accident rates with causal factors. The reason is that an accident is a rare, random event where people have failed to cope with the situation; often exacerbated by one or more influences from a large selection of contributory factors. Serious injury accidents are rarer still, with the majority being primarily attributable to driver error. It is estimated that

road layout is a main contributory factor in only a small proportion of injury accidents, indicating that accident rates are unlikely to be significantly affected by small or even moderate reductions in design parameters.

1.14 Studies carried out on rural all-purpose roads for the development of this Standard aimed to correlate personal injury accident rates with horizontal curvature, gradient, and sight distance. Results were consistent with those of other studies, showing that values of these layout parameters below Desirable Minimum values were associated with slightly increased accident rates, and the increase did not become significant until the difference from the Desirable value was considerable. Further, the effects of these elements in combination were found to be best represented by accumulating the separate effects. Individual results were widely scattered, showing that specific sites might not always follow the general trend, and reflecting the influence of factors other than road layout.

Relaxations

1.15 This Standard defines a sequence of parameter values in the form of a hierarchy of geometric design criteria related to Design Speeds. This three tier hierarchy enables a flexible approach to be applied to a range of situations where the strict application of Desirable Minimum Standards would lead to disproportionately high construction costs or severe environmental impact upon people, properties or landscapes. Designs with at least Desirable Minimum Standards will produce a high standard of road safety and should be the initial objective. However, the level of service may remain generally satisfactory and a road may not become unsafe where these values are reduced. This second tier of the hierarchy is termed a Relaxation.

1.16 The limit for Relaxations is defined by a given number of Design Speed steps below a specific bench mark, usually the Desirable Minimum. Relaxations vary according to the type of road - motorway or all-purpose, and whether the Design Speed is band A or band B. Details for sight distance are given in Chapter 2, for horizontal alignment in Chapter 3, and for vertical alignment in Chapter 4.

1.17 Relaxations may be introduced at the discretion of the Designer, having regard to the advice given in this document and all the relevant local factors. Careful consideration must be given to layout options incorporating Relaxations, having weighed the benefits and any potential disbenefits. Particular attention should be given to the safety aspects and the environmental

and/or cost benefits which would result from the use of Relaxations. The consideration process should be recorded. The preferred option should be compared against options that would meet Desirable Minimum Standards.

1.18 A number of layout options might be feasible for a scheme, with each containing Relaxations. This Standard gives examples of locations where some options can be expected to be safer than others. For example, providing Desirable Minimum Stopping Sight Distance to a junction, at the expense of less than desirable values of horizontal or vertical curvature at a location away from that junction. The Relaxation then becomes isolated in that only one feature is below desirable value on a given length of road, and that length does not contain the complication of a junction. In this manner the accident potential of a constrained alignment has been minimised by applying layout design principles based upon the knowledge currently available.

1.19 A list of principles to follow when preparing options that include Relaxations is as follows. It is equally a list of factors to be taken into account when considering the merits of options.

1.20 The Designer should consider whether, and to what degree the site is:

- isolated from other Relaxations
- isolated from junctions
- one where drivers have Desirable Minimum Stopping Sight Distance
- subject to momentary visibility impairment only
- one that would affect only a small proportion of the traffic
- on straightforward geometry readily understandable to drivers
- on a road with no frontage access
- one where traffic speeds would be reduced locally due to adjacent road geometry (eg uphill sections, approaching roundabouts and major/minor junctions where traffic has to give way or stop, etc), or speed limits

1.21 The Designer should also consider whether the following should be introduced in conjunction with any Relaxation:

- accident prevention measures (eg safety fencing, increased skidding resistance etc.)
- Warning signs and road markings to alert the driver to the layout ahead.

1.22 The Designer should have regard to the traffic flows carried by the link. High flows may carry a greater risk of queues & standing traffic approaching junctions in the peak period. Conversely lower flows might encourage higher speeds.

1.23 Values for sight distance, horizontal curvature and vertical curvature shall not be less than those given in Table 3 for 50kph Design Speed.

1.24 Only stopping sight distance, horizontal curvature, vertical curvature, and superelevation shall be subject to Relaxations. Stopping sight distance Relaxations of up to 1 Design Speed step below Desirable Minimum may be coincident with horizontal curvature Relaxations of up to 1 design Speed step below Desirable Minimum. All other combinations of Relaxations are not permitted and shall be treated as Departures.

1.25 Relaxations are not permitted for either of the overtaking sight distance parameters given in Table 3

1.26 The Relaxations below Desirable Minimum in stopping sight distance and vertical curvature for crest curves and Absolute Minimum for sag curves described in Paragraphs 2.8 to 2.13 inclusive and 4.9 to 4.17 inclusive are **NOT** permitted on the immediate approaches to junctions, because the majority of accidents occur in the vicinity of junctions. For the purposes of this Standard the immediate approaches to a junction shall be:

- a. For at grade major/minor junctions without diverge and merge tapers, those lengths of carriageway on the minor roads between a point 1.5 times the Desirable Minimum Stopping Sight Distance upstream of the Stop line or Give Way line and the Stop line or Give Way line itself, and those lengths of carriageway on the mainline between a point 1.5 times the Desirable Minimum Stopping Sight Distance from the centre line of the minor road and the centre line itself.
- b. For roundabouts, those lengths of carriageway on the approach to the roundabout between a 1.5 times the Desirable Minimum Stopping Sight Distance from the Give Way line and the Give Way line itself.

- c. For diverges, that length of carriageway from a point 1.5 times the Desirable Minimum Stopping Sight Distance upstream of the start of the diverge taper to the back of the diverge nose.
- d. For merges, that length of carriageway from a point 1.5 times the Desirable Minimum Stopping Sight Distance upstream of the back of the merge nose to the end of the merge taper.

Departures

1.27 In situations of exceptional difficulty which cannot be overcome by Relaxations, it may be possible to overcome them by adoption of Departures, the third tier of the hierarchy. Proposals to adopt Departures from Standard must be submitted to the Overseeing Department for approval before incorporation into a design layout to ensure that safety is not significantly reduced.

1.28 Where a scheme will create more than 2km of WS2 road (Categories 3B & 4, Table 4) then the approval of the Overseeing Department is required.

2. SIGHT DISTANCE

Stopping Sight Distance

2.1 Table 3 shows the stopping sight distance (SSD) appropriate for each Design Speed.

2.2 Stopping sight distance shall be measured from a minimum driver's eye height of between 1.05m and 2.00m, to an object height of between 0.26m and 2.00m both above the road surface, as shown in Figure 3. It shall be checked in both the horizontal and vertical plane, between any two points in the centre of the lane on the inside of the curve (for each carriageway in the case of dual carriageways).

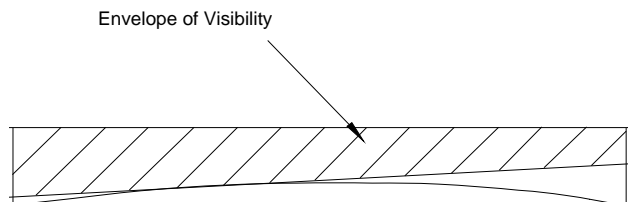


Figure 3 Measurement of Stopping Sight Distance

Full Overtaking Sight Distance

2.3 Table 3, shows for each Design Speed the Full Overtaking Sight Distance (FOSD) required for overtaking vehicles using the opposing traffic lane on single carriageway roads. Sufficient visibility for overtaking shall be provided on as much of the road as possible, especially where daily traffic flows are expected to approach the maximum design flows.

2.4 FOSD shall be available between points 1.05m and 2.00m above the centre of the carriageway as shown in Figure 4, and shall be checked in both the horizontal and vertical planes.

2.5 FOSD is considerably greater than stopping sight distance, and can normally only be economically provided in relatively flat terrain where the combination of vertical and horizontal alignment permits the design of a flat and relatively straight road alignment.

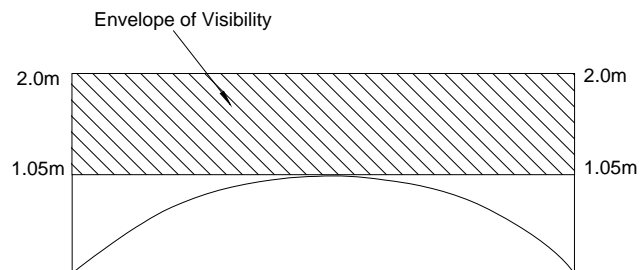


Figure 4 Measurement of FOSD

Coordinated Design of Single Carriageways:

2.6 It will frequently be more economic to design a single carriageway road so as to provide clearly identifiable Overtaking Sections with FOSD in relatively level areas, with climbing lanes at hills, interspersed with Non-overtaking Sections where constraints on the alignment would result in high cost or environmental implications. The detailed Standards and design considerations regarding the coordinated design of such links are given in Chapter 6 to Chapter 8 inclusive. Designs which provide the driver with obvious lengths for overtaking have been found to reduce the frequency of serious accidents occurring on roads with continuous large radius curves. On the other hand, in some conditions in flat topography speeds may be somewhat reduced. There is therefore always an inherent economic trade-off between the construction and environmental costs of alternative alignments and their user benefits, which shall be tested by COBA (Scotland - NESAs).

Obstructions to Sight Distance

2.7 Care shall be taken to ensure that no substantial fixed obstructions obstruct the sightlines including road furniture such as traffic signs. However, isolated slim objects such as lamp columns, sign supports, or slim footbridge supports of width 550mm or under can be ignored. Similarly, the effect of short intermittent obstructions, such as bridge parapets of minor roads under, can be ignored. Lay-bys should, wherever possible, be sited on straights or on the outside of curves, where stopped vehicles will not obstruct sightlines.

Relaxations

2.8 In the circumstances described in Paragraphs 1.15 to 1.26, Relaxations below the Desirable Minimum Stopping Sight Distance values may be made at the discretion of the Designer. The number of Design Speed steps permitted below the Desirable Minimum are normally as follows:

motorways	band A	1 step
motorways	band B	2 steps
all-purpose	band A	2 steps
all-purpose	band B	3 steps

However, in the circumstances listed in Paragraphs 2.9, 2.10, 2.11, and 2.12, the scope for Relaxations shall be extended or reduced as described.

2.9 For all band A roads where the stopping sight distance is reduced by bridge piers, bridge abutments, lighting columns, supports for gantries and traffic signs in the verge or central reserve which form momentary obstructions, the scope for Relaxations may be extended by 1 Design Speed step.

2.10 Long bridge parapets or safety fences or safety barriers on horizontal curves may obscure stopping sight distance to the 0.26m object height, although the appropriate sight distance to the tops of other vehicles, represented by the 1.05m object height, will be obtained above the parapet or safety fence or safety barrier. For band A roads where the appropriate stopping sight distance to the high object is available in this way, the scope for Relaxation of stopping sight distance for sight lines passing in front of the obstruction to the 0.26m object height may be extended by one Design Speed step.

2.11 On or near the bottom of long grades on dual carriageways steeper than 3% and longer than 1.5km the scope for Relaxations shall be reduced by 1 Design Speed step. Conversely, at or near the top of up gradients on single carriageways steeper than 4% and longer than 1.5 km, the scope for Relaxation may be extended by 1 step due to reduced speeds uphill.

2.12 The scope for Relaxations shall be reduced by 1 Design Speed step immediately following an Overtaking Section on single carriageway roads (see Paragraphs 7.5 to 7.16).

2.13 Relaxations below Desirable Minimum are not permitted on the immediate approaches to junctions as defined in Paragraph 1.26.

3. HORIZONTAL ALIGNMENT

Road Camber

3.1 On sections of road with radii greater than that shown in Table 3, (Minimum R without elimination of adverse camber & transitions), (ie $V^2/R < 5$) the crossfall or camber should be 2.5% from the centre of single carriageways, or from the central reserve of dual carriageways to the outer channels. At junctions other than roundabouts, the cross-section of the major road shall be retained across the junction, and the side road graded into the channel line of the major road. On horizontal curves, adverse camber shall be replaced by favourable crossfall of 2.5% when the radius is less than that shown in Table 3, (Minimum R without elimination of adverse camber & transitions), (ie $V^2/R > 5$). However, it will frequently be necessary to eliminate adverse camber on larger radii for aesthetic or drainage reasons.

Superelevation

3.2 On radii less than those shown in Table 3, (Minimum R with superelevation of 5%), (ie $V^2/r > 7$) superelevation shall be provided, such that:

$$S = \frac{V^2}{2.828 \times R}$$

Where :

V = Design Speed kph

R = Radius of Curve m.

S = Superelevation %.

In rural areas superelevation shall not exceed 7%

In urban areas with at-grade junctions and side accesses, superelevation shall be limited to 5%.

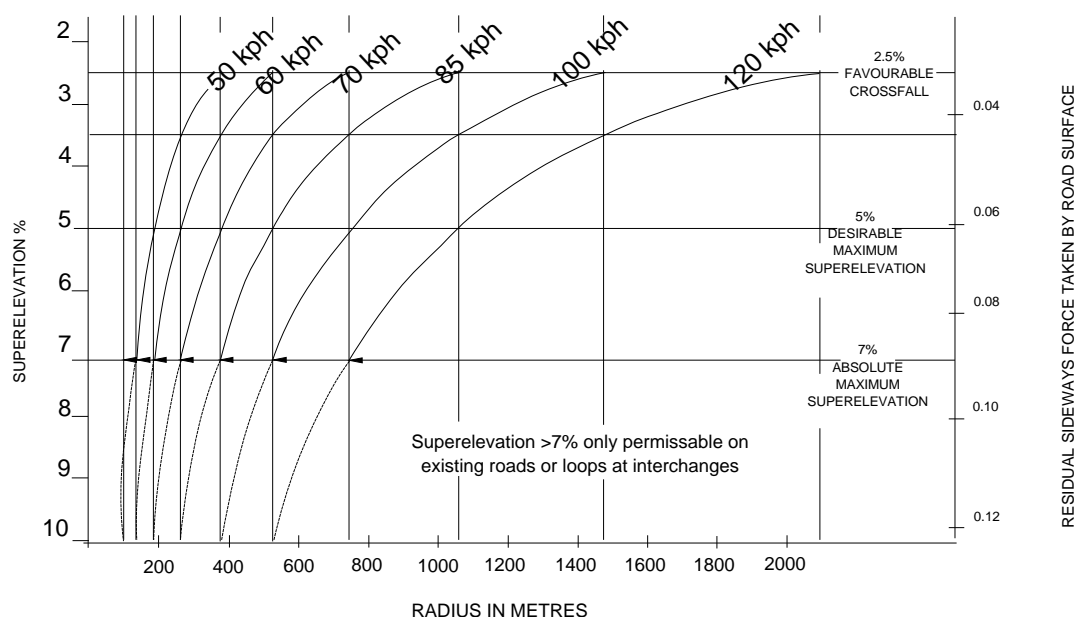


Figure 5 Superelevation of Curves

Figure 5 shows the appropriate superelevation for the range of Design Speeds. Sharper radii than the Desirable Minimum shown in Table 3 result in steep crossfalls which should be avoided if possible. It is essential to maintain adequate skidding resistance and good drainage at all superelevations in accordance with the Overseeing Department's current criteria.

Desirable Minimum Radius

3.3 The Desirable Minimum radii, corresponding with superelevation of 5% and radii below Desirable Minimum with superelevation of 7% are shown in Table 3 (ie $V^2/R > 14$ Desirable, 20 Absolute Maximum).

Relaxations

3.4 In the circumstances described in Paragraphs 1.16 to 1.26, Relaxations below the Desirable Minimum values may be made at the discretion of the Designer. The number of Design Speed steps permitted below the Desirable Minimum are normally as follows:-

motorways	band A	2 step
motorways	band B	3 steps
all-purpose	band A	3 steps
all-purpose	band B	4 steps

However, for all roads in Design Speed band B in the circumstances listed in Paragraphs 3.5 and 3.6, the scope for Relaxations shall be extended or reduced as described.

3.5 On or near the bottom of long grades on dual carriageways steeper than 3% and longer than 1.5km the scope for Relaxations shall be reduced by 1 Design Speed step. Conversely, at or near the top of up gradients on single carriageways steeper than 4% and longer than 1.5 km, the scope for Relaxations may be extended by 1 step due to reduced speeds uphill.

3.6 The scope for Relaxations shall be reduced by 1 Design Speed step immediately following an Overtaking Section on single carriageway roads (see Paragraphs 7.5 to 7.16).

Appearance and Drainage

3.7 Superelevation shall not be introduced, nor adverse camber removed, so gradually as to create large almost flat areas of carriageway, nor so sharply as to cause discomfort or to kink the edges of the carriageway. A satisfactory appearance can usually be achieved by ensuring that the carriageway edge profile does not vary in grade by more than about 1% from that of the line about which the carriageway is pivoted, and by ample smoothing of all changes in edge profile. In general on motorways, a smoother edge profile should be provided by reducing the variation in grade of the edge profile to a maximum of 0.5% where feasible, ie where local drainage conditions permit, and care should be taken to ensure that a minimum longitudinal gradient of at least 0.5% is maintained wherever superelevation is to be applied or reversed. However, in some difficult areas even the above requirements can lead to drainage problems, eg where the superelevation is applied against the longitudinal gradient. It may be necessary to either modify the horizontal alignment to move the superelevation area, increase the variation in grade of the edge profile, or apply a rolling crown. Areas susceptible to such drainage problems should be identified at an early stage in the design process, before the horizontal alignment is fixed.

Application of Superelevation

3.8 Progressive superelevation or removal of adverse camber shall be achieved over or within the length of the transition curve from the arc end. On existing roads without transitions, between $\frac{1}{2}$ and $\frac{2}{3}$ of the cant shall be introduced on the approach straight and the remainder at the beginning of the curve.

Widening on Curves

3.9 Widening of curves on links and on the main line through junctions is required for carriageways of less than standard width and for low radius curves of standard width to allow for the swept path of long vehicles.

3.10 For Carriageways of Standard Width, (7.3m, 11m, and 14.6m for 2, 3 or 4 lanes respectively), an increase of 0.3m per lane shall be allowed when the radius is between 90m and 150m. Two lane roads of width greater than 7.9m require no additional widening.

3.11 For Carriageways less than the Standard Widths, widening shall be:

0.6m per lane where the radius is between 90m and 150m subject to maximum carriageway widths of 7.9m, 11.9m and 15.8m (for 2, 3 and 4 lanes respectively).

0.5m per lane where the radius is between 150m and 300m, subject to a maximum width not greater than the standard width in Paragraph 3.10 above.

0.3m per lane, where the radius is between 300m and 400m subject to a maximum width not greater than the standard width in Paragraph 3.10 above.

3.12 Radii less than 90m on the mainline are Departures from standard. For these and all other junction elements, widening should be in accordance with TA 20 (DMRB 6.2).

3.13 The extra width should be applied uniformly along the transition curve. In the improvement of existing curves the widening should generally be made on the inside of curves.

Lane Width Reductions at Pinch Points:

3.14 At points of particular difficulty on new dual carriageways, where full lane widths cannot be achieved, a reduction from 3.65m to 3.50m is permitted provided that the radius of curvature exceeds 1000m. Points where such a relaxation are likely to be most applicable are around the urban fringe, and at sites with difficult topography or in historic or conservation areas. This relaxation shall not apply on new single carriageway roads.

Transitions

3.15 Transition curves shall be provided on curves the radius of which are less than that shown in Table 3, Minimum R without elimination of adverse camber & transitions.

3.16 Length of Curve:

The basic transition length shall be derived from the formula:

$$L = \frac{V^3}{46.7 \times q \times R}$$

Where:

L = Length of transition (m)

V = Design Speed (kph)

q = Rate of increase of centripetal acceleration (m/sec³) travelling along curve at constant speed V(kph)

R = Radius of curve (m)

q should normally not exceed 0.3 m/sec³, although in difficult cases, it may be necessary to increase the value up to 0.6 m/sec³. On bends (sub-Standard curves for the appropriate Design Speed) the length of transition should normally be limited to $\sqrt{(24R)}$ metres.

3.17 Application of Superelevation: Superelevation or elimination of adverse camber shall generally be applied on or within the length of the transition curve from the arc end. The basic transition appropriate to the Design Speed however will often result in insufficient transition length to accommodate superelevation turnover, and it will therefore be necessary to provide longer transitions to match the superelevation design.

The Effect of Sight Distance at Horizontal Curves

3.18 Stopping Sight Distance: When the road is in a cutting, or at bridge crossings, it will be necessary to widen verges or increase bridge clearances to ensure that the appropriate stopping sight distance is not obstructed. Figure 6 shows the maximum central offset required with varying horizontal curvature, in order to maintain the Design Speed related stopping sight distances. It can be seen that extensive widening of verges and structures, or central reserves with safety fence or safety barriers, would be required to maintain Desirable Stopping Sight Distances on horizontal radii below Desirable Minimum. Where a road is on embankment, however, visibility will be available across the embankment slope, and in such cases it is environmentally desirable to permit beneficial usage of the land by granting a licence to adjoining landowners under Section 142, Highways Act, 1980. (Scotland: Section 50, Roads Scotland Act 1984.)

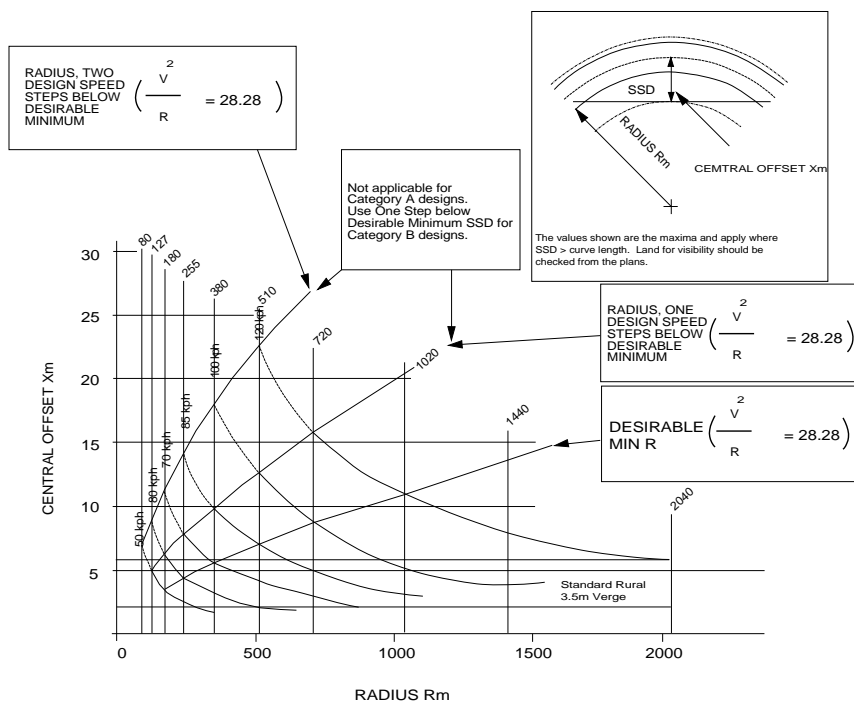


Figure 6 Verge Widening for Desirable Minimum Stopping Sight Distance

3.19 Full Overtaking Sight Distance: Figure 7 shows the maximum central offset required with varying horizontal curvature, in order to maintain the Design Speed related FOSD's. It can be seen that the higher requirements of FOSD result in extensive widening of verges for all but relatively straight sections of road, and in such cases it is environmentally desirable to permit beneficial usage of the land by granting a licence to adjoining landowners under Section 142, Highways Act, 1980. (Scotland: Section 50, Roads Scotland Act 1984).

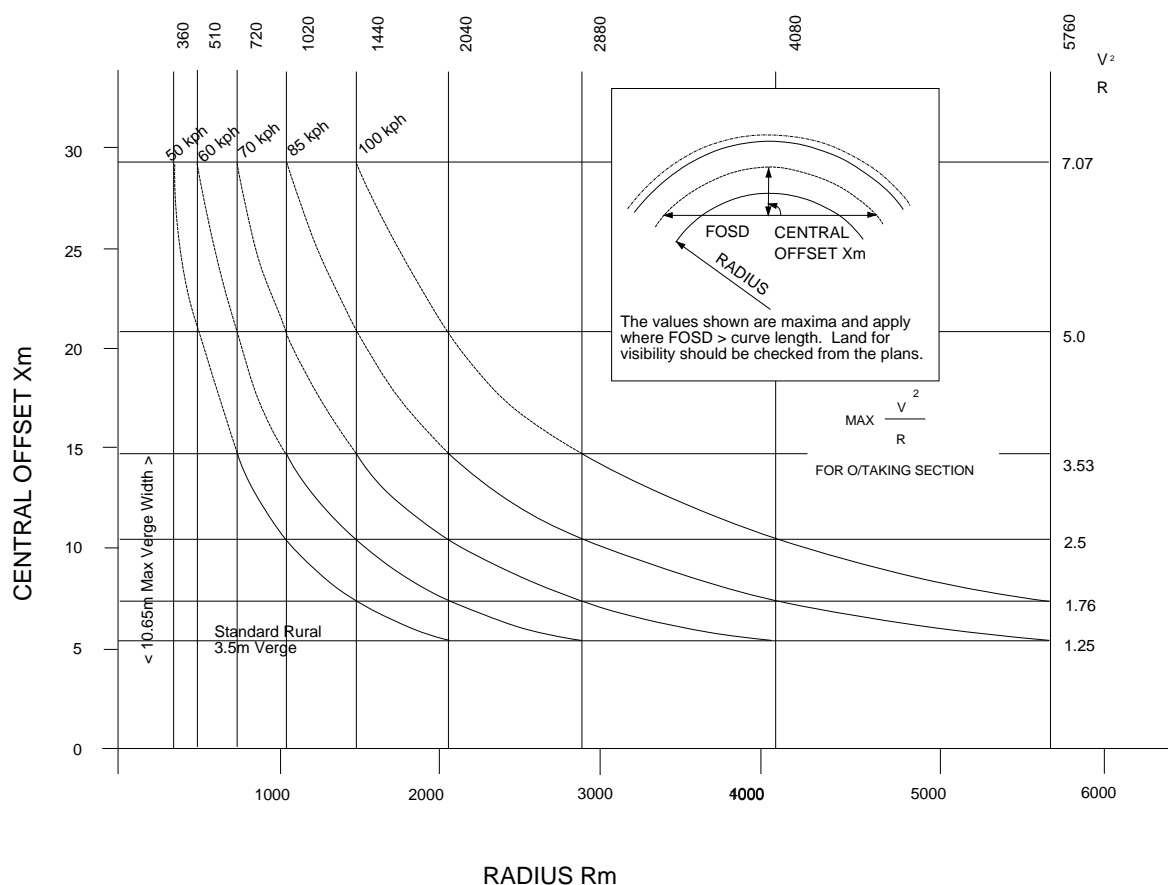


Figure 7 Verge Widening for FOSD

4. VERTICAL ALIGNMENT

Gradients

4.1 Maximum Gradients: The desirable maximum gradient for design shall be:

	<u>Desirable Max Grade</u>
Motorways	3%
AP Dual Carriageways	4%
AP Single Carriageways	6%

However, in hilly terrain steeper gradients will frequently be required, particularly where traffic volumes are at the lower end of the range.

4.2 Effects of Steep Gradients: In hilly terrain the adoption of gradients steeper than Desirable Maximum could make significant savings in construction or environmental costs, but would also result in higher user costs, ie by delays, fuel and accidents. Whilst on motorways the disbenefits associated with the consequently high traffic volumes indicate that 4% gradient should normally be regarded as the Absolute Maximum, on all purpose roads an economic assessment of the effects of adopting a steeper gradient should be carried out to determine the economic trade-off between construction/environmental cost savings and disbenefits to traffic (as shown in Annex 2). There is, however, a progressive decrease in safety with increasingly steeper gradients, and gradients steeper than 8% shall be considered as Departures from Standards.

4.3 Minimum Gradients: For effective drainage with kerbed roads a minimum gradient of 0.5% should be maintained wherever possible. In flatter areas, however, the vertical alignment should not be manipulated by the introduction of vertical curvature simply to achieve adequate surface water drainage gradients. Drainage paths must be provided by false channel profiles with minimum gradients of 0.5%. False channels may be avoided by using over-edge drainage (to filter drains or surface channels or ditches) where kerbs are inappropriate, eg in rural areas.

Vertical Curves

4.4 General: Vertical curves shall be provided at all changes in gradient. The curvature shall be large enough to provide for comfort and, where appropriate, stopping sight distances for safe stopping at Design Speed. The use of the permitted vertical curve parameters will normally meet the requirements of visibility, however stopping sight distance should always be checked because the horizontal alignment of the road, presence of crossfall, superelevation or verge treatment and features such as signs and structures adjacent to the carriageway will affect the interaction between vertical curvature and visibility.

4.5 K Values: Curvature shall be derived from the appropriate K value in Table 3. The minimum curve lengths can be determined by multiplying the K values shown by the algebraic change of gradient expressed as a percentage, ie +3% grade to -2% grade indicates a grade change of 5%. Thus for a Design Speed of 120 kph, the length of a crest curve would be:

$$\begin{aligned}\text{Desirable Min} &= 5 \times 182 = 910\text{m} \\ \text{Absolute Min} &= 5 \times 105 = 525\text{m}\end{aligned}$$

4.6 Crest Curves: There are two factors that affect the choice of crest curvature, visibility and comfort. At Design Speeds of 50 kph and above the crest in the road will restrict forward visibility to the Desirable Minimum Stopping Sight Distance before minimum comfort criteria are approached, and consequently Desirable Minimum crest curves are based upon visibility criteria.

4.7 Sag Curves: Visibility at sag curves is usually not obstructed unless overbridges, signs or other features are present. For these curves, comfort criteria apply. (0.3 m/sec² maximum rate of vertical acceleration). However, for Design Speeds of 70 kph and below in unlit areas, shallower curves are necessary to ensure that headlamps illuminate the road surface for a stopping sight distance which is not more than one Design Speed step below Desirable Minimum Stopping Sight Distance. Sag curves should normally be designed to the Absolute Minimum k values in Table 3.

4.8 Grass Verges Where, at crests, the sight line crosses the verge, consideration shall be given to the design of a lower verge profile in order to allow for an overall height of grass of 0.5m.

Relaxations

4.9 Crest curves In the circumstances described in Paragraphs 1.15 to 1.26, Relaxations below the Desirable Minimum values may be made at the discretion of the Designer. The number of Design Speed steps permitted below the Desirable Minimum are normally as follows:

motorways	band A	1 step
motorways	band B	2 steps
all-purpose	band A	2 steps
all-purpose	band B	3 steps

However, in the circumstances listed in Paragraphs 4.10, 4.11 and 4.12 the scope for Relaxations shall be extended or reduced as described.

4.10 At or near the top of up gradients on single carriageways steeper than 4% and longer than 1.5 km, the scope for Relaxations may be extended by 1 step due to reduced speeds uphill.

4.11 The scope for Relaxations shall be reduced by 1 Design Speed step immediately following an Overtaking Section on single carriageway roads (see Paragraphs 7.5 to 7.16).

4.12 For band A roads when the crest curve is within a straight section the scope for Relaxations may be extended by 1 Design Speed step.

4.13 Relaxations below Desirable Minimum are not permitted on the immediate approaches to junctions as defined in Paragraph 1.26.

4.14 Sag curves In the circumstances described in Paragraphs 1.15 to 1.26, Relaxations below the Absolute Minimum values may be made at the discretion of the Designer. The number of Design Speed steps permitted below the absolute minimum are normally as follows:

motorways	none
all-purpose all others	1 step
all-purpose 50B, 60B, 70B	2 steps

However, in the circumstances listed in Paragraphs 4.15 and 4.16, the scope for Relaxations shall be extended or reduced as described.

4.15 For Design Speeds of 70kph and less where the road is illuminated, the scope for Relaxations may be extended by one Design Speed step.

4.16 For roads in Design Speed bands 50B, 60B and 70B the scope for Relaxations shall be reduced by 1 Design Speed step immediately following an Overtaking Section on single carriageway roads (see Paragraphs 7.5 to 7.16).

4.17 Relaxations below Desirable Minimum are not permitted on the immediate approaches to junctions as defined in Paragraph 1.26.

C. TD 27/05 Cross sections and headroom

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 2

TD 27/05

CROSS-SECTIONS AND HEADROOMS

SUMMARY

This Standard sets out the dimensional requirements for the highway cross-sections for all-purpose and motorway trunk roads, both at and away from structures. It also gives requirements for headroom at structures.

INSTRUCTIONS FOR USE

1. Remove Contents pages from Volume 6 and insert new Contents page for Volume 6 dated February 2005.
2. Remove TD 27/96 from Volume 6, Section 1 which is superseded by this Standard and archive as appropriate.
3. Insert TD 27/05 into Volume 5, Section 1.
4. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

**WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU**



DRD
Department for
Regional Development
www.drdni.gov.uk

**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

Cross-Sections and Headrooms

Summary: This Standard sets out the dimensional requirements for the highway cross-sections for all-purpose and motorway trunk roads, both at and away from structures. It also gives requirements for headroom at structures.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 2

TD 27/05

CROSS-SECTIONS AND HEADROOMS

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Chapter

1. Introduction
2. Design Principles
3. Design Process
4. Highway Cross-Sections
5. Highway Cross-Sections at Structures
6. Headrooms at Structures
7. References
8. Enquiries

Annex A Features Commonly Occurring in the
 Highway Cross-Section

Annex B Rural Motorway Widening, Cross-Section
 and Layout at Physical Restraints

1. INTRODUCTION

1.1 General

1.1.1 This Standard sets out the design principles and factors that should be considered by Design Organisations in selecting highway cross-sections and headrooms. The process of design is described together with an approach to developing options.

1.1.2 This Standard supersedes TD 27/96. The major changes are:

- i. the use of a modular system to describe the individual components of the cross-section;
- ii. the acknowledgement that society demands measures to permit better use of existing roads;
- iii. further guidance to encourage consideration of future maintenance operations;
- iv. a widening of the road pavement in certain circumstances for reasons of buildability and to accommodate future traffic management layouts;
- v. emphasis on the need to fully consider and promote facilities for non-motorised road users;
- vi. the way in which certain components of the cross-section are measured;
- vii. the presentation of information has been clarified and improved, with new Tables and additional Figures; and
- viii. definitions have been updated and extended:
 - guidance associated with reduced width hardshoulders, central reserve and lane widths to assist in the widening of rural motorways at short obstructions. See Annex B; and
 - advice given on the provision of off-side hardstrips.

1.2 Scope

1.2.1 This Standard gives details of the cross-sections and headrooms to be used for all-purpose and motorway trunk roads, both at and away from structures.

1.2.2 The information covers trunk roads of all types: rural motorways, rural all-purpose roads, urban motorways and urban all-purpose roads, together with associated connector roads.

1.2.3 The cross-section of side roads that are not part of the Overseeing Organisation's network should be agreed with the relevant Highway Authority. Further details are given in Chapter 5.

1.2.4 This Standard is not applicable to road tunnels. For guidance see **BD 78 (DMRB 2.2.9)**.

1.2.5 For details of pedestrian, cycle and equestrian subway dimensions see **TD 36 (DMRB 6.3.1)** and **TA 91 (DMRB 5.2.4)**, for footbridges see **BD 29 (DMRB 2.2.8)**, and for agricultural crossings see **TA 57 (DMRB 6.3)** and **TA 56 (DMRB 8.2)**.

1.2.6 This standard does not give mandatory requirements for headroom near airports or at power lines, but Annex A provides details of sources of information.

1.3 Implementation

1.3.1 This Standard must be used forthwith for the design of all schemes for the construction and improvement of all-purpose and motorway trunk roads currently being prepared, provided that in the opinion of the Overseeing Organisation, this would not result in any significant additional expense or delay. The Design Organisation must confirm its application to particular schemes with the Overseeing Organisation.

1.4 Definitions

1.4.1 For the definitions of the general highway terms used in this Standard, such as "highway types" (trunk roads, motorway and all-purpose roads etc) and

“components of the highway” (hardshoulders, hardstrips and climbing lanes etc.), see **BS 6100: Subsection 2.4.1**.

1.4.2 Particular terms used in this Standard are defined as:

Bridleway: Highway for use on foot or horseback (unless specifically prohibited, cyclists can also use a bridleway but are required to give way to other users).

Berm: Any nominally flat area between the back of the verge and the highway boundary at the top of a cutting or the bottom of an embankment.

Central Reserve: The area that separates the carriageways of a dual carriageway exclusive of any hardstrips.

Connector Road: Refer to **TD 22 (DMRB 6.2.1)**.

Cross-section: The assembly of the various components of the highway between the highway boundaries, measured at right angles to the line of the highway. The cross-section includes carriageways, central reserve, separator zones, hardshoulders, hardstrips, verges including any footway, cycle track or bridleway, cutting or embankment slopes and berms. (See Figure 4-1a to Figure 4-4b).

CSRRS (Current Standard for Road Restraint Systems): Please refer to the Overseeing Organisations' current standard for road restraint systems. Note: Where diagrams within TD 27 show vehicle restraint systems, these are for illustrative purposes only and the CSRRS must be consulted to determine the appropriateness of any provision.

Cycle Lane: A lane in the carriageway for use by cyclists.

Cycle Track: A track separate from the main carriageway for use by cyclists.

Design Organisation: The organisation commissioned to undertake the various phases of scheme preparation.

Designated Lanes: A lane reserved exclusively for use by designated vehicles such as cycles, buses, taxis, large goods vehicles and high occupancy vehicles.

Downstream: That part of the carriageway(s) where the traffic is flowing away from the cross-section in question.

Headroom: The minimum distance between the surface of the highway cross-section and the deflected structure (including any temporary or permanent attachments) measured at right angles to the surface of the cross-section.

Interchange: Refer to **TD 22 (DMRB 6.2.1)**.

Interchange Link: Refer to **TD 22 (DMRB 6.2.1)**.

Loops: Refer to **TD 22 (DMRB 6.2.1)**.

Mainline: The carriageway carrying the main flow of traffic (generally traffic passing straight through a junction or interchange).

Maintained Headroom: The minimum value of Headroom that must be preserved at all times.

Margin: EITHER the area between the Paved Width and an NMU route OR an area between two parallel NMU routes OR an area between an NMU route and a physical boundary.

New Construction Headroom: The value of Headroom for new structures that includes an additional allowance for future road realignment and resurfacing.

Nearside: Left-hand side of vehicle when viewing a forward moving vehicle from behind, typically the front-seat passenger side of the vehicle in the UK.

Non-Motorised Users (NMUs): Pedestrians, cyclists and equestrians including mobility impaired users as defined in **HD 42 (DMRB 5.2.5)**.

Offside: Right-hand side of vehicle when viewing a forward moving vehicle from behind, typically the driver's side of the vehicle in the UK.

Overbridge: A bridge that spans the road under consideration.

Overseeing Organisation: The Highway Authority for the road construction or improvement scheme.

Paved Width: A collective term for the surface of the road cross-section that comprises the carriageway, hardshoulder and hardstrips.

Paved Width Headroom: The value of Headroom over the Paved Width.

Road Tunnel: Refer to **BD 2 (DMRB 1.1)**.

Rural Roads: All-purpose roads and motorways that are generally not subject to a local speed limit. Refer to TA 46 (DMRB 5.1.3).

Separator Zone: An area that separates traffic flows on the mainline from an adjacent parallel road, e.g. link road.

Slip Road: Refer to TD 22 (DMRB 6.2.1).

Standard Headroom: Either Maintained Headroom or New Construction Headroom, as appropriate.

Structure: Any object with the primary purpose of bearing loads. This includes bridges, footbridges, retaining walls and sign or signal gantries, but excludes more frangible items such as deformable vehicle restraint systems and small span drains.

Structure Free Zone (SFZ): A buffer zone adjacent to the Paved Width and beneath a Structure that reduces the risk of errant vehicle impacts by providing an appropriate value of Headroom.

Subway: Underground passageway or tunnel for use by pedestrians, cyclists and sometimes equestrians.

Underbridge: A bridge that carries the road under consideration.

Urban Roads: Refer to TA 79 (DMRB 5.1.3).

Urban Motorway: A motorway with a speed limit of 60 mph or less within a built-up area.

Urban All-Purpose Road (UAP): An all-purpose road within a built-up area, either a single carriageway with a speed limit of 40mph or less or a dual-carriageway with a speed limit of 60mph or less.

Upstream: That part of the carriageway(s) where traffic is flowing towards the cross-section in question.

Vehicle Restraint System (VRS): Refer to CSRRS.

Verge: Any nominally flat area between the edge of the Paved Width and either the start of an adjacent side slope or, in the absence of a side slope, the highway boundary or bridge parapet.

Wide Highway Corridor: Any highway with five or more lanes in any one direction.

Working Width: Refer to CSRRS.

1.5 Mandatory Sections

1.5.1 Mandatory sections of this document are contained in boxes. The Design Organisation must comply with these sections or obtain agreement to a Departure from Standard from the Overseeing Organisation. The remainder of the document contains advice and explanation, which is commended to users for consideration.

1.6 Departures From Standard

1.6.1 In exceptional situations, the Overseeing Organisation may be prepared to agree to a Departure from Standard where the standard, including permitted Relaxations, is not realistically achievable. Design Organisations faced by such situations and wishing to consider pursuing this course must discuss any such option at an early stage in design with the Overseeing Organisation. Proposals to adopt Departures from Standard must be submitted by the Design Organisation to the Overseeing Organisation and formal approval received **BEFORE** incorporation into a design layout.

1.7 Relaxations

1.7.1 In difficult circumstances Relaxations may be introduced at the discretion of the Design Organisation, having regard to all relevant local factors, but only where specifically permitted by this Standard. Careful consideration must be given to layout options incorporating Relaxations, having weighed the benefits and any potential disbenefits. Particular attention must be given to the safety aspects (including operation, maintenance, construction and demolition) and the environmental and monetary benefits/disbenefits that would result from the use of Relaxations. The consideration process must be recorded. The preferred option must be compared against options that would meet full Standards.

6. HEADROOMS AT STRUCTURES

6.1. General

6.1.1 Dimensional Standards are given in Table 6-1 for New Construction Headroom and Maintained Headroom at overbridges and at other structures over a highway.

6.1.2 For definitions of Headroom, Maintained Headroom, New Construction Headroom, Paved Width Headroom, Standard Headroom and Structure Free Zone, refer to paragraph 1.4.2.

6.1.3 All new structures must be designed and constructed to provide a Paved Width Headroom equal to or greater than the New Construction Headroom given in Table 6-1. In addition New Construction Headroom must be provided over the extent of the Structure Free Zones in accordance with paragraph 6.3.1.

6.1.4 Where the Paved Width Headroom beneath an existing structure is reduced as a consequence of resurfacing, the residual Paved Width Headroom must not be less than the appropriate Maintained Headroom given in Table 6-1.

6.1.5 Where the Paved Width Headroom beneath an existing structure is proposed to be reduced as a consequence of bridge strengthening or road widening, the Design Organisation must consider all the issues that may influence the choice of structure headroom, including those described in paragraphs 6.1.10 and 6.1.11.

6.1.6 The Paved Width Headroom proposed by the Design Organisation must be subject to the agreement of the Overseeing Organisation. In the case of existing structures, Design Organisations must ensure that any change to the Paved Width Headroom as given in paragraphs 6.1.4 and 6.1.5 above are documented in the Overseeing Organisation's bridge records and planning systems for the movement of high loads on a route.

6.1.7 Where a Maintaining Organisation has identified an existing structure with Headroom less than Maintained Headroom over the Paved Width, the Overseeing Organisation must be advised immediately and a risk assessment carried out as soon as is practicable and the structure managed in accordance with the outcome of that risk assessment.

6.1.8 The Headroom provision at Underbridges for trunk roads passing over other authorities' facilities must be agreed with the relevant highway, railway or water authority (road, rail, navigation or river authority in Scotland). However, where a trunk road passes over another highway, the Headroom provision must not be less than the corresponding Standard Headroom given in Table 6-1.

6.1.9 The Standard Headrooms given in Table 6-1 are the minima. Even when Headroom in excess of these values has been provided, the Design Organisation may still need to consider the effects of vehicle collisions on bridge superstructures. For new structures the Design Organisation must refer to **BD 60 (DMRB 1.3.5)** for details of design requirements relating to vehicle collision loads on bridge superstructures.

6.1.10 Headroom greater than the minimum may be needed when considering the following issues:

- i. risk of vehicular impact with the superstructure, taking into account records of vehicle impact and any indicators of previous impacts on the superstructure;
- ii. provision for adequate forward visibility in sags (see paragraph 6.2.1);
- iii. forward visibility to overhead signs and signals;
- iv. future implications for maintenance of structure and pavement;
- v. whole life costs of structure and pavement;

- vi. accommodation of services or apparatus;
- vii. compliances with the Design Organisation's health and safety responsibilities (see paragraph 3.2.2);
- viii. other site specific issues; and
- ix. to provide uniformity of headroom (see paragraph 6.5.1).

6.1.11 Where it is economical and/or environmentally acceptable, Headroom greater than the minimum should be provided.

6.1.12 Confirmation of the Paved Width Headroom actually provided based on site measurement alone can be prone to error as Headroom can seldom be obtained directly by vertical measurement alone. A desk study based on as-built records is recommended prior to actual on-site measurement, to determine an accurate method that will provide the correct perpendicular Headroom dimension.

6.2 Compensation for Vertical Sag Curvature and Deflection

6.2.1 Where the road passing under a structure is on a sag curve, the Standard Headrooms in Table 6-1 must be increased in accordance with Table 6-2. The sag radius must be measured along the carriageway over a 25m chord.

6.2.2 Allowances must be made for the deflection of structures. The relevant Standard Headroom must be provided for the serviceability limit state under the action of the maximum design deflection. The maximum design deflection must be obtained by reference to the relevant loading standard.

Type of structure	New Construction Headroom (m)	Maintained Headroom (m)
Overbridges	5.30 + S	5.03 + S
Footbridges, Sign/Signal Gentries and other structures vulnerable to vehicular impact	5.7 + S	5.41 + S
Free Standing Temporary Structures	N/A	5.41¹ + S
All Permanent Structures over High Load Routes ²	6.45 + S	6.18¹ + S

Where S = Sag Curve Compensation in accordance with Table 6-2

Table 6-1: Standard Headroom at Structures

1 For Free Standing Temporary Structures and also for a Temporary Structure attached to a Permanent Structure refer also to paragraph 2.5.4 of the **Traffic Signs Manual, Chapter 8**.
2 Not applicable in Northern Ireland.

Sag Radius (m)	Additional Clearance S (mm)
1000	80
1200	70
1500	55
2000	45
3000	25
6000	15
>6000	Nil

Table 6-2: Sag Curve Compensation

6.3 Structure Free Zone (SFZ)

6.3.1 Errant vehicles may leave the road pavement leading to a risk of collision with components of the structure. In addition, it may become necessary in the future to increase the width of the pavement (either permanently or temporarily) at the expense of the adjacent verge and central reserve. In order to ensure that adequate provision is made for these circumstances, SFZ must be included beneath all new structures, by providing the appropriate value of New Construction Headroom given in Table 6-1 over the lesser of the following widths:

- i. the full verge width derived from paragraph 5.6.1 or central reserve width derived from paragraph 5.5.1 (deemed to include any side slopes shallower than 1:4 - vertical:horizontal); and
- ii. from the edge of the Paved Width to the face of any vertical support.

6.3.2 Examples of the Paved Width Headroom and the SFZ for typical Cross-sections are given in Figure 6-1, Figure 6-2 and Figure 6-3.

6.3.3 Where a Maintaining Organisation has identified an existing structure with an SFZ providing less than Maintained Headroom, a risk assessment should be carried to determine if measures to safeguard

the structure are required, e.g. the introduction of a VRS.

6.3.4 The SFZ defined in paragraph 6.3.1 above should be marked on the design and as-built drawings in combination with the Paved Width Headroom and the corresponding Maximum Live Load Deflection (as shown on Figure 6-1, Figure 6-2 and Figure 6-3) for the purposes of maintaining accurate bridge records.

6.3.5 Even when an SFZ has been provided, the Design Organisation may still need to consider the effects of vehicle collisions. For new structures, the Design Organisation must refer to **BD 60 (DMRB 1.3.5)** for details of design requirements relating to vehicle collision loads.

6.4 Non-Motorised User Headrooms

6.4.1 Requirements for Headroom at subways dedicated to NMUs are contained in **TD 36 (DMRB 6.3.1)**.

6.4.2 For structures outside the scope of **TD 36 (DMRB 6.3.1)**, Design Organisations must adopt the Headrooms given in **TD 36 (DMRB 6.3.1)** where an NMU route is present. Where more than one Headroom value is quoted in **TD 36 (DMRB 6.3.1)** Design Organisations must adopt the higher value unless the NMU route is short as defined in **TD 36 (DMRB 6.3.1)**. The initial selection of NMU Headroom to be provided must be increased by 300mm where any future overlay of road pavement could subsequently reduce the adjacent NMU headroom to a value below the required minimum.

6.5 Uniformity of Headroom Along an Existing Route

6.5.1 Where a new overbridge is proposed on an existing route that has overbridges with Headroom greater than New Construction Headroom, consideration should be given to providing the same Paved Width Headroom as the existing bridges. This uniformity of Headroom can lead to a marked reduction in the risk of superstructure impacts along that route. The Headroom for new Overbridges on an existing

route should therefore be increased where this will allow uniformity of Headroom to be provided without significantly adding to cost. However, consideration should be given to the vulnerability of footbridges or other lightweight structures that may have lower Headrooms than other more robust structures on the same route.

6.6 Utilities Companies and Other Authorities Apparatus

6.6.1 Greater Headroom than that determined from paragraphs 6.1.1 to 6.2.2 and 6.3.1, may be required by a utility company, or other authority. Any such increase in the Headroom dimension must be agreed with the Overseeing Organisation.

6.7 Accommodation Underbridges

6.7.1 The Headroom for accommodation Underbridges should be selected using the criteria given in Section 5.11.

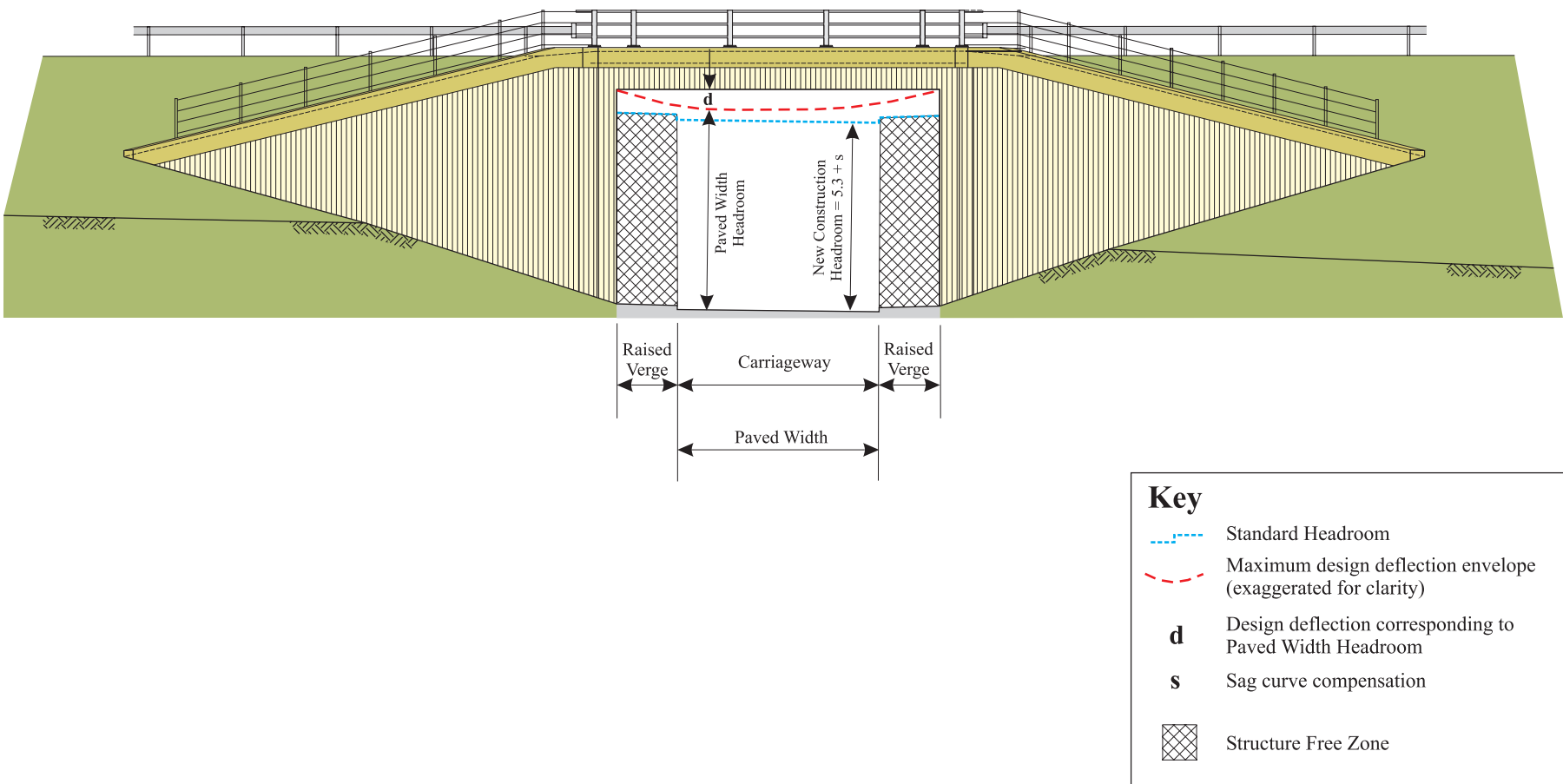


Figure 6-1: Headroom and Structure Free Zone for a Single Carriageway Road with Footways

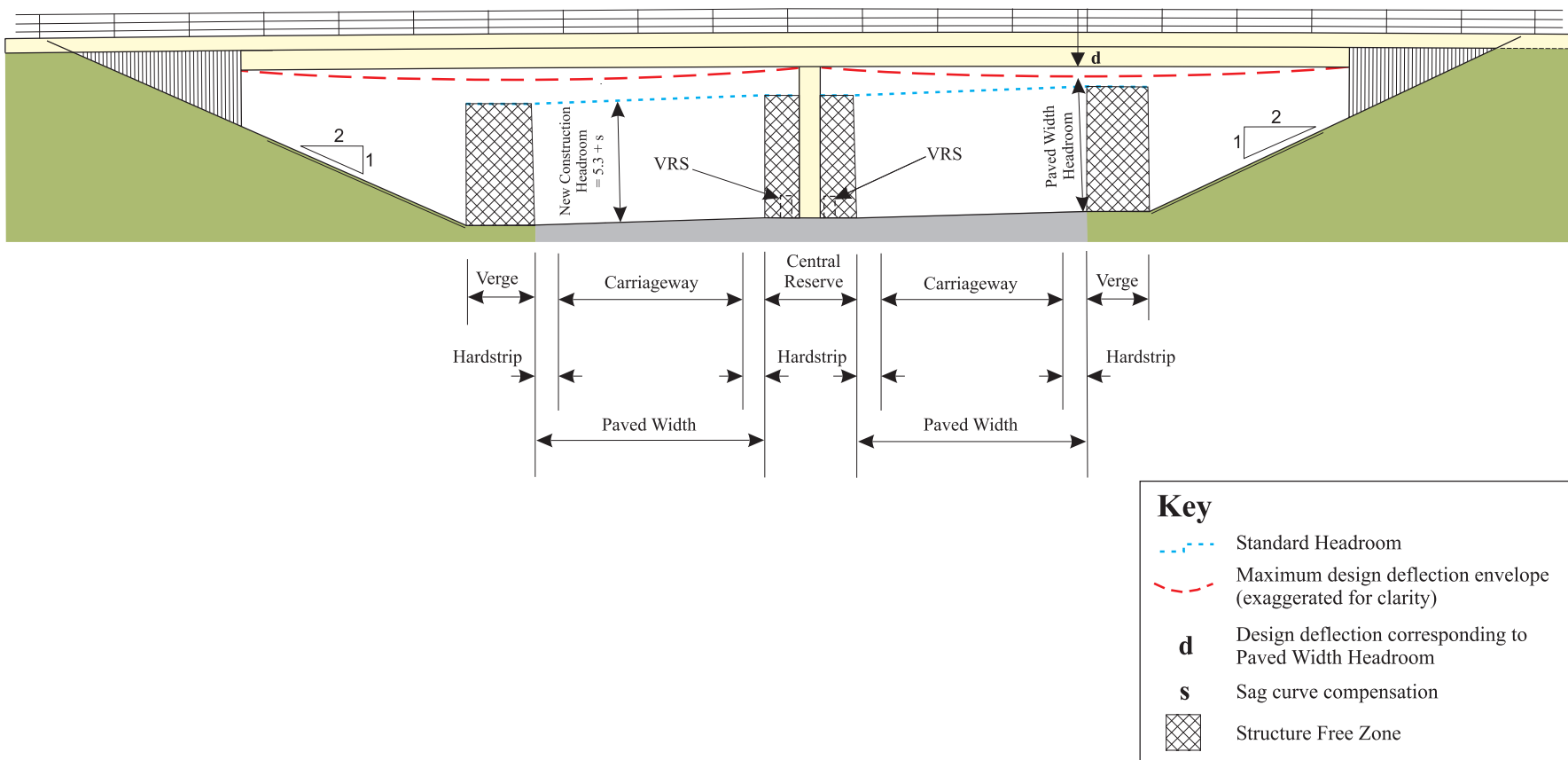


Figure 6-2: Headroom and Structure Free Zone for a Two Span Structure Crossing a Dual Carriageway

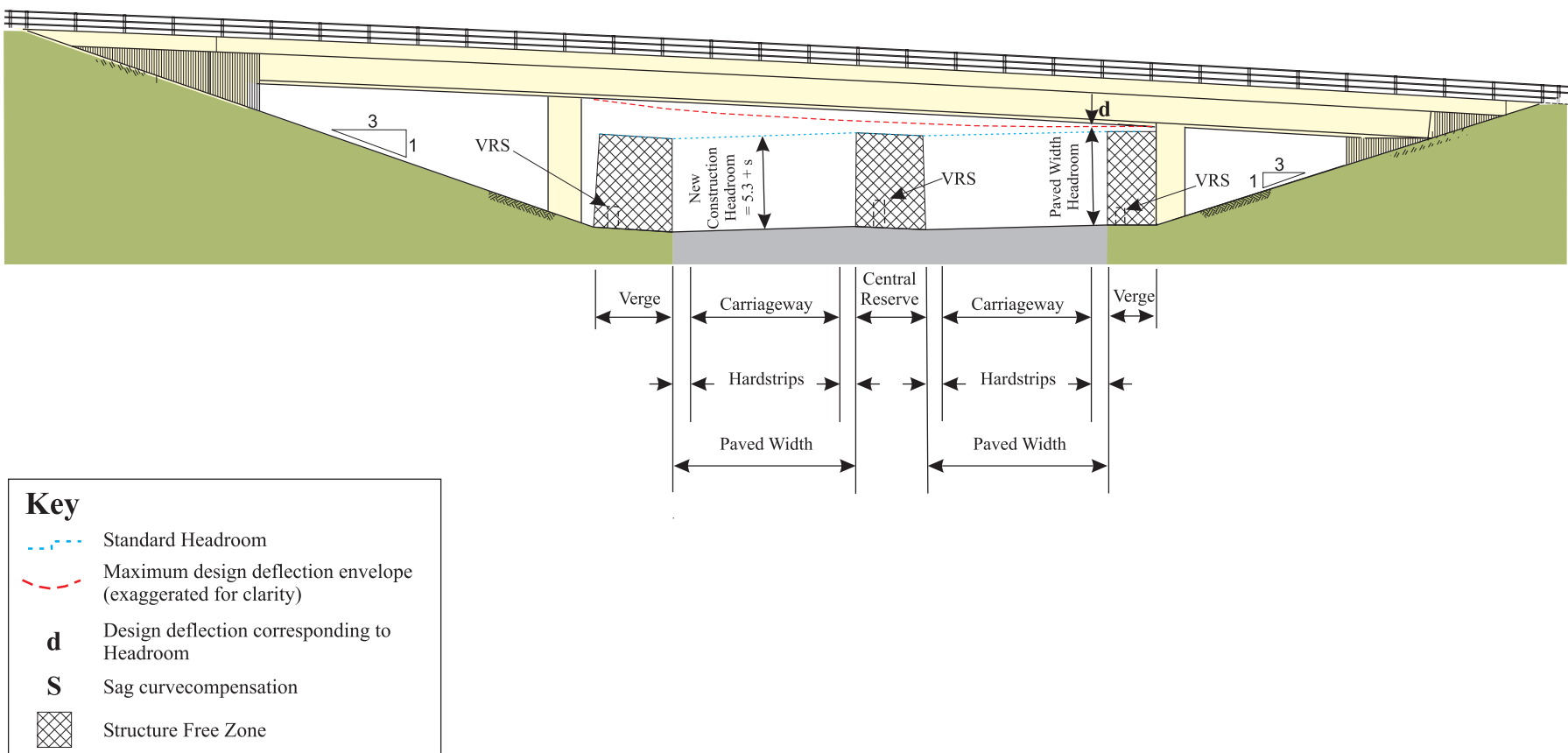


Figure 6-3: Headroom and Structure for a Three Span Structure Crossing a Dual Carriageway

7. REFERENCES

Department for Transport

Design Manual For Roads and Bridges

BD 2 (DMRB 1.1)	Technical Approval of Highway Structures
BD 60 (DMRB 1.3.5)	Design of Highway Bridges for Vehicle Collision Loads
BD 29 (DMRB 2.2.8)	Design Criteria for Footbridges
BD 78 (DMRB 2.2.9)	Design of Road Tunnels
TA 80 (DMRB 4.2.2)	Surface Drainage of Wide Carriageways
TA 46 (DMRB 5.1.3)	Traffic Flow Ranges for Use in the Assessment of New Rural Roads
TA 79 (DMRB 5.1.3)	Traffic Capacity of Urban Roads
TA 91 (DMRB 5.2.4)	Provision for Non-Motorised Users
HD 42 (DMRB 5.2.5)	Non-Motorised User Audits
TA 57 (DMRB 6.3)	Roadside Features
TD 9 (DMRB 6.1.1)	Highway Link Design
TD 22 (DMRB 6.2.1)	Layout of Grade Separated Junctions
TD 39 (DMRB 6.2.4)	The Design of Major Interchanges
TD 42 (DMRB 6.2.6)	Geometric Design for Major/Minor Priority Junctions
TD 36 (DMRB 6.3.1)	Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions
TA 69 (DMRB 6.3.3)	The Location and Layout of Lay-bys

TA 90 (DMRB 6.3.5)	The Geometric Design of Pedestrian, Cycle and Equestrian Routes
HD 39 (DMRB 7.2.5)	Footway Design
TA 56 (DMRB 8.2)	Hazardous Cattle Crossing: Use of Flashing Amber Lamps
TA 92 (DMRB 8.4.6)	Crossover and Changeover Design
TA 73 (DMRB 9.4.2)	Motorway Emergency Telephones
DMRB 10.1 and 10.2	The Good Roads Guide
DMRB Volume 11	Environmental Assessment

Other Department for Transport Documents

Inclusive Mobility (DfT 2003) http://www.dft.gov.uk/stellent/groups/dft_mobility/documents/page/dft_mobility_503282.hcsp

Provision of Farm Crossings (DfT/NFU)

Report of the Study Group on Dimensions of Agricultural Bridges and Underpasses (DfT/MAFF)

The Traffic Signs Manual

Manual of Contract Documents for Highway Works

Manual of Contract Documents for Highway Works (MCDHW)

Transport Research Laboratory (TRL)

Accidents at Hard Shoulder Discontinuities on Dual 2-Lane and 3-Lane Motorways - Unpublished Report PR/TT/025/98 (available on request from Overseeing Organisation)

**The Institution of Highways & Transportation
(IHT)**

Transport in the Urban Environment (TUE) (IHT 1997)

Guidelines for Providing for Journeys on Foot (IHT
2000)

Note: The above list does not generally include those
references in Annex A.

**D. TA 90/05 The Geometric Design of
Pedestrian, Cycle and Equestrian Routes**

VOLUME 6 ROAD GEOMETRY
SECTION 3 HIGHWAY FEATURES

PART 5

TA 90/05

**THE GEOMETRIC DESIGN OF
PEDESTRIAN, CYCLE AND
EQUESTRIAN ROUTES**

SUMMARY

This Advice Note provides guidance on the geometric design for NMU off-carriageway routes associated with trunk road or motorway improvement schemes.

INSTRUCTIONS FOR USE

This is a new document to be inserted into the manual.

1. Remove Contents pages from Volume 6.
2. Insert new Contents page for Volume 5 dated February 2005.
3. Insert TA 90/05 into Volume 6, Section 3.
4. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



THE HIGHWAYS AGENCY



SCOTTISH EXECUTIVE



Llywodraeth Cynulliad Cymru
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**WELSH ASSEMBLY GOVERNMENT
LLYWODRAETH CYNULLIAD CYMRU**



**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

The Geometric Design of Pedestrian, Cycle and Equestrian Routes

Summary: This Advice Note provides guidance on the geometric design for NMU off-carriageway routes associated with trunk road or motorway improvement schemes.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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VOLUME 6 ROAD GEOMETRY
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PART 5

TA 90/05

**THE GEOMETRIC DESIGN OF
PEDESTRIAN, CYCLE AND
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6. Crossfall
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1. INTRODUCTION

General

1.1 A variety of guidance exists on aspects of designing for non-motorised users (NMUs). NMUs are considered to be pedestrians, cyclists or equestrians. Particular consideration needs to be given to the needs of disabled people, who may use any of these modes.

Scope

1.2 This Advice Note provides guidance on the geometric design for NMU off-carriageway routes associated with trunk road or motorway improvement schemes. The advice is also relevant for NMU routes away from trunk roads constructed as part of a trunk road improvement, and for aspects of crossing the trunk road not dealt with in BD 29 (DMRB 2.2.8), TD 36 (DMRB 6.3.1) or TD 50 (DMRB 6.2.3). For general advice covering on-carriageway routes, designers should refer to 'Cycle Friendly Infrastructure' (IHT, 1996), the Traffic Signs Manual Chapter 5 (DfT, 2003) and other guidance.

1.3 This Advice Note does not cover issues of route choice, scheme assessment, signing, or more general aspects of designing for NMUs. These are covered in TA 91 (DMRB 5.2.4), which should be referred to in conjunction with this document. Designers are also referred to HD 42 (DMRB 5.2.5), which sets out procedures for ensuring that scheme designs have considered the needs of NMUs.

1.4 This Advice Note and those identified above wholly supersede TA 67 (DMRB 5.2.4) and Chapters 8 and 11 of TA 57 (DMRB 6.3.3).

1.5 For the purpose of this Advice Note, users of electrically assisted pedal cycles or powered wheelchairs and invalid carriages, that conform with current Department for Transport Regulations and may legally be used on pedestrian and cycle facilities, are also considered as NMUs. Where there is known to be regular use of these vehicles, design parameters for cyclists should be used.

1.6 As with all highway design, there is a need to balance issues of safety and practicality. This Advice Note provides 'preferred' and 'acceptable' minimum values based on best available evidence, but in

exceptional circumstances it may be appropriate to apply some flexibility in using these figures over short distances and where other measures are used such as 'SLOW' markings to encourage lower speeds.

Implementation

1.7 This Advice Note should be used forthwith on all schemes for the construction, improvement and maintenance of trunk roads currently being prepared provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Organisation. Where this is confirmed, the contract documents for the Works should be written to reference this Advice Note.

1.8 This Advice Note does not apply in Scotland.

Definitions

1.9 The following definitions have been used within this document:

- a **shared use** route is an unsegregated facility used by more than one type of NMU, for example pedestrians and cyclists or pedestrians, cyclists and equestrians;
- an **adjacent use** route is one with clearly defined segregated areas for different types of NMU. Segregation may be by white line or by a physical feature such as a verge, a fence or a kerbed level difference.

2. DESIGN SPEED

2.1 In designing facilities for pedestrian-only use, it is not necessary to consider design speed. However, it is important in designing facilities for use by cyclists and equestrians, as it affects other design parameters such as visibility.

Cyclists

2.2 Design speeds for cyclists can vary according to different types of user. The design cyclist types are:

- fast commuter;
- other utility cyclist;
- inexperienced utility cyclist (may travel more slowly than regular cyclists);
- child; and
- users of specialised equipment.

2.3 Different authorities in the UK and overseas have used a range of design speeds, from 10 kph to 50 kph. However, cyclists travelling in excess of 30 kph are less likely to be using off-carriageway facilities.

2.4 A design speed of 30 kph should be adopted for most off-carriageway cycle routes. However, where a cyclist would expect to slow down (e.g. on the approach to a crossing or a subway) the design speed may be reduced to 10 kph over short distances, with use of 'SLOW' markings.

2.5 The design speeds appropriate for different route types are summarised in Table 2.1.

	Design Speed
Acceptable minimum (over short distances)	10 kph
General off-carriageway cycle route provision	30 kph

Table 2.1 – Design Speed for Off-Carriageway Cycle Routes

Equestrians

2.6 The concept of design speed for equestrians is unusual, as there are different speeds at which horses progress, depending upon the type of activity being undertaken (such as leisure or fitness training) and the surrounding environment.

2.7 There are three basic speeds of travel: walk, trot and canter. The speed is particularly affected by route surface. Grass and wood chip bark can provide adequate surfaces for cantering, whereas routes surfaced with bituminous materials are generally discouraged and would only make walking or a slow trot possible. In areas close to motorised traffic, horses may be walking, or occasionally trotting briskly, to minimise the time spent by a busy road.

2.8 Tables 2.2 and 2.3 show design speeds for different circumstances. In Table 2.2 'remote from carriageway' means that the road is either:

- generally not visible due to screening or planting; or
- visible, but more than 6m from the equestrian route.

Situation	Expected Speed
Adjacent to carriageway	Walk
On approach to crossing	Walk
Remote from carriageway (for <50m length)	Walk
Remote from carriageway (for > 50m length)	Trot/Canter

Table 2.2 – Expected Speeds for Equestrian Routes

Type of Use	Design Speed
Trot/Canter	20 kph
Walk	10 kph

Table 2.3 – Design Speeds for Equestrian Routes

Shared Routes

2.9 Where routes are shared with other users, the design speed of these routes should be relevant to that of the fastest user (see Table 2.4).

Shared Users	User for determining Design Speed
Pedestrian/Cycle	Cycle
Pedestrian/Equestrian	Equestrian
Cycle/Equestrian	Cycle
Pedestrian/Cycle/Equestrian	Cycle

Table 2.4 – Design Speeds where Use is Shared

3. VISIBILITY

3.1 The following require consideration:

- the forward visibility for cyclists and/or equestrians along a route, such that an appropriate Stopping Sight Distance (SSD) and eye to object height are met; and
- the visibility at junctions or crossings, to enable both the NMU to see approaching traffic, and for other users on the main route to see NMUs about to cross.

Stopping Sight Distances on NMU Routes

3.2 SSD is the distance for a rider to perceive, react and stop safely in adverse conditions, such as on wet asphalt or where the surfacing is loose. It is measured in a straight line between any two points on the centre of route, and sighting across the highway boundary line is not permitted. It should, however, be noted that cyclists and equestrians generally have a greater ability to avoid momentary obstructions than vehicular traffic. SSDs for cyclists are given in Table 3.1, and the corresponding figures for equestrians are shown in Table 3.2.

Design Speed	Preferred Minimum Stopping Sight Distance
30 kph	30 m
10 kph	10 m

Table 3.1 – SSD for Off-Carriageway Cycle Routes

Design Speed	Preferred Minimum Stopping Sight Distance
20 kph	30 m
10 kph	10 m

Table 3.2 – SSD for Equestrian Routes

Eye and Object Heights

3.3 Designers should ensure that an object at the minimum SSD is visible from a range of eye heights. For cyclists, an eye height range of 1.0m to 2.2m should be used, which accommodates a range of cyclists from children and recumbent users to adults (see Figure 3.1). The object height should be taken as a range from ground level to 2.2m, as cyclists need to be able to observe deformations, holes and objects which could interfere with safe progress.

3.4 For equestrians the rider's eye height should be taken as 1.5m to 2.7m. This accommodates a range of horse riders from children on ponies to adults on larger horses (see Figure 3.2). The object height should again be taken as a range from ground level to 2.2m, so that riders can observe deformations, holes and objects which could interfere with the horse's safe progress.

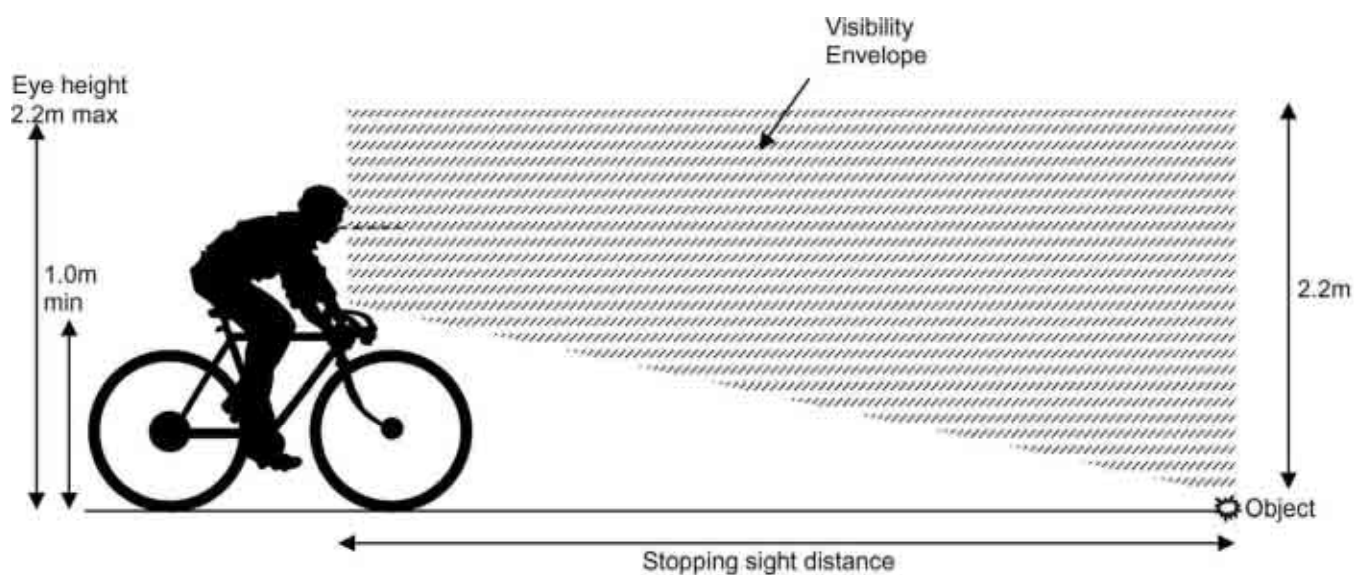


Figure 3.1 – Forward Visibility for Cyclists

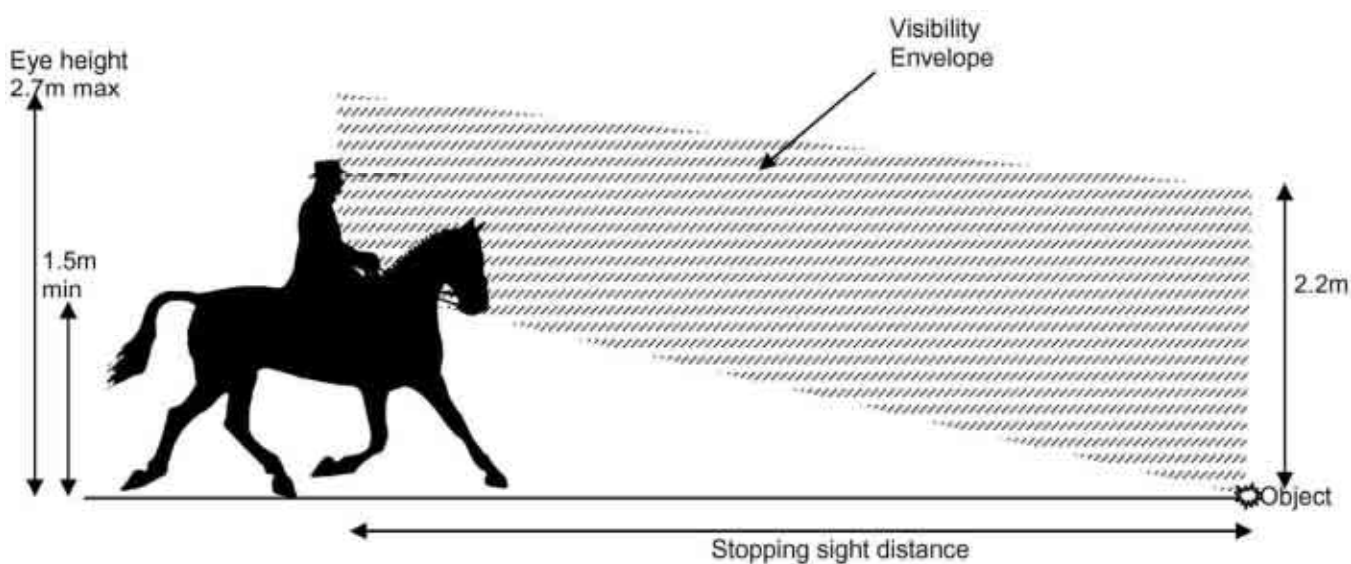


Figure 3.2 – Forward Visibility for Equestrians

Momentary Obstructions

3.5 Street furniture, trees and shrubs should be located outside of the envelope of SSD where practical. In particular, trees can obscure pedestrians from approaching cyclists. Isolated objects with widths of less than 300mm are unlikely to have a significant effect on visibility and may be ignored if removal is not practicable. For unmovable obstructions wider than 300mm it may be necessary to provide markings to guide cyclists and equestrians accordingly.

Visibility to and from NMU Crossing Points

3.6 Any crossing of a trafficked road should be located such that drivers of vehicles have full visibility of NMUs wishing to use the crossing point. Desirable minimum SSD to TD 9 (DMRB 6.1.1) should be available for drivers on the highway approaching an NMU crossing point.

Visibility Splays at NMU Route Junctions

3.7 A visibility splay should be provided for NMUs approaching crossings and junctions where they have to stop or give way. “x” and “y” distances are defined, as shown in Figure 3.3.

3.8 The “x” distance is normally measured from a give way line, back along the centre line of the minor

arm. The “y” distance is measured along the edge of the main road or NMU route.

3.9 For pedestrians, the preferred “x” distance is 2.0m, to allow for the needs of disabled people and users with prams.

3.10 In designs for motorised vehicles, the “x” distance is based on the position of a second vehicle approaching the junction being able to see the full “y” distance without stopping. However, this does not need to be applied to cyclists in the same way. A longer “x” distance provides greater capacity for emerging vehicles, but too great an “x” distance encourages greater minor route approach speeds.

3.11 The preferred “x” distance for cyclists is 4.0m, which equates approximately to the length of two cycles. This provides a reasonable distance for cyclists to slow down and observe the full “y” distance necessary. While every effort should be made to achieve the desirable value of 4.0m, in practice, the “x” distance that can be achieved for existing roads may be limited by the trunk road verge width. In these cases the “x” distance can be reduced to a minimum of 2.5m.

3.12 Where the crossing is approached by means of a “jug handle” from a route parallel to the trunk road, the speed of approach of cyclists is less than for a route which approaches the crossing at right angles. In these circumstances, the “x” distance can be reduced to 1.0m.

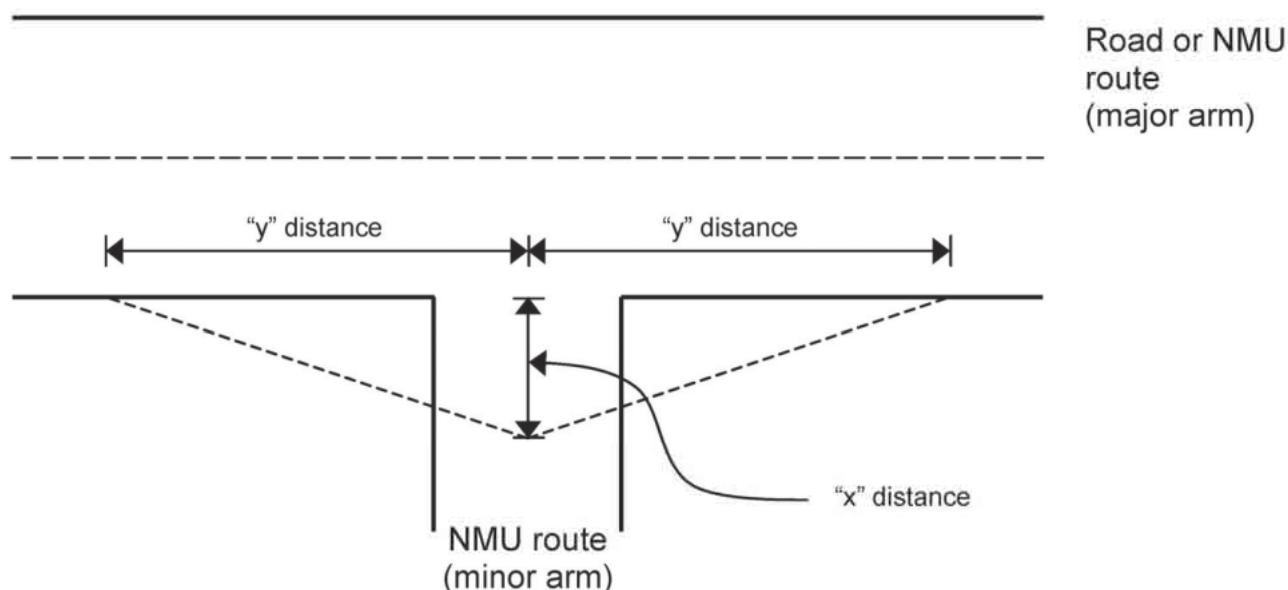


Figure 3.3 – Visibility Splay for NMU Route

(A “jug handle” is a left hand diverging lane loop, as defined and illustrated in paragraph 2.17 and Figure 2/4 of TD 42 (DMRB 6.2.6)).

3.13 The preferred minimum “x” distance for equestrians is 5.0 m. Where an “x” distance of 5.0m is not achievable, it may be reduced to a minimum of 3.0m. It should be noted that a horse may view the major route vehicle before the rider.

3.14 A summary of “x” distances is provided in Table 3.3.

3.15 Where the main route is a public road, the “y” distance for pedestrian and cycle route crossings should be the same “y” distance identified for vehicles in TD 42 (DMRB 6.2.6). However, equestrians require greater visibility, as there is a reaction time between rider perception and the movement of the horse, and it takes additional time for the horse to move fully into the carriageway. Only at this point does it become a visible hazard to the motorist, and at this stage it will

not normally be possible for the rider to turn back or stop. As such, at equestrian crossings, it is recommended that visibility be provided as shown in Table 3.4. However, see also paragraph 3.18.

3.16 Where an NMU route meets a cycle or equestrian route at a junction, the “y” distance should be equivalent to the SSD for the major cycle/ equestrian route, as shown in Tables 3.1 and 3.2.

3.17 A summary of “y” distances is provided in Table 3.4. These should be measured from an eye height of 0.9m to 2.0m for pedestrians, 1.0m to 2.2m for cyclists and 1.5m to 2.7m for equestrians. The object height should be taken as 0.26m to 2.0m in accordance with TD 9 (DMRB 6.1.1).

3.18 Where it proves difficult to achieve the visibilities set out in this chapter, measures that reduce speeds on the major arm, commensurate with the maximum visibility that can be practically provided, should be considered.

	Preferred	Acceptable	Minimum for “Jug Handle” crossing
Pedestrian	2.0 m	1.5 m	N/A
Cycle	4.0 m	2.5 m	1.0 m
Equestrian	5.0 m	3.0 m	N/A

Table 3.3 – Minimum “x” Distances for NMUs at Crossings

Minor Route	85 th percentile approach speed on mainline	Main Route		
		Mainline carriageway	Off-carriageway cycle route	Equestrian Route
Pedestrian/Cycle	All	As in TD 42 (DMRB 6.2.6)	As in Table 3.1	As in Table 3.2
Equestrian	50kph	135m	As above	
	60kph	168m		
	70kph	211m		
	85kph	270m		
	100kph	345m		
	120kph	At-grade crossing not recommended (See Chapter 9 and TA 91 (DMRB 5.2.4) for further details)		

Table 3.4 – Preferred Minimum “y” Distances for NMU Routes at Crossings

4. ALIGNMENT

4.1 NMU routes need to be practical to use. NMUs will avoid routes that include diversions, frequent obstacles and fragmented facilities. The principles of good overall design are described further in TA 91 (DMRB 5.2.4).

Horizontal

4.2 Changes in horizontal alignment should normally be via simple circular curves, rather than straight sections with occasional sharp curves. Providing appropriate radii in both horizontal and vertical planes should help to ensure that appropriate forward visibility for cyclists and equestrians is achieved.

4.3 At corners and junctions, the internal corners of footways should be splayed to assist the passage of wheelchairs and pushchairs. Surface undulations, steps and gaps may cause problems for people with mobility or sensory impairments.

4.4 The preferred minimum radius for cycle routes is 25m. For sections of the route where the design speed is 10kph, a preferred minimum radius of 4m should be provided and consideration should be given to widening the track and providing warning signs. Table 4.1 summarises the preferred minimum radii for cyclists.

Design Speed	Preferred Minimum Radii
30 kph	25 m
10 kph	4 m

Table 4.1 – Preferred Minimum Radii

Vertical

4.5 Severe crest curves are unlikely to occur along cycle tracks or equestrian routes and hence achieving adequate forward visibility in the vertical direction will rarely cause difficulties. However, this should be checked.

4.6 For comfort, there should be a preferred minimum crest K value of 5.0, and an acceptable minimum crest K value of 1.6, along off-carriageway cycle routes. For the definition of crest K value, refer to TD 9 (DMRB 6.1.1).

5. GRADIENT

Pedestrian-Only Routes

5.1 Gradients along new pedestrian routes are considered in HD 39 (DMRB 7.2.5). Gradients of NMU routes across footbridges are considered in BD 29 (DMRB 2.2.8). Further information is also given in 'Inclusive Mobility – A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure' (DfT, 2002).

Off-Carriageway Cycle Routes

5.2 Care should be taken in designing off-carriageway cycle routes to ensure that gradients are kept to a minimum. The type of surface is important on slopes, since the ability of the cycle tyres to grip the surface will depend upon the frictional resistance of the surface, as well as its gradient.

5.3 The speed of travel is another important factor to consider, as well as the length of the gradient. Steep gradients can lead to relatively high speeds for descending cyclists or very low speeds for climbing cyclists, which can create hazards for all users of the route. Stopping distances also increase significantly on gradients in excess of 5%. Obstacles and sharp bends at the top or bottom of steep and/or long gradients should be avoided.

5.4 The preferred maximum gradient for off-carriageway cycle routes is 3%, with an acceptable maximum of 5%. Where new routes are constructed adjacent to the existing carriageway, the gradient will often need to reflect conditions on the adjacent road. As such, where it is not practicable to provide gradients less than 5%, steeper gradients may be considered over short distances. In these circumstances, signs advising cyclists of the need to proceed with care should also be considered.

5.5 At the base and top of gradients exceeding 2%, a level plateau at least 5m long is desirable in advance of give way or stop lines.

Equestrian Routes

5.6 Care should be taken in designing equestrian routes to ensure that gradients are kept to a minimum for the rider and horse to progress safely. The ability of

the horse's hooves/shoes to grip the surface will depend upon the frictional resistance of the surface, as well as its gradient, and whether the horses are shod with horseshoe road studs or similar.

5.7 Most routes that cater for equestrian use will also be available to cyclists, and as such the advice in paragraph 5.4 will apply. For equestrian routes where cycle use is prohibited, the preferred maximum gradient is 20%.

5.8 Where gradients are at the maximum for an equestrian route, the material on this gradient should be non-slip surfacing (refer to HD 37 (DMRB 7.5.2)). On any gradient, the surfacing should be of a consistent material that does not create loose debris; for further information refer to TA 91 (DMRB 5.2.4).

5.9 Where the design of an equestrian facility is such that values in excess of those described above are likely to be encountered, provision of steps of height 0.15m and length 2.8m, and with gradients of half of the maximum values quoted, may be considered. However, use of such steps should be avoided where possible.

6. CROSSFALL

6.1 HD 39 (DMRB 7.2.5) considers footway crossfalls. For cycle and equestrian facilities, the values used for footways may be adopted up to a maximum of 5%, as higher values may create manoeuvring difficulties. Crossfalls greater than 3% can create difficulties for cyclists when the surface is icy.

6.2 Crossfall can be either to one side or cambered to both sides. However, on bends, adverse crossfall should be avoided.

7. CROSS-SECTION

7.1 The cross-section of an NMU facility will depend upon a number of factors, including:

- whether it is a shared use, adjacent use or unsegregated route;
- visibility;
- boundary design;
- whether the route is adjacent to a highway or away from it; and
- the need for street furniture within the facility.

7.2 Where obstructions are unavoidably present, the width of routes described in the following sections should be increased by at least the width of the obstruction. Obstructions at or near the centreline of a route may render the site too hazardous or too narrow to use.

7.3 Detailed advice on cross-sections of NMU routes is provided in draft LTN 2/04. Widths of NMU routes across footbridges are covered in BD 29 (DMRB 2.2.8). The remainder of this chapter summarises the key parameters of most relevance to typical routes adjacent to rural trunk roads.

Pedestrian-Only Routes

7.4 Table 7.1 provides values for the surfaced widths of unbounded pedestrian routes. A route is considered unbounded when it is not adjacent to a physical barrier such as a wall or fence at the edge of the route. Where it is not practicable to provide widths of 2.0m for the full length of a route, widths of 1.3m may be provided over short distances.

Preferred Width	2.6m
Acceptable Minimum	2.0m

Table 7.1 – Surfaced Widths of Pedestrian-Only Routes

Off-Carriageway Cycle Routes

7.5 Table 7.2 provides values for the surfaced widths of unbounded cycle-only routes.

Preferred Width	3.0m
Acceptable Minimum	2.0m

Table 7.2 – Surfaced Widths of Cycle-Only Routes

7.6 Where it is not practicable to provide widths of 2.0m for the full length of a route, widths of 1.5m may be provided over short distances.

7.7 At gates and where routes are signed for single file use at pinch points, the surfaced width of the route may be reduced to 1.2m.

7.8 Sections of off-carriageway cycle route where single file use is unavoidable should be signed accordingly. Single file sections should be no longer than the SSD for the route. Where there are different design speeds on either side of a single file section, the lower value of SSD should be used.

7.9 Transitions from one width to another should normally be tapered at a rate no sharper than 1:7 for design speeds greater than or equal to 30kph. For lower design speeds, the taper may be reduced to 1:5.

Equestrian Routes

7.10 There are very few equestrian-only routes, as in practice most rights of way are shared with other users. Therefore, the cross-section of a route will normally depend upon the likely interaction of equestrians with other users.

7.11 Ridden horses can occupy a width of around 1.5m, and a surfaced width of 2.0m should be provided as a minimum to accommodate this. Where horses are expected to pass, a minimum width of 3.0m should be provided.

7.12 Equestrian routes where single file use is unavoidable should be signed accordingly. Single file

sections should be no longer than the SSD for the route. Where there are different design speeds on either side of a single file section, the lower value of SSD should be used.

7.13 At gates, the likelihood of two equestrians meeting in opposite directions is low. BS5709:2001 specifies a minimum width for bridle gates of 1.525m between posts. A rider would expect to be able to turn 90° after passing through the gate to be able to close it from horseback. Hence, there should be a paved width of 3.0m on either side of the gate for a distance of 5.0m. Fencing for 1.5m each side of a gate should be free of barbed wire and overhanging trees.

7.14 There may be a need to turn a horse around at some point on an equestrian route. Designers should ensure that locations are available at intervals of no more than 1 km where this can be easily and safely undertaken. The surfaced width of the route at such locations should be a minimum of 3.0m.

7.15 There should be no sudden changes of cross-section on equestrian routes, except at gates, as these may unnerve the horse. Where changes in cross-section are necessary, tapers of no sharper than 1:7 should be used.

Shared and Adjacent Use Routes for NMUs

7.16 Shared use facilities should generally be restricted to where flows of either cyclists or pedestrians are low, and hence where the potential for conflict is low. Unsegregated shared facilities have operated satisfactorily down to 2.0m wide with combined pedestrian and cycle use of up to 200 per hour. However, the preferred minimum width for an unsegregated facility is 3.0m.

7.17 The potential for conflict between users increases where flows of more than one group are high. In this case it is normally necessary to have some form of segregation along the route. Route segregation should also be considered if disabled people, people with pushchairs or other vulnerable users are likely to make frequent use of the facility. When determining the method of segregation, consideration should be given to the issues above and site-specific factors. For more detailed information refer to draft LTN 2/04.

7.18 The preferred separation between different types of NMu is 1.0m, with an acceptable separation of 0.5m. Greater verge widths facilitate maintenance. Verges adjacent to field boundaries and existing hedgerows

should be a minimum of 0.5m wide to allow hedges to overhang the route without interfering with its use.

7.19 If the separation described above cannot be provided, segregation may be achieved by use of a post and single rail fence, railings, kerbs or delineator strips. Guardrails should only be used in short lengths, because over any appreciable distance the risk of cycle handlebars and pedals colliding with them is increased. Fences and guardrails can also trap users on the 'wrong' side. The principles are set out in more detail in draft LTN 2/04 and 'Inclusive Mobility' (DfT, 2002).

7.20 Table 7.3 provides values for the surfaced widths of pedestrian/cycle routes segregated by line.

Preferred Minimum	5.0m (3.0m cycle route, 2.0m pedestrian route)
Acceptable Minimum	3.0m (1.5m cycle route, 1.5m pedestrian route)

Table 7.3 – Surfaced Widths of Unbounded Pedestrian/Cycle Routes Segregated by Line

Boundary Treatments

7.21 The above widths for pedestrian and cycle routes should be modified in particular circumstances as follows (see Figure 7.1):

- for a route bounded on one side (where the boundary height is up to 1.2m), an extra 0.25m should be provided to allow for 'kerb shyness' between the route and the barrier;
- for a route bounded on one side (where the boundary height is greater than 1.2m), an extra 0.5m should be provided to allow for 'kerb shyness' between the route and the barrier; and
- for a route bounded on both sides, an extra 0.25m or 0.5m should be provided on each side as appropriate.

7.22 It is desirable to provide physical separation between NMu routes and carriageways. For pedestrians and cyclists the preferred separation between the NMu route and the carriageway is 1.5m, with an acceptable separation of 0.5m. The higher value of 1.5m should, where possible, be used on roads with speed limits in excess of 40mph. If a hardstrip is provided, this can be considered as part of the separation. Where new routes

are introduced, street furniture and all vegetation (except grass) within the separation distance should be removed or the verge widened.

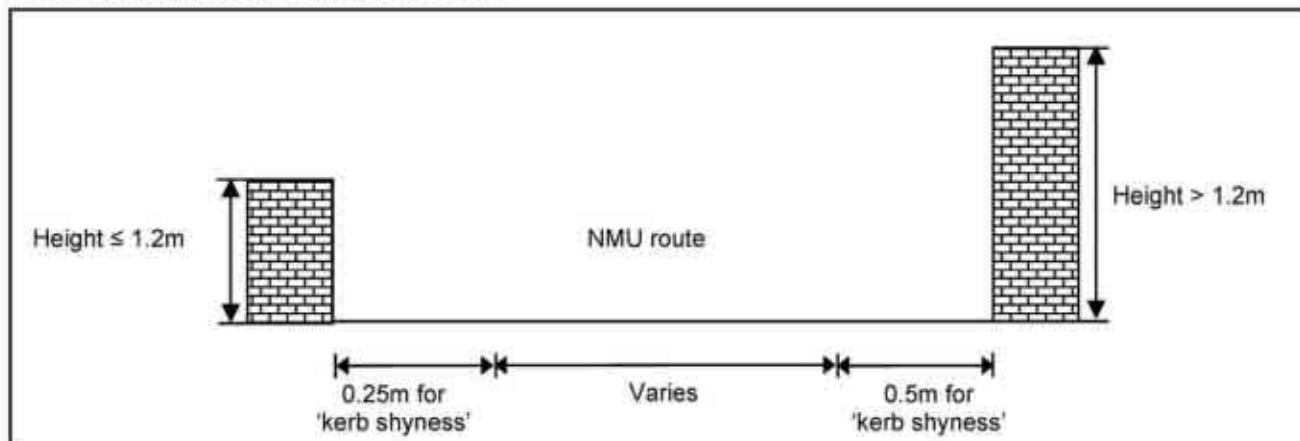
7.23 For routes used by equestrians, the separation of the route from the carriageway should be a preferred minimum of 1.8m. If a hardstrip is provided, this can be considered as part of the separation. Where near continuous screening is provided between the equestrian route and the carriageway, gaps should be avoided, as they may unnerve horses.

Hazards Adjacent to NMU Routes

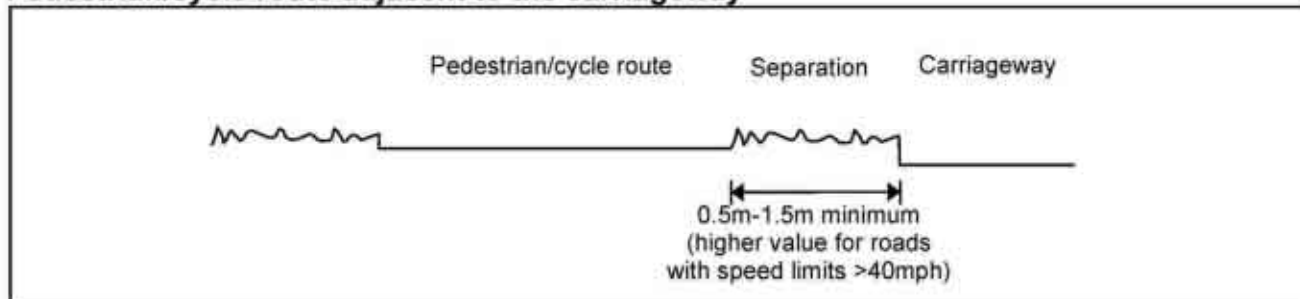
7.24 Where an NMU route is adjacent to hazards such as a ditch (or other water feature) or embankment slopes steeper than 1 in 3, a separation greater than that recommended in paragraphs 7.22 and 7.23 should be considered to minimise the risks. Designers should also consider providing physical barriers, such as dense shrubbery, guardrails or fences. Further information is provided in the Overseeing Organisations' standards for road restraint systems.

7.25 The risks described above are heightened at sharp bends, particularly for cyclists at night if the route is unlit. In such circumstances consideration should be given to lighting the bend, increasing the recommended separation and provision of warning signs.

NMU route bounded on both sides



Pedestrian/cycle route adjacent to the carriageway



Equestrian route adjacent to the carriageway

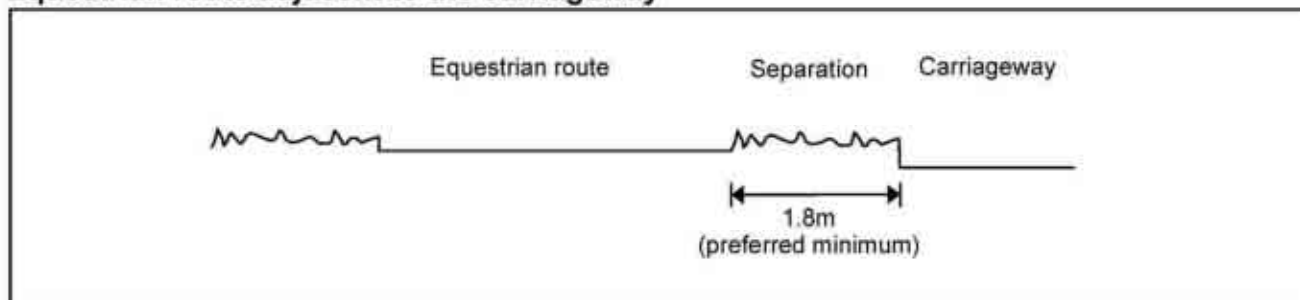


Figure 7.1: Boundary treatments for NMU Routes

8. HEADROOM

8.1 For subways and underpasses, guidance on headroom is provided in TD 36 (DMRB 6.3.1).

8.2 Away from subways and underpasses, adequate headroom for NMU routes should be provided under overhanging branches of trees, road signs and overhead structures. For vegetation the maintenance regime should be designed to be sufficient to maintain the required minimum headrooms. Paragraphs 8.4 to 8.6 describe the requirements for each type of user.

8.3 The need for equestrians and cyclists to dismount should be kept to an absolute minimum by careful planning and design of road signs and other street furniture.

Pedestrian Routes

8.4 For obstacles longer than 23m, a minimum headroom of 2.6m should be provided. For shorter obstructions this may be reduced to 2.3m.

Off-Carriageway Cycle Routes

8.5 For obstacles longer than 23m, a minimum headroom of 2.7m should be provided. For shorter obstructions, such as signs, this may be reduced to 2.4m. In exceptional circumstances, where 2.4m headroom cannot be achieved, signs advising cyclists to dismount will be required.

Equestrian Routes

8.6 The desirable headroom for ridden horses is 3.4m, with an absolute minimum headroom for ridden use of 2.8m over short distances, such as at momentary obstructions. If horses are required to be led rather than ridden, the headroom may be reduced to 2.8m over longer distances, such as under bridges. However, this should be avoided wherever possible, as horses can be difficult to control when led. In cases where horses are to be led, mounting blocks should be provided at either side of the discontinuity, together with signs advising riders to dismount.

9. CROSSINGS

9.1 Visibility at crossings is covered in Chapter 3. Advice on the choice of crossing facility within a scheme is given in TA 91 (DMRB 5.2.4).

9.2 At crossings where there is a danger of NMUs inadvertently entering the carriageway (for example where an NMU route approaches at right angles to the carriageway with limited visibility, or where regular use by unaccompanied children might be anticipated), guardrailing should be provided to ensure NMUs slow down before crossing. However, excessive use of guardrailing should be avoided.

Pedestrian Crossings

9.3 The desirable minimum crossing provision where pedestrian routes cross the carriageway is a dropped kerb laid flush with the carriageway, with associated tactile paving. Further advice on dropped kerbs is given in TA 57 (DMRB 6.3.3). Advice on assessing whether increased crossing provision is appropriate can be found in TA 68 (DMRB 8.5.1) and TA 91 (DMRB 5.2.4).

9.4 The ramp gradient across the footway to a dropped kerb should be between 1 in 12 and 1 in 20. For narrow footways, the steeper gradient will allow the width of the level strip at the back of the footway to be maximised. This will make it more comfortable for people with pushchairs or wheelchairs who do not wish to use the crossing.

Cycle Crossings

9.5 Where cycle tracks join or cross carriageways or Private Means of Access (PMA), dropped kerbs laid flush with the carriageway should be used as carriageway edging.

9.6 Approaches to crossings should normally be at right angles to the carriageway. Where acute crossing angles cannot be avoided, non-slip kerb surfacing should be considered. Where cycle routes are located adjacent to the carriageway and lead to crossing points, 'jug handle' layouts should be used to place the cyclists at right angles to traffic flow (see TD 42 (DMRB 6.2.6)).

Equestrian Crossings

9.7 For roads where at-grade equestrian crossings are unavoidable, a grassed holding area of 10m wide by 5m long should be provided in the verge. The holding area should be fenced to guide equestrians and highlight the presence of the facility to other users, as shown in Figure 9.1. BS5709:2001 requires structures associated with equestrian routes (i.e. bridle gates and/or horse stiles) to be a minimum of 4.0m from the carriageway.

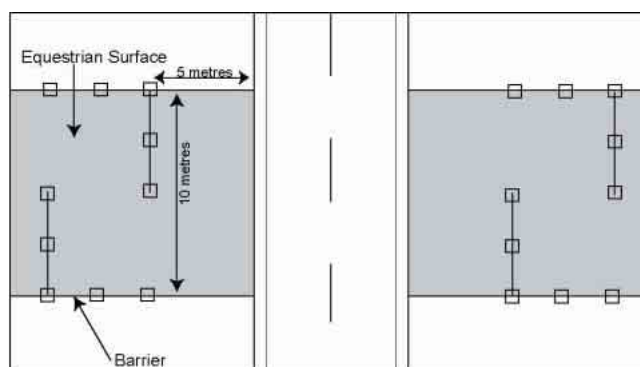


Figure 9.1: Bridleway Crossing with Holding Area

9.8 At-grade equestrian crossings of dual carriageways are not recommended, but may be necessary in certain circumstances. In these circumstances, a holding area should also be provided in the central reserve (5m wide by 3m long). Equestrian refuges are likely to require a 'U turn' prohibition for vehicles using the carriageway.

9.9 At equestrian crossing points, a 10.0m band of high friction surfacing to HD 37 (DMRB 7.5.2) should be provided on the carriageway to prevent horses from slipping. Where possible, the high friction grip material should be of the same colour as the carriageway, as brightly coloured surfacing may unnerve horses.

9.10 For further information on equestrian crossings see TA 91 (DMRB 5.2.4).

Obstructions

9.11 Where a cycle or equestrian route is crossed by vehicular accesses to the carriageway, and where there is a risk of obstruction to the NMU route, e.g. by parking or deposition of farm equipment, then protective posts may be used. These may be of wood 150mm square by 1.2 m high, set at 1.8 m spacing across the mouth of the NMU route. Metal or concrete posts may also be considered for urban situations.

9.12 Care should be taken to ensure that protective posts are not a hazard. Reflectors should be fitted near the tops of the posts to help cyclists to see them at night. A yellow or white non-reflectorised band may also be provided to help partially sighted pedestrians to see the posts.

10. REFERENCES

1. Cycle-Friendly Infrastructure: Guidelines for Planning and Design (IHT/Bicycle Association/ CTC/DfT, 1996)
2. Traffic Signs Manual Chapter 5, Road Markings (DfT, 2003)
3. BD 29 (DMRB 2.2.8) Design Criteria for Footbridges
4. TD 36 (DMRB 6.3.1) Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions
5. TD 50 (DMRB 6.2.3) The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts
6. TA 91 (DMRB 5.2.4) Provision for Non-Motorised Users
7. HD 42 (DMRB 5.2.5) Non-Motorised User Audits
8. TA 67 (DMRB 5.2.4) Providing for Cyclists (superseded)
9. TA 57 (DMRB 6.3.3) Roadside Features (Chapters 8 and 11 superseded by this advice note)
10. TD 9 (DMRB 6.1.1) Highway Link Design
11. TD 42 (DMRB 6.2.6) Geometric Design of Major/Minor Priority Junctions
12. Inclusive Mobility – A guide to best practice on access to pedestrian and transport infrastructure (DfT, 2002)
13. HD 37 (DMRB 7.5.2) Bituminous Surfacing Materials and Techniques – [Incorporating Amendment No.1 dated May 1999]
14. HD 39 (DMRB 7.2.5) Footway Design
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6. DMRB 11.3.8 Pedestrians, Cyclists, Equestrians and Others and Community Effects
7. HD 33 (DMRB 4.2.3) Surface and Sub-surface Drainage Systems for Highways
8. HA 83 (DMRB 4.2.4) Safety Aspects of Road Edge Drainage Features
9. HA 90 (DMRB 10.0.5) Planning and Policy Features (Section 4.4 Public Rights of Way)
10. HA 91 (DMRB 10.0.6) Environmental Database System
11. Interim Requirements for Road Restraint Systems (IRRRS) (Highways Agency)

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12. TAL 1/97 Cyclists at Road Narrowings
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15. TAL 3/03 Equestrian Crossings

16. LTN 1/04 Policy, Planning and Design for Walking and Cycling (Consultation Draft, 2004)
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28. Information Sheet FF06 – Traffic-free Paths
29. Information Sheet FF09 – Removing Barriers on the National Cycle Network
30. Information Sheet FF21 – Designing for Security on the National Cycle Network

- 31. Information Sheet FF22 – Access Controls
- 32. Information Sheet FF26 – Direction Signing on the National Cycle Network

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- 33. Surfacing of Bridleways
- 34. Bridleway Gates (A Guide to Good Practice)
- 35. Obstruction of Rights of Way
- 36. Diversion of Bridleways
- 37. Width of Bridleways
- 38. Some Practical Recommendations on Standards and Dimensions
- 39. Rights of Way
- 40. Horse Crossings (Roads)
- 41. Highways Margins and Verges

12. ENQUIRIES

All technical enquiries or comments on this Advice Note should be sent in writing as appropriate to:

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E. TD 36/93 Subway for Pedestrians and Pedal Cyclists Layout and Dimensions



THE HIGHWAYS AGENCY

TD 36/93



THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT



THE WELSH OFFICE
Y SWYDDFA GYMREIG



THE DEPARTMENT OF THE ENVIRONMENT
FOR NORTHERN IRELAND

Subways for Pedestrians and Pedal Cyclists Layout and Dimensions

Summary: This Standard gives layout and dimensional requirements for the planning and design of subways for the exclusive use of pedestrians and for the combined use of pedestrians and pedal cyclists. Guidance is also included on headroom and width requirements for subways incorporating bridleways, surface finishes, lighting, drainage, handrailing, markings and signs.

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VOLUME 6	ROAD GEOMETRY
SECTION 3	HIGHWAY
	FEATURES

PART 1

TD 36/93

**SUBWAYS FOR PEDESTRIANS AND
PEDAL CYCLISTS LAYOUT AND
DIMENSIONS**

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3. Cross-section of Subways for Pedestrians Only
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1. INTRODUCTION

General

1.1 This Standard updates and supersedes TD 2/78, "Pedestrian Subways: Layout and Dimensions" and TD 3/79, "Combined Pedestrian and Cycle Subways: Layout and Dimensions". Both those Standards are hereby withdrawn.

1.2 Principal changes to those previous Standards and new concepts introduced in this Standard are:

- a. Alternative cross-sections both wider than normal and narrower than normal are introduced to increase the number of options available.
- b. Personal security aspects have been given greater prominence.
- c. Features that are helpful to elderly people, disabled people, and visually impaired people, as well as to people with prams and pushchairs have been updated.
- d. Helical stairs and ramps built around central voids are included as an alternative to straight stairs and ramps for sites where the space is restricted.

Implementation

1.5 This Standard should be used forthwith on all schemes for the construction and improvement of trunk roads, including motorways, currently being prepared provided that, in the opinion of the Overseeing Department, this would not result in significant additional expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Department.

Scope

1.3 This document gives the requirements for geometric alignments and cross-sections of subways, access ramps and stairs for use by pedestrians and access ramps for use by cyclists. The headroom and width requirements for equestrians are also given. There will be situations where constraints could prevent the desirable subway standards being achieved. In such situations a subway built to the minimum dimensions may be preferable to not providing a grade separated crossing.

1.4 This document does not give specification requirements for the construction of subways, nor for any elements or materials of which they are constructed.

2. FACTORS AFFECTING SUBWAY PROVISION AND CHOICE OF CROSS-SECTION

General

2.1 There are a large number of factors affecting the choice whether to provide a subway, and if so the type of cross-section. For this reason it is preferable that each case is considered on its merits having regard to the particular local situation. The following factors have been found to be significant in the consideration process:

- Volume of pedestrian traffic;
- Volume of cycle traffic;
- Whether the access route is to a school, playground or other local amenity;
- Type of road to be crossed and its total width;
- Speed of vehicles on the road and the volume of traffic including the proportion of heavy goods vehicles;
- Location, convenience and safety of alternative routes for pedestrians and cyclists;
- Use by children, elderly people, visually impaired people and disabled people including wheelchair users, and people with prams and pushchairs;
- Environmental aspects;
- Other aspects particularly relevant to the local situation;
- Cost of subway;
- Effects of changes in local land use over the next 15 years including any prospective recreational routes for pedestrians and cyclists.

Siting of Subway

2.2 The line of the subway and its accesses should preferably be close to the main line of travel for the majority of subway users in order to maximise the use of the facility. The subway should be kept as short as possible. Where the number of pedestrians is very large an option might be to raise the level of the road to reduce the height and length of pedestrian access stairs and ramps.

2.3 Buried services may affect the siting of a subway if these cannot be re-routed economically and without significant disruption to highway users.

Types of Subway

2.4 Subways may be designed for use by pedestrians only or by both pedestrians and cyclists. Subways for joint usage should normally be segregated, and preferably by level difference, however an unsegregated shared surface for both pedestrians and cyclists may be suitable in certain situations. Additional headroom may be required where bridleways pass through subways.

Personal Security Aspects

2.5 Wide approaches, subway alignments with good through visibility, and good lighting, all within the view of passing pedestrians and passing traffic, will help to minimise pedestrians' fears for their personal safety. Subways and their accesses should be designed to avoid places of concealment in the interests of personal security.

2.6 Vandalism can be a major problem in urban and peri-urban subways. Attractiveness and good design are important factors in developing the use of a subway. It has been found that frequent cleaning and maintenance to preserve appearance are vital in this respect, particularly in the early life of the subway. Finishes should be of high standards, good in appearance and easy to maintain throughout the life of the subway.

2.7 Physical barriers may be necessary in some locations to prevent cars and motorcycles being driven into subways or subway approaches.

3. CROSS-SECTION OF SUBWAYS FOR PEDESTRIANS ONLY

3.1 Three types of pedestrian subway cross-section may be used:

- a. a **wide section**, suitable for those situations where a subway forms an extension to a footpath system not less than 5.0m in width carrying large numbers of pedestrians or where for aesthetic reasons the normal section is not considered to be suitable,
- b. a **normal section**, suitable for the majority of situations,
- c. a **narrow section**, for situations with small numbers of pedestrians where the normal section could not be justified on cost grounds.

Table 1

Minimum dimensions for pedestrian-only subways

TYPE OF SUBWAY	LENGTH OF SUBWAY (m)	HEIGHT (m)	WIDTH (m)
Wide	-	2.6	5.0
Normal	< 23	2.3	3.0
	≥ 23	2.6	3.3
Narrow	-	2.3	2.3

3.2 If circular or other shaped sections are proposed, they should circumscribe the rectangular sections with dimensions not less than the minimum laid down in this Standard.

3.3 The minimum height and width of subways for pedestrians only are given in Table 1.

3.4 Sight distance of 4.0m or more should be provided at corners and changes of direction. For calculation purposes, pedestrians can be assumed to be 0.4m away from an adjacent vertical wall. The visibility envelope should extend from a height of 1.5m representative of an adult to 0.6m for a child. Inside corners rounded off to a radius of 4.6m will meet this criteria.

4. CROSS-SECTION OF SUBWAYS FOR COMBINED USE

General

4.1 Pedestrians and cyclists can share the use of a single subway and associated ramps. For combined use to be successful the existing travel lines and those expected in the future should be investigated for both pedestrians and cyclists. Short diversions of one mode may be necessary to encourage the other mode to use the dual facility.

4.2 Guidance given on non-rectangular cross-sections in paragraph 3.2 is also applicable to this section.

Segregated Subways

4.3 The width for pedestrians should be segregated from the width for cyclists, preferably by level difference, as shown in Fig 1. Alternatively, segregation can be achieved by means of guardrailing which would serve as physical barrier to separate the footpath users from cycle track users. Where these measures are not suitable, a raised dividing line and tactile paving should be provided to assist visually impaired people.

4.4 The minimum dimensions for cross-sections are given in Table 2.

4.5 A typical cross-section of a subway to serve pedestrians and cyclists using the minimum internal dimensions for a segregated subway 20m long is given in Fig 1. The safety margin of 0.5m between the cycle track and subway wall may be haunched to deter pedestrians.

4.6 Stopping sight distances for cyclists given in Table 3 should be provided within the subway and on the approaches. These are illustrated in Fig 2. These distances are applicable to design speeds of 10 km/h or less on sharp curves and straights with staggered barriers, and 25 km/h or less on large radii and straights. The design speeds are not significantly affected by gradient. For layout purposes, the line of sight of a cyclist should be taken from a point 1.5m high, and at least 0.6m away from the edge of the cycle track. The design of subway walls, wingwalls, associated ancillary earthworks and landscape works should take account of these visibility requirements.

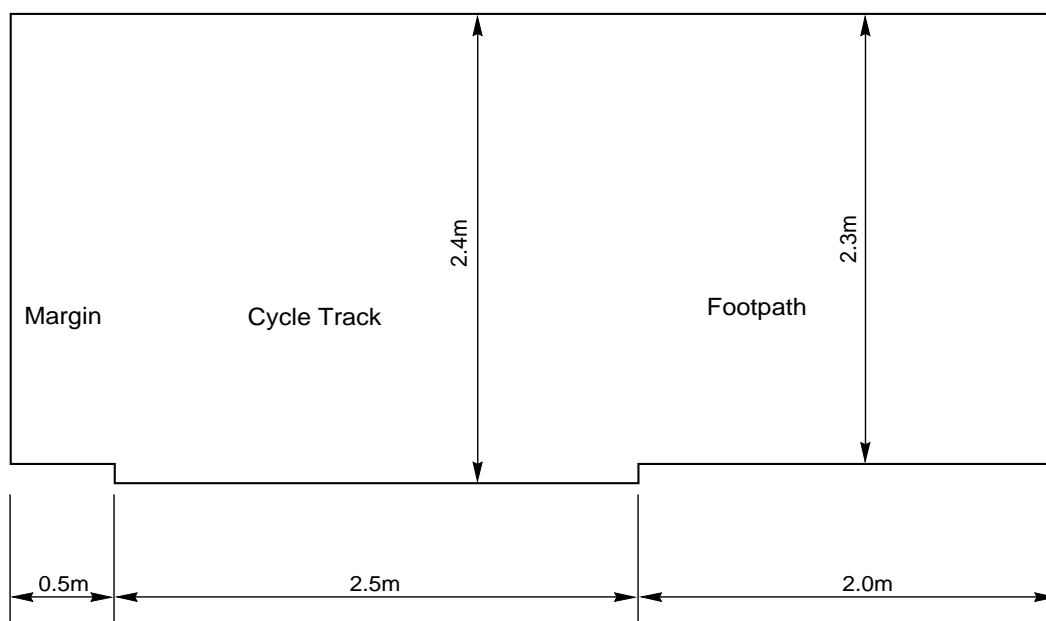


Figure 1 A cross-section of a typical segregated subway for combined use

Table 2

Minimum dimensions for segregated subways for pedestrians and cyclists

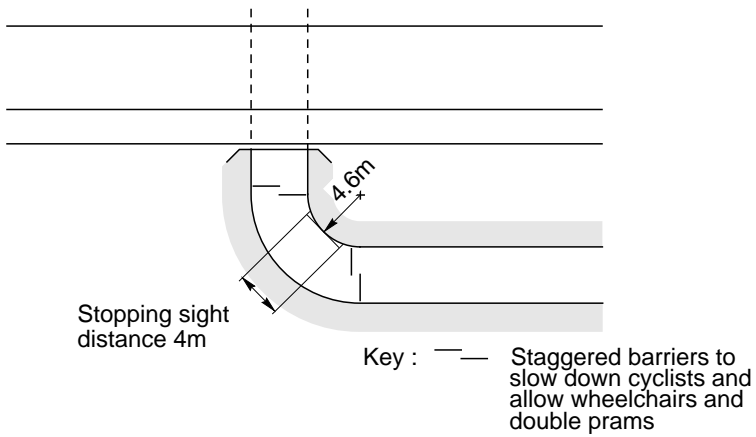
SUBWAY LENGTH (m)	HEIGHT (m)		WIDTH (m)		
	Cycle track	Footpath	Margin between subway wall and cycle track	Cycle track	Footpath
< 23	2.4	2.3	0.5	2.5	2.0
≥ 23	2.7	2.6			

Table 3

Stopping sight distances for cyclists

DESIGN SPEED (km/h)	MIN STOPPING SIGHT DISTANCE (m)	MIN RADIUS OF CURVATURE OF WALLS ADJACENT TO CYCLE TRACK (m)	MIN RADIUS OF CURVATURE OF WALLS ADJACENT TO FOOTPATH (m)
≤ 10	4.0	4.6	4.6
≤ 25	26.0	68.0	28.5

(i) Design speed ≤ 10 km/h



(ii) Design speed ≤ 25 km/h

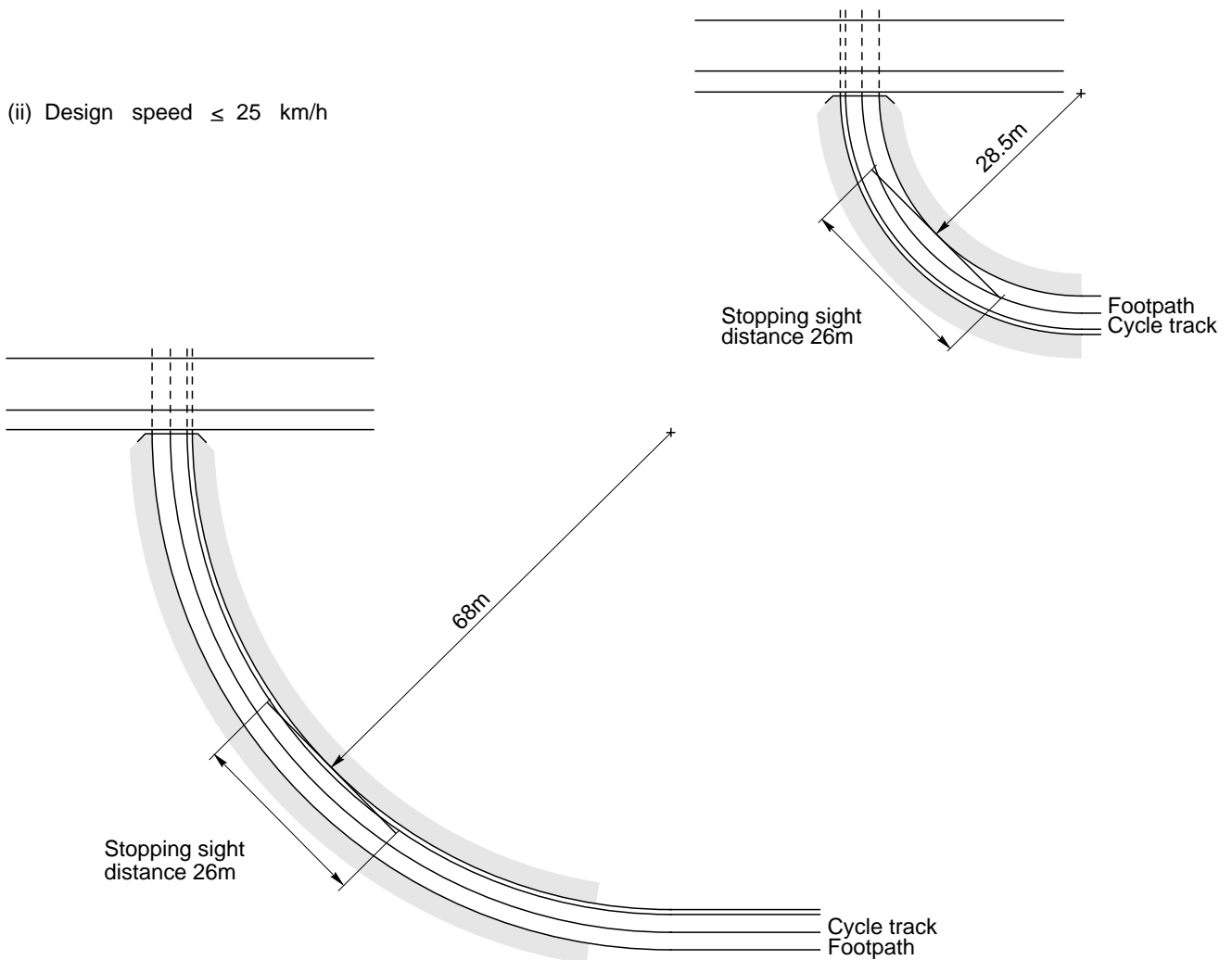


Figure 2 Stopping sight distances for cyclists

Unsegregated Subways

4.7 Where the total number of pedestrians and cyclists is small, an unsegregated subway may be acceptable, particularly for short subways with good through visibility.

4.8 The minimum dimensions for cross-sections are given in Table 4. At sites where space is restricted or where the total number of pedestrians and cyclists is very small, the subway width may be reduced to 3.0m.

4.9 An alternative where the number of cyclists is expected to be small is to provide a narrow pedestrian subway in accordance with Table 1. Suitable signs would be required to indicate that the cyclists should dismount before entering the subway and that no cycling is permitted within the subway. It would also be necessary to ensure that the cycle track is legally terminated either side of the subway.

Subways for Equestrian Use

4.10 Where bridleways are to be incorporated into subways, the minimum headroom should be 3.7m, except where suitable facilities for the riders to dismount and remount are provided, when the headroom may be reduced to 2.7m. Suitable signs should be erected to indicate that equestrians are required to dismount if the latter option is adopted. The minimum width of a subway for equestrian use should be 3.0m.

Table 4

Minimum dimensions for an unsegregated subway for pedestrians and cyclists

SUBWAY LENGTH (m)	HEIGHT (m)	WIDTH (m)
< 23	2.4	4.0
≥ 23	2.7	

5. ACCESS

General

5.1 Access to the subway may be via ramps or stairs which may be straight or helical. Consideration should be given to providing both ramps and stairs to suit able-bodied, cyclists, people with prams and pushchairs, those with heavy shopping or luggage, visually impaired people and disabled people including wheelchair users.

5.2 Access ramps or stairs should normally be the same width as the subway; except when multiple ramps and stairs are connected to a single subway, they may be narrower.

5.3 The thresholds of all subway accesses, tops and bottoms of flights of stairs, should be provided with a system of tactile pavings to assist visually impaired people. For details, see Ref 21.

Access Ramps

General

5.4 Ramps should not be allowed to run into the subway beyond the threshold as there could be a risk of cyclists hitting the soffit of the subway.

5.5 Landings should be provided at changes of direction, and changes of gradient. Landings should be used, even on straight ramps, so that the total rise between landings is not greater than 3.5m. Landings should normally be the same width as the ramp, and 2.0m or more long measured along the centre line of the landing. All landings should be approximately horizontal, and adequately drained.

Pedestrian Ramps

5.6 Gradients of 5% or shallower are preferred for access ramps where significant numbers of disabled persons or heavily laden shoppers are expected to use the subway. In other situations gradients shallower than 8% are preferred, but gradients up to 10% are permitted for short lengths in exceptionally difficult sites. Stepped ramps may also be considered at exceptionally difficult sites although wheelchair users find stepped ramps difficult to negotiate.

Cycle Ramps

5.7 In order to limit cycling effort to reasonable levels and to discourage cyclists from high speeds, the gradient of the access ramps should preferably be shallower than 3%, and should not normally exceed 5%. If space is very restricted a gradient of up to 7% may be adopted. In steep ramps of this type, staggered barriers would be desirable to encourage cyclists to exercise greater care and slow down, particularly on downhill bends, until they clear the steep ramp. See paragraph 6.20 for barrier details.

5.8 An effective way of controlling the speed of cyclists to less than 10km/h at or near the threshold of subway entrances leading to steep approach ramps is to introduce staggered barriers as shown in Fig 2.

Straight Access Stairs

5.9 The dimensions for access stairs are given in Table 7.

5.10 The headroom between any ceiling and stair measured vertically should not be less than the height of the subway.

5.11 Stair flights should normally comprise no more than 20 steps between landings. The landings should normally be the same width as the stair, and preferably 1.8m deep, or a minimum of 1.2m depth in restricted sites. There should not be more than 3 successive flights without a change of direction of 30 degrees or more at a landing. All landings should be approximately horizontal, and adequately drained.

5.12 Stair flights limited to 9 steps are preferred where significant numbers of disabled persons are expected to use the stairs.

5.13 Stair pitch should be uniform for a subway system, with steps of equal rise.

5.14 Nosings on the stairs should be rounded to a 6mm radius without overhang, and should be colour contrasted from the rest of the step.

5.15 The stair elements; rise, going, nosing and pitch are illustrated in Fig. 3.

Table 7 Dimensions for straight stairs

RISE r (mm)			GOING g (mm)			PITCH (degrees)	
Min	Max	Optimum	Min	Max	Optimum	Max	Optimum
100	150	130	280	350	300	33	27

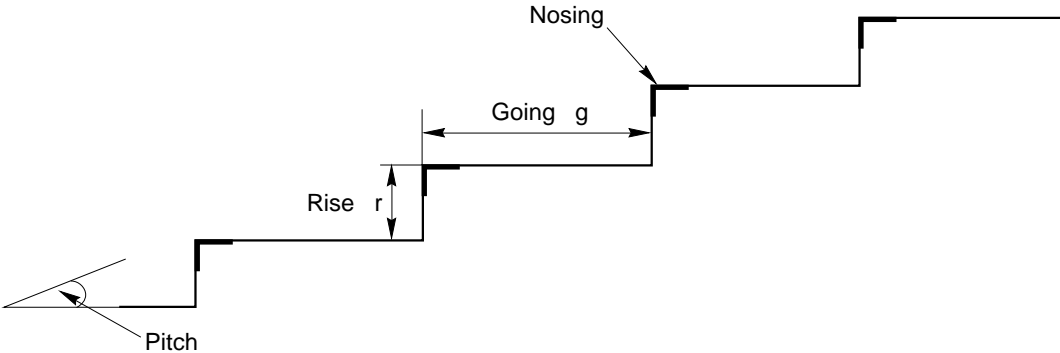


Fig. 3 Stair elements

Helical Access Stairs

5.16 At sites where space is restricted helical stairs may offer a useful alternative to straight stairs.

5.17 The dimensions for helical stairs are given in Table 8.

5.18 The requirements for straight stairs in paragraphs 5.10 to 5.14 also apply to helical stairs.

5.19 If structural columns are used adjacent to the central void, they should be slender so as not to create places of concealment.

Table 8 Dimensions for helical stairs

RISE r (mm)	GOING g (mm)			2r+g	
	Min inner going	Min centre going	Max outer going	Min	Max
150 to 190	150	250	450	480	800

6. CONSTRUCTION DETAILS

Surface Finishes

Walls

6.1 The walls are the most conspicuous and vulnerable areas and their finishes will affect the whole character of the subway. Some finishes are difficult to keep clean and have poor quality of light reflection. Important considerations in the selection and specification of finishes are their resistance to vandalism and the ease with which any graffiti can be removed.

6.2 For these reasons, porous open surfaced materials such as facing bricks and exposed aggregate finishes are best avoided. Mosaics and other hard impervious surfaced materials have performed well in the past. They are reasonably graffiti-proof and easy to clean.

6.3 In situ structural concrete and precast concrete are more prone to graffiti; but this can be discouraged by the application of suitable plastic paints to make walls impervious and easier to clean.

6.4 Bold designs with bright multiple colours in irregular or random patterns, and murals with themes suggested by children can help to create an atmosphere that the subway is well-used and therefore safer. This has also been found to deter vandalism.

6.5 Mosaics and tiles on external arrises are vulnerable to damage. They should be inset and stopped at least 0.10m short of these arrises and another material used for the arrises. Hard cement mortar or structural concrete, treated with plastic paint are suitable materials.

6.6 Mosaics or tiles will not, however, be satisfactory for those subways where the risk of structural vandalism is anticipated; consideration should be given to the use of a suitable robust finish such as structural concrete coated with graffiti-proof paint.

Floors Ramps and Stairs

6.7 Finishes may be subjected to all weather conditions and to salting and gritting in winter. They should have an adequate and durable slip resistance both when wet and when dry. The same advice should be followed for footpaths, cycle tracks, access stairs

and access ramps.

6.8 It is recommended that the coefficient of friction between the dry surface and rubber, leather or composition soled shoes should not be less than 0.6, and when wet this coefficient of friction should not reduce to less than 0.4. A guide to the slip resistance of floor finishes is given in BS 5395: Part 1.

Ceilings

6.9 Concrete soffits should be treated to maximise the amount of light reflection. Finishes known to have been successful include plastic paint with a matt white finish, Tyrolean and cement sprays.

6.10 Suspended ceilings should not be used.

Lighting

6.11 Daylight penetration into the subway entrances should be utilised wherever possible, with surface finishes chosen to enhance daylight illumination.

6.12 Artificial lighting should always be provided for use in the hours of darkness both inside the subway and on the subway approaches. Continuous use of lighting, in the daytime also, will encourage subway use in many cases.

6.13 The levels of illumination given in BS 5489: Part 9 are recommended for subways, stairs and ramps in rural and urban areas. Further information is contained in Ref 20.

6.14 Vandal-proof lighting systems should generally be used. Luminaires recessed into the ceiling or into the tops of walls have been successful in the past although surface mounted corner light fittings should be satisfactory in most situations provided they do not unduly encroach into the minimum cross-section required by this standard.

Drainage

6.15 The floors of pedestrian subways should be cambered with transverse slopes of about 3% and shallow channels on each side. For segregated subways the drainage should be at the edge or edges of the cycle track. It is preferable for the subway to slope longitudinally at a gradient of not less than 0.7%.

6.16 The drainage system should be large enough to deal with the water and detritus entering the subway from the ramps and stairs. The specification and siting of gully gratings and channel gratings should be carefully considered in the interests of women with stiletto heeled shoes and cyclists with narrow tyred wheels. Lockable or hinged gratings are recommended in situations where vandalism or theft is a problem. Adequate provision should be made for the cleaning and maintenance of gulleys and drains.

Handrailing

6.17 Handrails should be provided on both sides of stairs and ramps. Central handrails may be advisable where the width of stairs or ramps exceeds 3.0m.

6.18 To assist elderly people and disabled people, the handrailing height should be 1.0m above the level surface, 0.9m above a ramp and 0.85m above the nose of a step.

6.19 People with frail or arthritic hands have difficulty in gripping objects. The most comfortable sections for handrails are round sections between 45mm and 50mm in diameter and there should be a gap of 45mm between the rail and the wall, see Fig 4.

6.20 Where used, bollards and metal railings should be between 1.0m and 1.2m high. The minimum access gaps between these barriers should be 1.2m wide for the passage of wheelchairs and double prams. To assist the visually impaired, the tops of these barriers should be applied with colour contrasting paints.

Markings and Signs

6.21 Advice on the signing, including marking, for subways is contained in the references in Chapter 7 of this Standard.

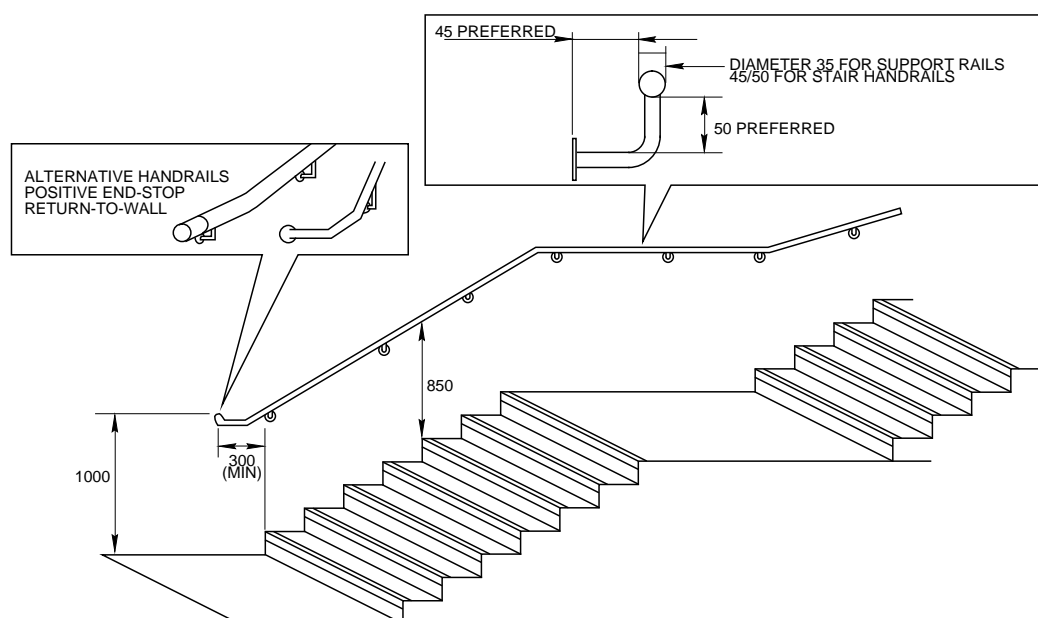


Figure 4 Handrailing details

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21. M Williams, Tactile markings for the guidance of visually handicapped pedestrians (TRL).

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F. Extract from HD 19/15 Road Safety Audit

VOLUME 5 ASSESSMENT AND PREPARATION OF ROAD SCHEMES

SECTION 2 PREPARATION AND IMPLEMENTATION

Part 2

HD 19/15

Incorporating Amendment dated May 2017

ROAD SAFETY AUDIT

SUMMARY

This document provides the requirements for Road Safety Audit which are mandatory for all trunk road Highway Improvement Schemes including motorways. It describes the stages at which Road Safety Audit shall be carried out, the procedures to be followed and the requirement for road safety monitoring of Highway Improvement Schemes after opening. **HD 19/15** supersedes **HD 19/03** and **IAN 152/11** (and the other Overseeing Organisation documents **IAN 152/11 (W)**, **DEM 136/11** and **TS Interim Amendment 40/11**). Incorporating Amendment dated May 2017.

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HIGHWAYS ENGLAND

HD 19/15

**Volume 5, Section 2,
Part 2**

**Incorporating
Amendment May 2017**



TRANSPORT SCOTLAND



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**DEPARTMENT FOR INFRASTRUCTURE
NORTHERN IRELAND**

Road Safety Audit

Summary: This document provides the requirements for Road Safety Audit which are mandatory for all trunk road Highway Improvement Schemes including motorways. It describes the stages at which Road Safety Audit shall be carried out, the procedures to be followed and the requirement for road safety monitoring of Highway Improvement Schemes after opening. HD 19/15 supersedes HD 19/03 and IAN 152/11 (and other Overseeing Organisation documents IAN 152/11 (W), DEM 136/11 and TS Interim Amendment 40/11). Incorporating Amendment dated May 2017.

REGISTER OF AMENDMENTS

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**VOLUME 5 ASSESSMENT AND
PREPARATION OF ROAD
SCHEMES**

**SECTION 2 PREPARATION AND
IMPLEMENTATION**

Part 2

HD 19/15

Incorporating Amendment May 2017

ROAD SAFETY AUDIT

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1. INTRODUCTION

Background

- 1.1. The objective of this Standard is to ensure that the road safety implications of all Highway Improvement Schemes are fully considered for all users of the motorway and trunk road network. The application of the Standard to those working on the highway is covered in paragraph 2.17.
- 1.2. The Overseeing Organisations attach great importance to the improvement of road safety. The use of Standards that are based on road safety considerations help to ensure that this objective is met.
- 1.3. Many elements of a Highway Improvement Scheme design are based on the use of Design Standards and Advice Notes. Whilst these Standards and Advice Notes provide a basis for safe design, care has to be taken when combining elements from them to avoid the creation of potential hazards. However, it is important to note that Road Safety Audit is not exclusively concerned with those aspects that are associated with the interaction of Design Standards. The objective of Road Safety Audit is to identify aspects of a Highway Improvement Scheme that could give rise to road safety problems and to suggest modifications that would improve the road safety of the resultant scheme.
- 1.4. Although road safety has always been considered during scheme preparation, there have been instances where details of the design have contributed to collisions and/or incidents on newly opened schemes. Design Teams do not necessarily contain staff with Collision Investigation or Road Safety Engineering experience and consequently they may not foresee potential factors pertaining to collision causation.
- 1.5. The Road Safety Audit procedure has been developed to ensure that operational road safety experience is applied during the design and construction process in order that the number and severity of collisions is kept to a minimum. Road Safety Auditors identify and address problem areas using the experience gained from highway design, road safety engineering, collision analysis and road safety related research. The Overseeing Organisations' aim is that the monitoring of Road Safety Audited schemes will result in more informed designs, leading to schemes that rarely require road safety related changes after opening.
- 1.6. It is recommended that Design Teams include staff with Road Safety Engineering experience to ensure that road safety issues are considered during the design process. However, Road Safety Engineers included within the Design Team cannot be permitted to be part of the appointed Road Safety Audit Teams. This is because of a potential lack of independence from the scheme design as their views may be influenced by familiarity and a natural "pride of authorship". The involvement of a Road Safety Engineer within the Design Team is not considered to be an acceptable substitute for undertaking Road Safety Audit.

Scope of this Standard

- 1.7. This Standard sets out the procedures required to implement Road Safety Audit on Highway Improvement Schemes on trunk roads including motorways. It defines the relevant schemes and stages in the design and construction process at which Road Safety Audit shall be undertaken and sets out the requirements for post- implementation collision monitoring.
- 1.8. This document includes several significant changes from the previous Standard **HD 19/03 (DMRB 5.2.2)**. This document also incorporates the requirements and advice in the withdrawn **IAN 152/11**, **IAN 152/11(W)**, **DEM 136/11** and **TS Interim Amendment 40/11**, which relates to **EC Directive 2008/96/EC** in respect to Road Safety Audit. The main changes in this Standard include:

- additional guidance on schemes to be Road Safety Audited;
- clarification of the process for the collision monitoring of completed Highway Improvement Schemes in the form of Stage 4 Road Safety Audit;
- further information on the application of Road Safety Audit for developer-led schemes;
- inclusion of the Road Safety Auditor Certificate of Competency requirements;
- additional guidance on the preparation of the Road Safety Audit Brief;
- inclusion of the Road Safety Audit Response Report and guidance on its preparation; and
- additional guidance on the preparation of the Road Safety Audit Exception Report.

Mandatory Sections

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| 1.9. | Mandatory sections of this document are contained in boxes. The organisations involved in the Road Safety Audit process must comply with these sections or obtain agreement to a Departure from Standard from the Overseeing Organisation. The remainder of the document contains advice and explanation, which is commended to users for consideration. |
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Application in Northern Ireland

- 1.10. This Standard will apply to those roads designated by the Overseeing Organisation.

Superseded Documents

- 1.11. This Standard supersedes **HD 19/03 (DMRB 5.2.2)**, which is hereby withdrawn. The contents of this Standard also supersede **IAN 152/11, IAN 152/11 (W), DEM 136/11 and TS Interim Amendment 40/11**.

Implementation

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| 1.12. | This Standard shall be used forthwith for all Road Safety Audits on all Highway Improvement Schemes with the exception of Road Safety Audits for which a Road Safety Audit Brief in accordance with HD 19/03 has been issued before the publication date of HD 19/15 . Those Road Safety Audits may be completed in accordance with HD 19/03 . |
| 1.13. | Exemptions granted under paragraph 2.6 of HD 19/03 prior to the publication of this Standard are recognised as valid. However, where this previous exemption only refers to a stage of the Road Safety Audit process, any stages of the process subsequent to the exemption must follow the requirements of this Standard. |

Definitions

- 1.14. **Collision Investigation:** The collection and examination of historical collision data over a period of time in order to identify common trends and factors which may have contributed to the collisions. This could also include the detailed forensic investigation of single collisions.

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- 1.15. **Design Organisation:** The organisation(s) commissioned to undertake the various phases of scheme preparation.
- 1.16. **Design Team:** The group within the Design Organisation undertaking the various phases of scheme preparation.
- 1.17. **Design Team Leader:** A person within the Design Team responsible for managing the scheme design and co-ordinating the input of the various design disciplines.
- 1.18. **Director:** The Director in the Overseeing Organisation with overall responsibility for the Highway Improvement Scheme. The Director will make the final decision in respect of the acceptance of any Exception Reports produced (see Annex L). For Transport Scotland, the term Director shall mean the Chief Road Engineer. For the Welsh Government, the term Director shall mean the Chief Highway Engineer. For the Department for Regional Development Northern Ireland, the term Director shall mean the Director of Engineering.
- 1.19. **Exception Report:** A report from the Project Sponsor to the Director on each recommendation in the Road Safety Audit Report that the Project Sponsor proposes should not be implemented. (See paragraphs 3.7 to 3.14 and Annex L).
- 1.20. **Highway Improvement Schemes:** All works that involve construction of new highway or permanent change to the existing highway layout or features. This includes changes to road layout, kerbs, signs and road markings, lighting, signalling, drainage, landscaping, communications cabinets and the installation of roadside equipment. The term “Highway Improvement Scheme” is considered to include the **EC Directive 2008/96/EC** term “Infrastructure Project”.
- 1.21. **Interim Road Safety Audit:** The application of Road Safety Audit to the whole or part of a Highway Improvement Scheme at any time during its design and construction. Interim Road Safety Audit is neither mandatory nor a substitute for the Stage 1, 2 and 3 Road Safety Audits.
- 1.22. **Like-for-like Maintenance Scheme:** A scheme or highway feature proposed as maintenance works, that solely involves the replacement or refurbishment of a highway feature with a corresponding feature, which as a minimum, will appear the same, be located in the same position, perform the same and be constructed of comparable materials as the feature it replaces.
- 1.23. **Non-Motorised Users (NMUs):** NMUs are considered to be pedestrians, cyclists and equestrians. The term NMU also includes disabled people and wheelchair users.
- 1.24. **Overseeing Organisation:** The highway or road authority responsible for the motorway or trunk road Highway Improvement Scheme to be Road Safety Audited, or in the case of developer-led or third party organisation promoted schemes, the highway or road authority responsible for the motorway or trunk road affected by the proposed Highway Improvement Scheme.
- 1.25. **Overseeing Organisation Specialist:** A person from the Overseeing Organisation that has the appropriate training, skills and experience in the Road Safety discipline. For the Highways Agency this will be an appropriate person from the Safer Roads – Design Team. For the Welsh Government this would be a specialist within the Network Management Division of the Transport Department. For the Department for Regional Development Northern Ireland this will be the Road Safety Engineering Policy Manager and for Transport Scotland this will be the Head of Standards.

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- 1.26. **Project Sponsor/Project Manager:** A person from the Overseeing Organisation responsible for ensuring the progression of a scheme in accordance with the policy and procedures of the Overseeing Organisation, and ensuring compliance with the requirements of this Standard. It should be noted that the Project Sponsor may not always be from the same organisation as those promoting the scheme, as the scheme may be proposed by a third party organisation (see paragraph 1.40).
- 1.27. **Road Safety Audit:** The evaluation of Highway Improvement Schemes during design and at the end of construction (preferably before the scheme is open to traffic). The aim is to identify potential road safety problems that may affect any users of the highway and to suggest measures to eliminate or mitigate those problems. The Road Safety Audit process includes the collision monitoring of Highway Improvement Schemes to identify any road safety problems that may occur after opening. The Stage 4 Road Safety Audit will include the analysis and reporting of 12 and 36 months of personal injury collision data from when the scheme became operational.
- 1.28. **Road Safety Audit Brief:** The instructions to the Road Safety Audit Team defining the scope and details of the Highway Improvement Scheme to be Road Safety Audited, including sufficient information for the Road Safety Audit to be undertaken (see Annex E).
- 1.29. **Road Safety Audit Report:** The report produced by the Road Safety Audit Team describing the road safety related problems identified by the Road Safety Audit Team and the recommended solutions to those problems.
- 1.30. **Road Safety Audit Response Report:** A report produced by the Design Team following Road Safety Audit Stages 1, 2 and 3 in which the Design Team responds to the problems and recommendations raised in the Road Safety Audit Report. The Road Safety Audit Response Report (see Annex K) will assist the Project Sponsor when deciding on the need to produce an Exception Report (see Annex L).
- 1.31. **Road Safety Audit Site Visit:** a visit to the location of a proposed or completed Highway Improvement Scheme.
- 1.32. **Road Safety Audit Team:** A team that works together on all aspects of the Road Safety Audit, independent of the Design Team and approved for a particular Road Safety Audit by the Project Sponsor on behalf of the Overseeing Organisation. The Road Safety Audit Team shall comprise a minimum of two persons (a Team Leader and Team Member). The individuals within the Road Safety Audit Team may be drawn from the Design Organisation or from other organisations.
- 1.33. **Road Safety Audit Team Leader:** A person with the appropriate training, skills and experience who is approved for a particular Road Safety Audit by the Project Sponsor on behalf of the Overseeing Organisation. The Road Safety Audit Team Leader has overall responsibility for carrying out the Road Safety Audit and managing the Road Safety Audit Team.
- 1.34. **Road Safety Audit Team Member:** A member of the Road Safety Audit Team with the appropriate training, skills and experience necessary for the Road Safety Audit of a specific scheme, reporting to the Road Safety Audit Team Leader.
- 1.35. **Road Safety Audit Team Observer:** A person with the appropriate training, skills and experience accompanying the Road Safety Audit Team to observe and gain experience of the Road Safety Audit process. The Road Safety Audit Team Observer is encouraged to contribute actively to the Road Safety Audit process.
- 1.36. **Road Safety Engineering:** The design and implementation of Highway Improvement Schemes intended to reduce the number and severity of collisions involving road users, drawing on the results of Collision Investigations.

- 1.37. **Road Safety Matters:** Any element of the road environment that could potentially contribute to a Road Traffic Collision or incident. The definition of Road Safety Matters also includes features that could present an unacceptable risk of trips, slips or falls to road users.
- 1.38. **Road Traffic Collision:** A collision between road users or between a road user and a feature on or adjacent to the highway.
- 1.39. **Specialist Advisor:** A person approved by the Project Sponsor to provide specialist independent advice to the Road Safety Audit Team, should the scheme include complex features outside the experience of the Road Safety Audit Team Members, e.g. a complex traffic signal controlled junction (see paragraph 2.85).
- 1.40. **Third Party Organisations:** Organisations such as a developer, a developer's consultant, a local authority, Statutory Undertaker or other private organisation that could be promoting a Highway Improvement Scheme on the Overseeing Organisation's road network.

2. ROAD SAFETY AUDIT

Schemes to be Road Safety Audited

- 2.1. This Standard shall apply to all Highway Improvement Schemes (see paragraph 1.20) on trunk roads including motorways, regardless of procurement method. This includes work carried out under agreement with the Overseeing Organisation resulting from developments alongside or affecting the trunk road or Highway Improvement Schemes being promoted by third party organisations.
- 2.2. Highway Improvement Schemes that will not impact on road user behaviour or adversely change the outcome of an incident involving an errant vehicle, due to the nature of the works and/or the distance of the improvement from the operational highway may, in certain circumstances be excluded from the Road Safety Audit process without the need for a formal Departure from Standard application (see paragraph 2.10). In such situations, Project Sponsors must formally consult with Overseeing Organisation Specialists at an early stage and gain agreement from the Specialist that the Road Safety Audit process does not need to be applied to the Highway Improvement Scheme.

2.3. The Project Sponsor must formally record on their scheme file (or equivalent) any decision not to apply Road Safety Audit to a scheme that they consider will not impact on road safety. If the Overseeing Organisation Specialist does not formally agree that the scheme may be excluded from the Road Safety Audit process and the Project Sponsor still considers the Road Safety Audit unnecessary, then the Departure from Standard process must be applied in accordance with paragraph 2.10 of this Standard.
- 2.4. Like-for-like maintenance schemes are excluded from Road Safety Audit (see paragraph 1.22). However, Project Sponsor's and Designer's attention is drawn to paragraph 2.6 of this Standard. This Standard does apply to Highway Improvement Schemes that are constructed as part of the same procurement package as maintenance works.
- 2.5. When considering whether a scheme is a like-for-like maintenance scheme, the Project Sponsor must consider if the works may change road user behaviour or adversely change the outcome of an incident involving an errant vehicle. If the feature could potentially change road user behaviour or its presence could exacerbate the severity of a collision then the Road Safety Audit process detailed in this Standard must be applied. If a Project Sponsor is unsure if the scheme under consideration could impact on road user behaviour or change the outcome of an incident involving an errant vehicle, they must formally consult with an appropriate Specialist from the Overseeing Organisation.
- 2.6. Project Sponsors and Designers should ensure that any like-for-like replacement or refurbishment scheme does not reinstate a feature that is known by the Overseeing Organisation or Design Organisation to adversely affect road user safety (e.g. the replacement of a non-passively safe traffic sign in the same location where it has been previously struck by errant road users on numerous occasions).

Delegation

- 2.7. The Overseeing Organisation will decide on the extent of delegation of the Director's and Project Sponsor's responsibilities, duties and tasks, with respect to this Standard. Project Sponsors may delegate to an assistant within the Overseeing Organisation. The Project Sponsor is responsible for ensuring that the assistant is competent to carry out the responsibilities, duties and tasks delegated. Project Sponsors may also delegate to a supplier employed as a "Department's Representative" provided they are independent from the design, construction and Road Safety Auditor organisations and the individuals appointed are competent to undertake the role. If a Project Sponsor or Director is unsure if the individual they are intending to delegate to is competent and independent, they should formally consult with an appropriate Specialist from the Overseeing Organisation.

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| 2.8. The Project Sponsor must inform the Road Safety Audit Team Leader and Design Team Leader in writing of any such delegations. |
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Application to Temporary Traffic Management Schemes

- 2.9. This Standard is not generally required for application to temporary traffic management schemes. The Department for Transport publication "Safety at Street Works and Road Works A Code of Practice" and Chapter 8 of the Traffic Signs Manual contain the necessary guidance to facilitate the safe planning and implementation of temporary traffic management activities. However, Road Safety Audit should be applied to exceptional temporary traffic management schemes that involve temporary changes to the layout and operation of junctions or realignment of roads that will affect the network for a considerable period. Examples of such schemes include installation of a temporary roundabout junction or a diversion using a length of temporary carriageway to allow major excavation on a main carriageway. If a Project Sponsor is unsure if the scheme under consideration should be subjected to Road Safety Audit, they should formally consult with an appropriate Specialist from the Overseeing Organisation.

Exemption

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| 2.10. Where the Project Sponsor considers it unnecessary for Road Safety Audit to be applied to a particular Highway Improvement Scheme and the scheme in question has not been excluded from Road Safety Audit in accordance with paragraph 2.2 or paragraph 2.49 of this Standard, approval for a Departure from Standard must be obtained from the Overseeing Organisation. The Departure application must clearly state why a Road Safety Audit is not considered necessary. |
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- 2.11. A Departure from Standard allowing exemption from Road Safety Audit will only be approved when, in the opinion of the Overseeing Organisation, the effect of the Highway Improvement Scheme on the highway would be negligible and the costs and safety risks of undertaking the Road Safety Audit would outweigh its benefits.

The Relationship between Road Safety Audit and Health & Safety Legislation

- 2.12. Road Safety Audit does not cover health & safety legislation issues concerning the construction, maintenance and use of the road.
- 2.13. Although the Road Safety Audit Team's contribution to design is limited, in making recommendations they may be considered to have undertaken design work under health & safety legislation. It is therefore recommended that Road Safety Audit Teams make themselves aware of current health & safety legislation and consider the implications of their recommendations for the health & safety of others.

- 2.14. Overseeing Organisation Project Sponsors and Directors should make themselves aware of current health & safety legislation and consider the implications of their instructions to Design Teams and Road Safety Audit Teams in terms of health & safety.

- 2.15. When incorporating Road Safety Audit recommendations into scheme designs (see paragraph 3.15), the Design Team shall be responsible for reviewing and amending any design risk assessments required by health & safety legislation. The Design Team must also consider the impact that incorporating Road Safety Audit recommendations could have on other design elements.

Scope of Road Safety Audit

- 2.16. Road Safety Audit shall only consider Road Safety Matters (see paragraph 1.37).

- 2.17. Issues relating to the health & safety of operatives constructing, operating or maintaining the highway are not covered by Road Safety Audit. Only issues relating to the design and construction of facilities for highway maintenance that may potentially contribute to a Road Safety Matter (see Paragraph 1.37) should be considered by the Road Safety Audit process.
- 2.18. Road Safety Audit is not a technical check that the design conforms to Standards and/or best practice guidance. Design Organisations are responsible for ensuring that their designs have been subjected to the appropriate design reviews (including, where applicable, Non-Motorised User (NMU) Audits **HD 42/05 “Non-Motorised User Audits” (DMRB 5.2.5))** prior to Road Safety Audit.
- 2.19. Road Safety Audit is not a check that the scheme has been constructed in accordance with the design.
- 2.20. Road Safety Audit does not consider structural safety.

Road Safety Audit

- 2.21. When making recommendations for dealing with identified problems, Road Safety Audit Teams must make allowance for the fact that strategic decisions on matters such as route choice, junction type, standard of provision and approved Departures from Standards already reflect an appropriate balance of a number of factors including road safety. Recommendations requiring major changes in these areas are unlikely to be acceptable when balanced with other aspects of the scheme and the Road Safety Audit Team must not make such proposals. In the unlikely situation where the road safety implications of the strategic decisions have not been fully considered previously, the Project Sponsor may extend the scope of the Road Safety Audit to include consideration of these items. The Project Sponsor must clearly identify within the Road Safety Audit Brief where the scope of the Road Safety Audit has been extended to cover strategic decisions.

- 2.22. Where the Project Sponsor has extended the scope of the Road Safety Audit to include strategic decisions in the Road Safety Audit Brief, it should be noted that the Road Safety Audit Team's recommended changes to the strategic elements of the design may not be accepted by the Project Sponsor and the Designer's original scheme layout as detailed in the Road Safety Audit Brief may be progressed. Therefore, when Road Safety Auditors are permitted to consider strategic elements of a Highway Improvement Scheme and they make recommendations for changes to the strategic decisions, the Road Safety Audit Team must also ensure that they fully assess the original layout as proposed by the Design Team so that any road safety problems are identified and addressed.

- 2.23. Advice is given on the general aspects that should be addressed at Road Safety Audit Stages 1, 2 and 3 in the lists in Annexes A to C of this Standard. An illustrative Stage 2 Road Safety Audit Report is shown in Annex F and illustrative Stage 4 Road Safety Audit Reports are contained in Annexes G and H.
- 2.24. The lists in Annexes A, B and C are not intended to be exhaustive. They provide a prompt for optional supplementary checks that Road Safety Audit Teams could make following their less prescriptive and more wide-ranging Road Safety Audit.

2.25. Road Safety Auditors must examine the overall layout of the Highway Improvement Scheme. All users of the highway shall be considered including motorists, pedestrians, cyclists, equestrians and facilities for those working on the highway (see paragraph 2.17). Particular attention should be given to vulnerable road users such as the very young, older users and the mobility and visually impaired.

- 2.26. The potential for road safety problems is often greatest at junctions, tie-ins and immediately beyond tie-ins. Where a Highway Improvement Scheme joins an existing road or junction, inconsistency in the standard of provision may potentially lead to collisions, so particular attention should be paid to these areas to ensure the safest possible transition is achieved. This applies particularly to on-line improvements where variations in the standard of provision between new and existing sections may not be obvious to the road user.

Stages of Road Safety Audit

- 2.27. Highway Improvement Schemes shall be Road Safety Audited at Stages 1, 2, 3 and 4. If, for any reason, a Stage 1 Road Safety Audit has not been carried out (for example, where a scheme is of such a scale that no preliminary design has been necessary and the scheme has progressed directly to detailed design with the agreement of the Project Sponsor), Road Safety Audit Stages 1 and 2 shall be combined at Stage 2 and shall be referred to as a Combined Stage 1 & 2 Audit. The information provided as part of the Road Safety Audit Brief for a Combined Stage 1 & 2 Road Safety Audit must be of sufficient detail to undertake a detailed design Road Safety Audit (see paragraph 2.33).
- 2.28. Stage 1 and Stage 2 Road Safety Audits must not be combined as purely a cost and/or programme saving measure.

Stage 1 Road Safety Audit: Completion of Preliminary Design

- 2.29. Stage 1 Road Safety Audits will be undertaken at the completion of preliminary design, (for example at the Order Publication Report Stage) before publication of draft Orders and for developer-led Highway Improvement Schemes, before planning consent is applied for (see paragraphs 2.54 to 2.61).
- 2.30. The end of the preliminary design stage is often the last occasion at which land requirements may be changed. It is therefore essential that Stage 1 Road Safety Audits considers any road safety issues which may have a bearing upon land take, licence or easement before the draft Orders are published or planning consent is applied for.

2.31. At Road Safety Audit Stage 1 all Road Safety Audit Team members must visit together the sites of Highway Improvement Schemes:

- that involve permanent change to the existing highway layout or features; and
- where new offline proposals tie-in to the existing highway.

2.32. The need to consider the site during specific traffic conditions at the Stage 1 Road Safety Audit should be identified in the Road Safety Audit Brief (see paragraph 2.89h).

Stage 2 Road Safety Audit: Completion of Detailed Design

2.33. Stage 2 Road Safety Audits will be undertaken at the completion of the detailed design stage. At this stage, the Road Safety Audit Team is concerned with the more detailed aspects of the Highway Improvement Scheme. The Road Safety Audit Team will be able to consider geometry (such as the layout of junctions and highway cross sections), street furniture (such as the position of traffic signs and road restraint systems), carriageway markings, street lighting provision and other issues (see Annex B).

2.34. The Stage 2 Road Safety Audit should include a review of the issues raised in the Stage 1 Road Safety Audit Report. Any issues that have not been satisfactorily resolved from the Stage 1 Road Safety Audit either by the element of the scheme being redesigned, as a result of clarification given by the provision of further information or by an approved Exception Report, should be reiterated in the Stage 2 Road Safety Audit Report.

2.35. At Road Safety Audit Stage 2 all team members must visit together the sites of Highway Improvement Schemes:

- that involve permanent change to the existing highway layout or features; and
- where new offline proposals tie-in to the existing highway.

2.36. The need to consider the site during specific traffic conditions at the Stage 2 Road Safety Audit should be identified in the Road Safety Audit Brief (see paragraph 2.89h).

Stage 3 Road Safety Audit: Completion of Construction

2.37. The Stage 3 Road Safety Audit should be undertaken when the Highway Improvement Scheme is substantially complete and preferably before the works are opened to road users. This is to minimise potential risk to road users and the difficulty that would be experienced by Road Safety Audit Teams in traversing the site when open to traffic. Where this is not feasible, alternative arrangements should be agreed with the Project Sponsor. This may result in the Road Safety Audit being carried out a short time after opening or in phases where a scheme is subject to phased completion and opening. However, all Highway Improvement Schemes should be subjected to a Stage 3 Road Safety Audit within 1 month of opening. If there is an accessibility issue that restricts the Road Safety Audit Team from fully traversing areas of the site (e.g. an area of live motorway that cannot be accessed on foot), reference to this should be included in the introduction of the Road Safety Audit Report for consideration by the Project Sponsor.

2.38. Road Safety Auditors are required to examine the Highway Improvement Scheme from all users' viewpoints and may decide to drive, walk and/or cycle through the scheme as well as consider motorcycle and equestrian use to assist their evaluation and ensure they have a comprehensive understanding. Issues raised in the Stage 2 or Combined Stage 1 & 2 Road Safety Audit Report should also be reviewed at the Stage 3 Road Safety Audit and reiterated if not satisfactorily resolved, either by the element of the scheme being redesigned, as a result of clarification given by the provision of further information or by an approved Exception Report.

2.39. All Road Safety Audit Team Members must examine the scheme site together during daylight. They shall also examine the site together during the hours of darkness at Stage 3 so that hazards particular to night operation can be identified.

2.40. The Road Safety Audit Team should also consider the potential impact on road safety of different traffic conditions which may be specific to the Highway Improvement Scheme location. For example at peak periods, the beginning or end of the school day or during frequent events. The need to consider the site during specific traffic conditions should be identified in the Road Safety Audit Brief (see paragraph 2.89h).

2.41. Road Safety Auditors should also consider the potential impacts on road safety of various weather conditions that may not be present at the time of inspection.

2.42. The Road Safety Audit Team Leader should discuss any alterations recommended at the Stage 3 Road Safety Audit with the Project Sponsor as soon as possible to give the opportunity for modifications to be undertaken before opening. This will provide a safer working environment for the workforce and delays to road users will be minimised.

Stage 4 Road Safety Audit: Monitoring

2.43. The Overseeing Organisation will arrange for evidence led collision monitoring of Road Safety Audited Highway Improvement Schemes. Stage 4 Road Safety Audits should be undertaken by individuals with the appropriate training, skills and experience as identified in paragraphs 2.76 to 2.84 of this Standard.

2.44. When a Highway Improvement Scheme is opened to road users, monitoring in the form of Stage 4 Road Safety Audits must be carried out on the number of personal injury collisions that occur, so that any road safety problems can be identified and remedial action taken as soon as possible.

2.45. Stage 4 Road Safety Audit collision monitoring reports shall be prepared using 12 months and 36 months of personal injury collision data from the time the Highway Improvement Scheme became operational and shall be submitted to the Overseeing Organisation. The Stage 4 Road Safety Audit process is an evidence led review of personal injury collisions that have occurred in the vicinity of the Highway Improvement scheme. The collision records shall be analysed in detail to identify:

- locations at which personal injury collisions have occurred; and
- personal injury collisions that appear to arise from similar causes or show common factors.

- 2.46. When considering the timing of the 12 month and 36 month Stage 4 Road Safety Audits, allowance should be made for any significant changes that may have been implemented as a result of the Stage 3 Road Safety Audit. In the case where there have been significant changes following the period the scheme first became operational, then the 12 month and 36 month reports should make reference to these changes and their potential impact on the personal injury collision history.
- 2.47. The analysis of personal injury collision data should include identification of changes in the collision population in terms of number, rate (taking account of any traffic flow changes), types and other collision variables, comparisons should be made with control data. Where the Highway Improvement Scheme is an on-line improvement then the collision record before the scheme was built should be compared with the situation after opening. The collision data should be analysed to identify the influence of problems and recommendations identified at previous Road Safety Audit stages, and any Exception Reports.
- 2.48. If collision records are not sufficiently comprehensive for detailed analysis, the Police should be contacted to ascertain the availability of statements and report forms, which could aid the 12 month and 36 month data analysis.
- 2.49. Where no personal injury collisions have been recorded in the vicinity of the Highway Improvement Scheme over the 12 month or 36 month periods, a formal Stage 4 Road Safety Audit collision monitoring report is not required. If, for the above reason, the Project Sponsor decides not to proceed with the Stage 4 Road Safety Audit collision monitoring report, then this decision must be formally recorded, with appropriate reasoning, on their Highway Improvement Scheme file (or equivalent).

2.50. At Road Safety Audit Stage 4 all Road Safety Audit Team members must visit together the sites of Highway Improvement Schemes:

 - where higher than expected numbers of personal injury collisions have occurred since the scheme became operational (when compared to control data); or
 - where the personal injury collision rate or severity has increased since the scheme became operational; or
 - where characteristics within the personal injury collision data post-opening show unexpected common trends (e.g. a high frequency of personal injury collisions during the hours of darkness or on a wet road surface).
- 2.51. When a site visit is undertaken (for the reasons identified in paragraph 2.50), the Road Safety Audit Team should consider if the personal injury collision analysis justifies an inspection during a particular time period (e.g. the hours of darkness or peak hour).
- 2.52. The Stage 4 Road Safety Audit collision monitoring report should identify any road safety problems indicated by the collision data analysis and any related observations during any site visits undertaken. The report should make recommendations for remedial action as appropriate.
- 2.53. Illustrative Stage 4 Road Safety Audit Reports examining 12 months and 36 months of collision data are contained in Annexes G and H respectively.

Developer-led and Third Party Organisation-led Schemes

2.54. The design and Road Safety Audit process for developer-led and third party organisation-led Highway Improvement Schemes can vary from the process for Overseeing Organisation promoted Highway Improvement Schemes. Most significantly, the scheme may be designed by an organisation working for the developer or third party organisation rather than an organisation working for the Overseeing Organisation. The developer-led scheme will be submitted for planning approval to the local planning authority and, where there are highway implications, the highway or road authority will be consulted. The following paragraphs provide additional requirements and guidance for all organisations involved in the Road Safety Audit of developer-led and third party organisation led Highway Improvement Schemes.

- 2.55. Where developer-led schemes or third party organisation-led schemes will result in Highway Improvements Schemes (as defined in paragraph 1.20) on the motorway and trunk road network, the contents of this Standard must be followed for all Stages of Road Safety Audit.

2.56. The Road Safety Audit Team approval and appointment must follow the process set out in paragraphs 2.70 to 2.75 of this Standard. As with highway or road authority promoted schemes, the Overseeing Organisation responsible for the affected motorway or trunk road is responsible for ensuring that the developer-led or third party scheme complies with the Road Safety Audit procedure as detailed in this Standard.

2.57. A Road Safety Audit Brief must be prepared and issued in accordance with paragraphs 2.87 and 2.88 of this Standard for all Road Safety Audit Stages (see Annex E).

2.58. The process of issuing and considering the draft Road Safety Audit Report identified in paragraphs 2.102 to 2.106 of this Standard must be followed for both developer-led and third party led schemes for all Road Safety Audit Stages. Once the Road Safety Audit Report has been finalised, the scheme Designer is responsible for producing a Road Safety Audit Response Report in accordance with paragraphs 3.1 and 3.2 of this Standard.

2.59. At all Road Safety Audit Stages, recommendations made in the Road Safety Audit Report that impact on the motorway or trunk road network must be either incorporated into the design, included within the constructed scheme or dealt with by means of Exception Report(s) to the satisfaction of the Overseeing Organisation Project Sponsor and Director. In the case of the Stage 1 Road Safety Audit Report (or combined Stage 1 & 2 Road Safety Audit Report), recommendations must be accommodated or Exceptions Reports produced to the satisfaction of the Overseeing Organisation Project Sponsor and Director prior to planning consent being given.

2.60. At all stages the Project Sponsor is responsible for the production of any Exception Reports. Typically the Project Sponsor will request that the developer or third party organisation produces the Exception Report(s) on their behalf. The Exception Report(s) must be produced to the satisfaction of the Overseeing Organisation's Project Sponsor and Director, for elements of the scheme on the motorway or trunk road network. The Exceptions Report(s) must be agreed with the Overseeing Organisation's Project Sponsor and Director prior to the scheme progressing to the next stage.
- 2.61. A Stage 1 Road Safety Audit (or combined Stage 1 & 2 Road Safety Audit where there has been no preliminary design) should be undertaken before planning consent is applied for as this demonstrates that the potential for road user safety issues has been addressed.

Design Changes and Road Safety Audit Shelf Life

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| 2.62. | Stage 1, Combined Stage 1 & 2 and Stage 2 Road Safety Audits must be repeated if the scheme design materially changes, if there are many minor changes which could together impact on road user safety, or if the previous finalised Road Safety Audit for the relevant stage is more than 5 years old. In the case of minor changes to a Highway Improvement Scheme then the repeated Road Safety Audit should only be concerned with the elements of the scheme that have been changed. If the changes are more significant or if there are many minor changes then the whole Road Safety Audit stage should be repeated. |
| 2.63. | Throughout the period following the Stage 2 Road Safety Audit, the Design Organisation and/or Contractor must keep the Project Sponsor informed of all design changes that occur so that any requirement for an additional Stage 2 Road Safety Audit can be identified. The Project Sponsor must then initiate any additional Road Safety Audits required. |

Interim Road Safety Audit

- 2.64. The requirement for independence need not prevent contact between the Design Team and the Road Safety Audit Team throughout the design and construction process, provided certain conditions are met (see paragraph 2.68). The Interim Road Safety Audit process can provide the benefit of early identification of potential road safety problems leading to savings in both programme and design costs. This could be particularly beneficial to larger projects with accelerated programmes, such as Highway Improvement Schemes involving early contractor involvement.

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| 2.65. | The Project Sponsor will decide whether to employ Interim Road Safety Audit. Design Teams must not contact Road Safety Audit Teams without the Project Sponsor's prior written authorisation. Road Safety Audit Teams undertaking Interim Road Safety Audit must only be appointed with the approval of the Project Sponsor in accordance with paragraphs 2.70 to 2.75 of this Standard. |
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- 2.66. Subject to the Project Sponsor's prior agreement, at any time during the preliminary and detailed design stages, Designers may submit or be instructed to submit designs of the whole or parts of schemes to the Road Safety Audit Team for completion of an Interim Road Safety Audit. The Road Safety Audit Team and Design Team are permitted to meet if considered necessary, to enable the Design Team to explain their designs and the Road Safety Audit Team to explain any identified problems and recommendations. This meeting should be chaired by the Project Sponsor.
- 2.67. In addition, Interim Road Safety Audit may be employed during the construction process with the agreement of the Project Sponsor. Elements of the constructed scheme may be subjected to Interim Road Safety Audit, when works are partially complete or when individual elements or sections of the scheme are complete and opened to road users in stages.

2.68. Interim Road Safety Audit is subject to the following conditions:

- Road Safety Audit Teams must report in the format illustrated in the Road Safety Audit Report in Annex F, namely the “problem/recommendation” format, unless instructed differently by the Project Sponsor in writing.
- Road Safety Audit Teams must limit their reports to matters within the scope of this Standard.
- Minutes of meetings must be recorded.
- All communications between the Road Safety Audit and Design Teams including design submissions, Interim Road Safety Audit Reports and minutes of meetings must be submitted to the Project Sponsor.
- Interim Road Safety Audit supplements the Road Safety Audits at Stages 1, 2, 3 and 4, therefore these Stage 1, 2, 3 and 4 Road Safety Audits must also be carried out and reported.

2.69. The Road Safety Audit Team will require a Road Safety Audit Brief for an Interim Road Safety Audit. This should contain as many of the items given in paragraph 2.89 as are available.

Road Safety Audit Team Approval and Appointment

2.70. Responsibility for the appointment of the Road Safety Audit Team at all stages will vary according to the procurement method for the scheme. Reference should be made to the scheme contract documents or the Overseeing Organisation for each scheme. If it is considered appropriate, the Project Sponsor may ask the Design Organisation to propose a Road Safety Audit Team for approval.

2.71. It is a fundamental principle of the Road Safety Auditing process that the Road Safety Audit Team is independent from the Design Team (see paragraph 1.6). The Project Sponsor must not accept a Road Safety Audit Team where its independence from the Design Team is in doubt. In such cases, an alternative Road Safety Audit Team must be proposed.

2.72. At Road Safety Audit Stages 1, 2, 3 and 4 the Road Safety Audit Team must comprise the Audit Team Leader and at least one Audit Team Member. This enables discussion between the Road Safety Auditors of the problems and recommendations and maximises the potential to identify problems. Road Safety Audit Team Observers may also join the Road Safety Audit Team to gain experience in carrying out Road Safety Audit. However, the number of Road Safety Audit Team Observers shall be limited to a maximum of two.

2.73. The Road Safety Audit Team must satisfy the Project Sponsor of their competence to undertake the Road Safety Audit. Members of the Road Safety Audit Team must demonstrate their competence by means of a road safety specific curriculum vitae. The information provided in the curriculum vitae must concisely set out how the proposed Road Safety Audit Team member's training, skills and experience (including Continuing Professional Development) align with the guidance and requirements of this Standard. Approvals of the Road Safety Audit Team are scheme specific and the use of personnel or organisations on previous Road Safety Audit work does not guarantee their suitability to Road Safety Audit other schemes. Experience must be relevant to the type of scheme being Road Safety Audited and this relevant experience must be identified in the proposed Road Safety Audit Team members' curriculum vitae.

2.74. At all Road Safety Audit stages the Project Sponsor is responsible for approving the Road Safety Audit Brief which shall be issued to the Road Safety Audit Team.

- 2.75. It is not necessary for the same Road Safety Audit Team to undertake all Road Safety Audit stages of a scheme, however, any changes to a Road Safety Audit Team and its individual members will require further approval from the Project Sponsor.

Road Safety Audit Team Training, Skills and Experience

- 2.76. Paragraphs 2.77 to 2.84 include guidance on the general levels of training, skills and experience that are expected of Road Safety Auditors. Most are not mandatory requirements but are intended to assist Project Sponsors when considering proposals for Road Safety Audit Teams and also to assist potential auditors to prepare themselves as candidates for Road Safety Audit Teams. The guidance is intended to be flexible, recognising that the experienced road safety professionals that are needed to carry out Road Safety Audits may have developed their careers from a range of backgrounds.
- 2.77. The most appropriate candidates for Audit Team Leader and Audit Team Member are individuals whose recent experience involves Collision Investigation or Road Safety Engineering on a regular basis. This should ensure that Road Safety Auditors are well versed in the most recent practices and developments in the field. Those candidates who have the recommended experience in Collision Investigation or Road Safety Engineering experience, but who have not undertaken such work on a regular basis in the previous 2 years, are unlikely to be acceptable, due to their lack of current relevant experience.
- 2.78. Candidates who carry out Road Safety Audits full time, to the exclusion of Collision Investigation or Road Safety Engineering work are unlikely to be acceptable as they may lack the appropriate and recent Collision Investigation or Road Safety Engineering experience.
- 2.79. Road Safety Auditors should also have an understanding of how best practice highway design principles may benefit road safety. It is not intended that Road Safety Auditors have extensive detailed design knowledge. However, they should have a reasonable understanding of design Standards and best practice design principles, and how the application of these can minimise collision risk.

- 2.80. The Continuing Professional Development (CPD) record included in the curriculum vitae must focus on Road Safety Audit, Collision Investigation and Road Safety Engineering. It shall include any other relevant CPD, covering areas such as highway design, traffic management and highway maintenance.

- 2.81. It should be noted that relevant CPD does not have to take the form of formal training courses alone. Outcome based structured reading, the preparation and presenting of relevant material and work based learning can all form part of a CPD record. Examples of what constitutes CPD can be found in places such as the Engineering Council (ECUK) web site.

- 2.82. Road Safety Audit Teams comprised of highway design engineers with little or no experience of road safety work are not acceptable.

- 2.83. The following list gives guidelines on acceptable training, skills and experience for Road Safety Audit Team Members:
- **Road Safety Audit Team Leader:** A minimum of 4 years Collision Investigation or Road Safety Engineering experience. Completion of at least 5 Road Safety Audits in the past 12 months as a Road Safety Audit Team Leader or Member. In order to become an Audit Team Leader the auditor will already have achieved the necessary training to become an Audit Team Member. However, they should also demonstrate a minimum 2 days CPD in the field of Road Safety Audit, Collision Investigation or Road Safety Engineering in the past 12 months.

- **Road Safety Audit Team Member:** A minimum of 2 years Collision Investigation or Road Safety Engineering experience. Completion of at least 5 Road Safety Audits as Road Safety Audit Team Leader, Member or Observer in the past 24 months. The Road Safety Audit Team Member should have attended at least 10 days of formal Collision Investigation or Road Safety Engineering training to form a solid theoretical foundation on which to base practical experience. They should also demonstrate a minimum of 2 days CPD in the field of Road Safety Audit, Collision Investigation or Road Safety Engineering in the past 12 months.
- **Road Safety Audit Team Observer:** A minimum of 1 year Collision Investigation or Road Safety Engineering experience. The Road Safety Audit Team Observer should have attended at least 10 days of formal Collision Investigation or Road Safety Engineering training.

Road Safety Auditor Certificate of Competency

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| 2.84. | At least one individual within the Road Safety Audit Team undertaking Road Safety Audit on the motorway and/or trunk road network must hold a Certificate of Competency in Road Safety Audit, acquired in accordance with Annex J of this Standard. |
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Specialist Advisors

- 2.85. The Overseeing Organisation, Design Organisation and the Road Safety Audit Team should consider if there are any particular features of the project, such as complex signal controlled junctions, temporary traffic management or maintenance issues that warrant the appointment of Specialist Advisors to advise the Road Safety Audit Team. Appointment of Specialist Advisors is subject to the approval of the Project Sponsor who would separately instruct them on their role. A Specialist Advisor is not a member of the Road Safety Audit Team but advises the team on matters relating to their specialism.

Design Manual for Roads and Bridges Standard GD 02/08

- 2.86. Paragraphs 2.76 to 2.84 of this Standard supersede the indicative levels of experience, professional status, training and competency suggested in **GD 02/08 “Quality Management Systems for Highway Design” (DMRB 0.1.2)** for Road Safety Auditors.

Road Safety Audit Brief

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| 2.87. | The Road Safety Audit Brief defines the scope of the Road Safety Audit to be undertaken. The Project Sponsor has overall responsibility for the Road Safety Audit Brief. However, the Design Team may prepare the Road Safety Audit Brief on their behalf. A copy of the Road Safety Audit Brief must be forwarded to the Project Sponsor for formal approval in advance of the Road Safety Audit. The Project Sponsor may instruct the Design Team to delete unnecessary items or to include additional material, as they consider appropriate. The Project Sponsor must document the reasons for deleting or adding any information to the Road Safety Audit Brief. The Project Sponsor must issue the Road Safety Audit Brief and instruct the Road Safety Audit Team when the scheme is ready to be Road Safety Audited. |
| 2.88. | To maximise the benefit from the Road Safety Audit process, the Road Safety Audit Brief needs careful preparation and must include sufficient information to enable an efficient and effective Road Safety Audit to be undertaken. |

- 2.89. An illustrative Road Safety Audit Brief is shown in Annex E of this Standard. A Road Safety Audit Brief should contain the following:
- a) A description of the proposed Highway Improvement Scheme clearly identifying its objectives.
 - b) Scheme drawings showing the full geographical extent of the scheme and including the areas beyond the tie-in points.
 - c) Details of determined and pending Departures and Relaxations from Standards, and/or the Design Strategy Record(s) where they have been produced for an improvement to an existing motorway or trunk road.
 - d) Clear identification of the elements of the scheme proposals included within the scope of the Road Safety Audit to be undertaken and also those elements of the scheme that fall outside of the scope, including strategic decisions. The Road Safety Audit Brief should clearly identify where the scope of the Road Safety Audit has been extended to allow consideration of strategic decisions.
 - e) General scheme details, to help give an understanding of the purpose of the scheme and how the layout will operate, including design speeds, speed limits, traffic flows, forecast flows, queue lengths, NMU flows and desire lines (including NMU Context and Audit reports undertaken in accordance with **HD 42/05 (DMRB 5.2.5)**). Also details of any environmental constraints on the design and how these may have affected any strategic decisions made.
 - f) Details of any safety risk assessments undertaken as part of the design process (on the Strategic Road Network in England these will be undertaken with reference to **GD 04/12 “Standard for Safety Risk Assessment on the Strategic Road Network” (DMRB 0.2.3)**).
 - g) Any other relevant factors which may affect road safety such as adjacent developments (existing or proposed), proximity of schools or retirement/care homes and access for emergency vehicles.
 - h) The Road Safety Audit Brief should identify if the location of the Highway Improvement Scheme should be visited at a particular time of the day (e.g. peak traffic periods or beginning or end of the school day).
 - i) For on-line schemes and at tie-ins, the previous 36 months personal injury collision data in the form of ‘stick plots’ and interpreted listings. The personal injury collision data should cover both the extent of the scheme and the adjoining sections of highway.
 - j) At Road Safety Audit Stages 2 and 3, details of any changes introduced since the previous Road Safety Audit stage.
 - k) Any changes in the Highway Improvement Scheme that are not shown on the design or As-Built drawings.
 - l) Plans using an appropriate scale for the Road Safety Audit Team to mark up for inclusion in the Road Safety Audit Report.
 - m) Previous Road Safety Audit Reports, Interim Road Safety Audit Reports, Road Safety Audit Response Reports and Exception Report(s)

- n) Contact details of the Maintaining Agent to whom any identified maintenance defects should be notified (by telephone and immediately confirmed in writing for serious defects) separately from the Road Safety Audit Report (see paragraph 2.105).
- o) Details of the appropriate police contact.
- p) Details of any site access arrangements including any specific health & safety requirements such as inductions, Personal Protective Equipment and vehicle livery requirements.

2.90. If the Road Safety Audit Team considers the Road Safety Audit Brief to be insufficient for their purpose, requests for further information shall be made to the Design Team Leader and copied to the Project Sponsor. Any information requested but not supplied to the Road Safety Audit Team must be identified in the introduction to the Road Safety Audit Report.

Road Safety Audit Management

- 2.91. The Project Sponsor and Design Team should liaise and ensure that the Road Safety Audit process is initiated at the appropriate stages, allowing sufficient programme time to complete the full Road Safety Audit procedure. This should include an allowance for the incorporation of design changes.
- 2.92. The Design Team should ensure that the Road Safety Audit Team is given sufficient notice of when the scheme will be ready for Road Safety Audit and the date by which the report will be required.

2.93. The Road Safety Audit Team Leader must invite representatives of the Police and the Maintaining Agent to accompany the Road Safety Audit Team to offer their views for the Stage 3 Road Safety Audit.

- 2.94. The Road Safety Audit Team Leader may also, with the approval of the Project Sponsor, invite representatives of the Police and the Maintaining Agent to advise on Road Safety Audits at Stages 1, 2 and 4 where the Road Safety Audit Team Leader considers that their participation will benefit the Road Safety Audit.
- 2.95. During any Road Safety Audit site visit the total number of Road Safety Audit Team Members and its advisors should not exceed 6 individuals. This is because traversing sites in large groups can make the Road Safety Audit process more complex and could increase the potential for health & safety issues.
- 2.96. Site visit risk assessments should be produced prior to visiting site and reviewed during the site visit should conditions change. Risk assessment should be undertaken in accordance with the latest health and safety guidance/legislation and the Road Safety Audit organisation's Health & Safety policy. Any control measures identified during the site visit risk assessment process should be adhered to.

Road Safety Audit Report

- 2.97. At all Stages, the Road Safety Audit Team must prepare a written report. For Stage 4 Road Safety Audit Reports see paragraph 2.43 to 2.53. Stage 1, 2 and 3 Road Safety Audit Reports shall include:
- a) Identification of the Road Safety Audit stage including a unique document reference number and the status of the Road Safety Audit Report.
 - b) A brief description of the proposed Highway Improvement Scheme including details of its location and its objectives.
 - c) Details of who supplied the Road Safety Audit Brief, who approved the Road Safety Audit Brief and who approved the Road Safety Audit Team.
 - d) Identification of the Road Safety Audit Team membership as well as the names of others contributing such as the Police, Maintaining Agent and Specialist Advisors.
 - e) Details of who was present at the site visit, the date and time period(s) when it was undertaken and what the site conditions were on the day of the visit (weather, traffic congestion, etc.).
 - f) The specific road safety problems identified, supported with the background reasoning.
 - g) Recommendations for action to mitigate or remove the road safety problems.
 - h) A location map based on the scheme plan(s), marked up and referenced to problems and if available, photographs of the problems identified.
 - i) A statement, signed by both the Road Safety Audit Team Leader and the Road Safety Audit Team Member(s) in the format given in Annex D.
 - j) A list of documents and drawings reviewed for the Road Safety Audit.
- 2.98. The Road Safety Audit Report must contain a separate statement for each identified problem describing the location and nature of the problem and the type of collisions or incident considered likely to occur as a result of the problem. When deciding whether to include a potential problem, a Road Safety Auditor must consider who may be involved in a collision and how it might happen. If a collision type cannot be associated with the problem being considered, then it may not be appropriate to include the problem in the Road Safety Audit Report.
- 2.99. Each problem must be followed by an associated recommendation. The Road Safety Audit Team must aim to provide proportionate and viable recommendations to eliminate or mitigate the identified problems. On the Strategic Road Network in England, this will require awareness of the Highways Agency's level of tolerability of safety risk for road users referred to in **GD 04/12 (DMRB 0.2.3)**. Recommendations to "consider" should be avoided. Recommendations to "monitor" must only be made where a need to supplement the scheduled Stage 4 Road Safety Audit monitoring is specifically identified in terms of frequency and incidence of particular vehicle manoeuvres or collision contributory factors and the monitoring task can be specifically allocated. The use of the word "must" shall also be avoided in Road Safety Audit recommendations, as this may be misinterpreted as an instruction from the Road Safety Audit Team.
- 2.100. Items such as correspondence with the Overseeing Organisation or copies of marked up checklists must not be included in the Road Safety Audit Report.

2.101. An illustrative Stage 2 Road Safety Audit Report is shown in Annex F. The Road Safety Audit Report format shown is recommended for use for Road Safety Audit Stage 1, 2 and 3 Audits. Alternatively, the Project Sponsor may instruct the Road Safety Audit Team via the Road Safety Audit Brief to present the problems and recommendations in an alternative format, such as the order that they are encountered progressing along the length of the Highway Improvement Scheme.

- 2.102. The Road Safety Audit Team must send a draft Road Safety Audit Report directly to the Project Sponsor and not via the Design Team. The Road Safety Audit Team Leader shall discuss the draft Road Safety Audit Report with the Project Sponsor prior to formal submission so that misinterpretations of the scheme proposals or anything agreed to be outside the terms of reference can be identified and removed. If a Project Sponsor is unsure if a particular item should be removed from a Road Safety Audit Report, they must formally consult with an appropriate Specialist from the Overseeing Organisation.
- 2.103. Where the Project Sponsor agrees a variation on a recommendation with the Road Safety Audit Team Leader, this revised recommendation must be incorporated into the final Road Safety Audit Report. The Road Safety Audit Team Leader must consider the need to discuss variations with the Road Safety Audit Team and Specialist Advisors before variations are made and the final Road Safety Audit Report submitted to the Project Sponsor.
- 2.104. The Road Safety Audit Team Leader must not include in the Road Safety Audit Report, technical matters that have no implications on road safety or any other matters not covered by the Road Safety Audit Brief, such as maintenance defects observed during site visits and health & safety issues.
- 2.105. The Road Safety Audit Team Leader must send any comments on matters that are not covered by the Road Safety Audit Brief to the Project Sponsor in separate correspondence. Maintenance defects noted during site visits shall be immediately reported direct to the Maintaining Agent and the Project Sponsor must also be informed.
- 2.106. On receipt of the finalised Road Safety Audit Report, the Project Sponsor must issue the document to the Design Team to allow them to prepare a Road Safety Audit Response Report in accordance with this Standard.

3 ROAD SAFETY AUDIT – SUBSEQUENT ACTIONS

Road Safety Audit Response Report

- 3.1. It is the Project Sponsor's responsibility to ensure that all problems raised by the Road Safety Audit Team are given due consideration. To assist with this, the Design Team must prepare a Road Safety Audit Response Report to the Road Safety Audit Report at the Stage 1, Combined 1 & 2, Stage 2 and Stage 3 Road Safety Audits.
- 3.2. An illustrative Road Safety Audit Response Report is shown in Annex K. The Road Safety Audit Response Report should include the following:
- a) A summary of the scheme, the Stage of Road Safety Audit, the document reference and date of the Road Safety Audit Report it considers.
 - b) Full consideration of each problem and recommendation raised in the Road Safety Audit Report.
 - c) The Road Safety Audit Response Report should reiterate each problem and recommendation made, followed by a suggested Road Safety Audit response from the Design Team. The Road Safety Audit Response Report should include the problem location plan provided in the Road Safety Audit Report.
 - d) The Road Safety Audit Response Report should, for each problem and recommendation, do one of the following:
 - accept the problem and recommendation made by the Road Safety Audit Team;
 - accept the problem raised, but suggest an alternative recommendation, giving reasoning for the alternative recommendation or;
 - disagree with the problem and recommendation raised, giving appropriate reasoning for rejecting both the problem and recommendation.
 - e) Details of the representatives from the Design Team who prepared the Road Safety Audit Response Report.
- 3.3. The Design Team Leader shall send a draft Road Safety Audit Response Report to the Project Sponsor for consideration. Where the Project Sponsor agrees an amendment to a response with the Design Team Leader, this amendment shall be incorporated into the final Road Safety Audit Response Report. If a Project Sponsor is unsure about the contents of a Road Safety Audit Response Report they must formally consult with an appropriate Specialist from the Overseeing Organisation.
- 3.4. It is possible that the Project Sponsor may not be able to agree all the responses with the Design Team Leader. In this situation the final Road Safety Audit Response Report should identify this difference of opinion.
- 3.5. The Road Safety Audit Response Report should be issued to the Project Sponsor within 1 month (or an alternative timescale as agreed with the Project Sponsor) of the Design Team receiving the finalised Road Safety Audit Report.

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| 3.6. | The Project Sponsor must provide a copy of the final Road Safety Audit Response Report to the Road Safety Audit Team Leader for their information. |
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Exception Report(s)

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| 3.7. | <p>The Road Safety Audit Response Report will initiate the requirement for an Exception Report(s) where:</p> <ul style="list-style-type: none">• the problem and/or recommendation have not been accepted in the final Road Safety Audit Response Report and the Project Sponsor agrees with the response; or• the Road Safety Audit Response Report accepts a problem and/or recommendation, but the Project Sponsor does not agree with the Road Safety Audit Response Report. |
| 3.8. | <p>An Exception Report must also be produced if the Project Sponsor considers:</p> <ul style="list-style-type: none">• any Road Safety Audit problem raised to be insignificant; or• the Road Safety Audit problem to be outside the scope of the Road Safety Audit Brief; or• that the Road Safety Audit solutions recommended are not suitable given the relevant economic, environmental, or other relevant constraints; or• that the Road Safety Audit recommendations are technically not feasible. |
| 3.9. | <p>In the situations identified in paragraphs 3.7 and 3.8 above, the Project Sponsor must prepare an Exception Report giving reasons and proposing alternatives for submission to the Overseeing Organisation's Director, with whom the final decision rests. Where an Exception Report(s) is approved by the Director, a record of this approval must be kept by the Project Sponsor on the Overseeing Organisation's scheme file (or equivalent). Should the Director disagree with the contents of the Exception Report(s), the Project Sponsor will either implement the Road Safety Audit Recommendation(s) or amend the Exception Report(s) to the satisfaction of the Overseeing Organisation Director.</p> |
| 3.10. | <p>If there is more than one exception in respect of a Road Safety Audit then each exception must be considered and approved separately.</p> |
| 3.11. | <p>When preparing Exception Report(s) on the Strategic Road Network in England, Project Sponsors must follow the principles contained in GD 04/12 (DMRB 0.2.3). So when compiling an Exception Report(s) the Project Sponsor must ensure that an appropriate risk assessment is undertaken with consideration of the road safety risks associated with the potential problem and/or recommendation. The Project Sponsor must also consider the impact on other road users, those working on the highway, those living or working adjacent to the highway and the impact on the environment and scheme costs.</p> |
- 3.12. When producing Exception Reports, Project Sponsors may contact the Overseeing Organisation Specialists for advice.

- 3.13. The Project Sponsor shall provide copies of each approved Exception Report to the Design Team and Road Safety Audit Team Leader for action and information respectively.
- 3.14. For schemes undertaken on the Highways Agency road network, the Project Sponsor must also provide electronic copies of the final Road Safety Audit Reports, Road Safety Audit Response Reports and any Exceptions Reports to the Highway Agency Safer Roads - Design Team for their records.

Subsequent Actions

- 3.15. The Project Sponsor must instruct the Design Team in respect of any changes required during the preparation, design and construction of the scheme resulting from Road Safety Audit.

- 3.16. If the changes are substantial, the Project Sponsor should resubmit the Highway Improvement Scheme or element of the scheme that has materially changed for a further Road Safety Audit (see paragraphs 2.62 and 2.63). If a Project Sponsor is unsure if the Highway Improvement Scheme or element of the scheme needs to be resubmitted for Road Safety Audit they should formally consult with an appropriate Specialist from the Overseeing Organisation.

- 3.17. The Project Sponsor is responsible for initiating prompt action on all recommendations in the Road Safety Audit Report and on all Exception Reports approved by the Director. The Project Sponsor must notify the Director of the reasons if works to implement Stage 3 Road Safety recommendations or alternative measures proposed in Exception Reports, are not completed within 6 months of acceptance of the Stage 3 Road Safety Audit recommendations and/or approval of Exception Reports.
- 3.18. The Stage 4 Road Safety Audit Reports (see paragraphs 2.43 to 2.53) must be submitted to the Overseeing Organisation who will consider the reports and decide on appropriate action. Decisions made by the Project Sponsor in respect of the Stage 4 Road Safety Audit recommendations must be recorded by the Project Sponsor on the Overseeing Organisation's scheme file (or equivalent).

4. REFERENCES

- 1) Safety at Street Works and Road Works A Code of Practice – Department for Transport, October 2013
- 2) Department for Transport Traffic Signs Manual (TSM) Chapter 8 (2009)
- 3) GD 02/08, DMRB 0.1.2, Quality Management Systems for Highway Design
- 4) GD 04/12, DMRB, 0.2.3, Standard for Safety Risk Assessment on the Strategic Road Network
- 5) HD 42/05, DMRB, 5.2.5, Non-Motorised User Audits
- 6) European Commission (EC) Directive 2008/96/EC on Road Infrastructure Safety Management

5. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

Chief Highway Engineer
The Highways Agency
Temple Quay House
The Square
Temple Quay
Bristol
BS1 6HA

M WILSON
Chief Highways Engineer

Trunk Road and Bus Operations
Transport Scotland
8th Floor, Buchanan House
58 Port Dundas Road
Glasgow
G4 0HF

R BRANNEN
Director, Trunk Road and Bus
Operations

Deputy Director Network Management Division
Network Management
Welsh Government
Transport
Cardiff CF10 3NQ
Wales

S HAGUE
Deputy Director
Network Management Division

Director of Engineering
Department for Regional Development
Transport NI
Clarence Court
10-18 Adelaide Street
Belfast BT2 8GB

P B DOHERTY
Director of Engineering

ANNEX A: STAGE 1 ROAD SAFETY AUDIT CHECKLISTS – COMPLETION OF PRELIMINARY DESIGN

List A1 – General

Item	Possible Issues
• Departures from Standards	What are the road safety implications of any approved Departures from Standards or Relaxations? (Are these strategic decisions within the scope of the Road Safety Audit?)
• Cross-sections	How safely do the cross-sections accommodate drainage, ducting, signing, fencing, lighting and pedestrian and cycle routes? Could the scheme result in the provision of adverse camber?
• Cross-sectional Variation	What are the road safety implications if the standard of the proposed scheme differs from adjacent lengths of highway?
• Drainage	Will the new road drain adequately, or could areas of excess surface water result? Could excess surface water turn to ice during freezing conditions? Could excessive water drain across the highway from adjacent land?
• Landscaping	Could areas of landscaping conflict with sight lines (including during windy conditions)?
• Public Utilities/Services Apparatus	Could utility apparatus be struck by an errant vehicle? Could utility apparatus obscure sight lines?
• Lay-bys	Has adequate provision been made for vehicles to stop off the carriageway including picnic areas? How will parked vehicles affect sight lines? Could lay-bys be confused with junctions? Is the lay-by located in a safe location (e.g., away from vertical crests or tight horizontal alignments with limited visibility)?
• Access	Can all accesses be used safely? Can multiple accesses be linked into one service road? Are there any conflicts between turning and parked vehicles?
• Emergency Vehicles	Has provision been made for safe access and egress by emergency vehicles?

- Future Widening
Where a single carriageway scheme is to form part of a future dual carriageway, is it clear to road users that the road is for two-way traffic?
- Adjacent Development
Does adjacent development cause interference/confusion? (e.g. lighting or traffic signals on adjacent roads may affect a road user's perception of the road ahead)
- Basic Design Principles
Are the overall design principles appropriate for the predicted level of use for all road users?

List A2 – Local Alignment

- | Item | Possible Issues |
|-------------------------------|---|
| • Visibility | <p>Are horizontal and vertical alignments consistent with required visibility?</p> <p>Will sight lines be obstructed by permanent or temporary features e.g. bridge abutments and parked vehicles?</p> |
| • New/Existing Road Interface | <p>Will the proposed scheme be consistent with the standard of provision on adjacent lengths of road and if not, is this made obvious to the road user?</p> <p>Does interface occur near any potential hazard, i.e. crest, bend after steep gradient?</p> |
| • Vertical Alignment | <p>Are climbing lanes to be provided?</p> <p>Will the vertical alignment cause any "hidden dips"?</p> |

List A3 – Junctions

- | Item | Possible Issues |
|----------|--|
| • Layout | <p>Is provision for right turning vehicles required?</p> <p>Are acceleration/deceleration lanes required?</p> <p>Are splitter islands required on minor arms to assist pedestrians or formalise road users movements to/from the junction?</p> <p>Are there any unusual features that affect road safety?</p> <p>Are widths and swept paths adequate for all road users? Will large vehicles overrun pedestrian or cycle facilities?</p> <p>Are there any conflicts between turning and parked vehicles?</p> <p>Are any junctions sited on a crest?</p> <p>Is the junction type appropriate for the traffic flows and likely vehicle speeds?</p> |

- Visibility
 - Are sight lines adequate on and through junction approaches and from the minor arm?
 - Are visibility splays adequate and clear of obstructions such as street furniture and landscaping?
 - Will the use of deceleration or acceleration lanes obscure junction visibility?

List A4 – Non-Motorised User (NMU) Provision

Item	Possible Issues
• Adjacent Land	Will the scheme have an adverse effect on safe use of adjacent land?
• Pedestrian/Cyclists	<p>Have pedestrian and cycle routes been provided where required?</p> <p>Do shared facilities take account of the needs of all user groups?</p> <p>Can verge strips dividing footways/cycleways and carriageways be provided?</p> <p>Where footpaths have been diverted, will the new alignment permit the same users free access?</p> <p>Are footbridges/subways sited to attract maximum use?</p> <p>Is specific provision required for special and vulnerable groups? (i.e. the young, older users, mobility and visually impaired?)</p> <p>Are tactile paving, flush kerbs and guard railing proposed? Is it specified correctly and in the best location?</p> <p>Have all NMU needs been considered, especially at junctions?</p> <p>Are these routes clear of obstructions such as signposts, lamp columns etc.?</p>
• Equestrians	<p>Have equestrian needs been considered?</p> <p>Does the scheme involve the diversion of bridleways?</p>

List A5 – Road Signs, Carriageway Markings and Lighting

Item	Possible Issues
• Signs	<p>Is there likely to be sufficient highway land to provide the traffic signs required?</p> <p>Are sign gantries needed?</p> <p>Have traffic signs been located away from locations where there is a high strike risk?</p>

- Lighting
 - Is the scheme to be street lit?
 - Has lighting been considered at new junctions and where adjoining existing roads?
 - Are lighting columns located in the best positions? (e.g. behind safety fences)
- Poles/Columns
 - Will poles/columns be appropriately located and protected?
- Road Markings
 - Are any road markings proposed at this stage appropriate?

ANNEX B: STAGE 2 ROAD SAFETY AUDIT CHECKLISTS – COMPLETION OF DETAILED DESIGN

The Road Safety Audit Team should satisfy itself that all issues raised at Stage 1 Road Safety Audit have been resolved. Items may require further consideration where significant design changes have occurred.

If a Highway Improvement Scheme has not been subject to a Stage 1 Road Safety Audit, the items listed in Lists A1 to A5 should be considered together with the items listed below.

List B1: General

Item	Possible Issues
• Departures from Standards	Consider road safety aspects of any Departures granted since the Stage 1 Road Safety Audit.
• Drainage	<p>Do drainage facilities (e.g. gully spacing, gully locations, flat spots, crossfall, ditches) appear to be adequate?</p> <p>Do features such as gullies obstruct cycle routes, footpaths or equestrian routes or are they located on NMU desire lines?</p> <p>Do the locations of features such as manhole covers give concern for motorcycle/cyclist stability?</p> <p>Is surface water likely to drain across a carriageway and increase the risk of aquaplaning under storm conditions?</p>
• Climatic Conditions	Is there a need for specific provision to mitigate effects of fog, wind, sun glare, snow, and ice?
• Landscaping	<p>Could planting (new or when mature) encroach onto the carriageway or obscure signs or sight lines (including during windy conditions)?</p> <p>Could earth bunds obscure signs or visibility?</p> <p>Could trees (new or when mature) be a hazard to an errant vehicle?</p> <p>Could planting affect lighting or shed leaves on to the carriageway?</p>
• Public Utilities/Services Apparatus	<p>Can maintenance vehicles stop clear of traffic lanes? If so, could they obscure signs or sight lines?</p> <p>Are boxes, pillars, posts and cabinets located in safe positions away from locations that may have a high potential of errant vehicle strikes? Do they interfere with visibility?</p> <p>Has sufficient clearance to overhead cables been provided?</p>

-
- Have any special accesses/parking areas been provided and are they safe?
 - Are there any utility inspection chambers in live traffic lanes and/or wheel tracks?
 - Lay-bys
 - Have lay-bys been positioned safely?
 - Could parked vehicles obscure sight lines?
 - Are lay-bys adequately signed?
 - Are picnic areas properly segregated from vehicular traffic?
 - Access
 - Is the visibility to/from accesses adequate?
 - Are the accesses of adequate length to ensure all vehicles clear the main carriageway?
 - Do all accesses appear safe for their intended use?
 - Skid Resistance
 - Are there locations where high skid resistance surfacing (such as on approaches to junctions and crossings) would be beneficial?
 - Do surface changes occur at locations where they could adversely affect motorcycle stability?
 - Is the colour of any high friction surfacing appropriate?
 - Agriculture
 - Have the needs of agricultural vehicles and plant been taken into consideration (e.g. room to stop between carriageway and gate, facilities for turning on dual carriageways)? Are such facilities safe to use and are they adequately signed?
 - Fences and Road Restraint Systems
 - Is there a need for road restraint systems to protect road users from signs, gantries, parapets, abutments, steep embankments or water hazards?
 - Do the road restraint systems provided give adequate protection?
 - Are the road restraint systems long enough?
 - Are specific restraint facilities required for motorcyclists?
 - In the case of wooden post and rail boundary fences, are the rails placed on the non-traffic side of the posts?
 - If there are roads on both sides of the fence is an interlocking-design necessary to prevent impalement on impact?
 - Adjacent Developments and Roads
 - Has screening been provided to avoid headlamp glare between opposing carriageways, or any distraction to road users?

Are there any safety issues relating to the provision of environmental barriers or screens?

List B2: Local Alignment

Item

Possible Issues

- Visibility

Obstruction of sight lines by:

- i. safety fences
- ii. boundary fences
- iii. street furniture
- iv. parking facilities
- v. signs
- vi. landscaping
- vii. structures
- viii. environmental barriers
- ix. crests
- x. features such as buildings, plant or materials outside the highway boundary

Is the forward visibility of at-grade crossings sufficient to ensure they are conspicuous?

- New/Existing Road Interface

Where a new road scheme joins an existing road, or where an on-line improvement is to be constructed, will the transition give rise to potential hazards?

Where the road environment changes (e.g. urban to rural, restricted to unrestricted) is the transition made obvious by appropriate signing and carriageway markings?

List B3: Junctions

Item

Possible Issues

- Layout

Are the junctions and accesses adequate for all vehicular movements?

Are there any unusual features, which may have an adverse effect on road safety?

Have guard rails/safety fences been provided where appropriate?

-
- Do any roadside features (e.g. guard rails, safety fences, traffic bollards signs and traffic signals) intrude into drivers' line of sight?

Are splitter islands and bollards required on minor arms to assist pedestrians or formalise road users' movements to/from the junction?

Are parking or stopping zones for buses, taxis and public utilities vehicles situated within the junction area? Are they located outside visibility splays?
 - Visibility
 - Are the sight lines adequate at and through the junctions and from minor roads?

Are visibility splays clear of obstruction?
 - Signing
 - Is the junction signing adequate, consistent with adjacent signing and easily understood?

Have the appropriate warning signs been provided?

Are signs appropriately located and of the appropriate size for approach speeds?

Are sign posts passively safe or protected by safety barriers where appropriate?

Are traffic signs illuminated where required?

Are traffic signs located in positions that minimise potential strike risk?

Is the mounting height of sign faces appropriate?

Are traffic signs orientated correctly to ensure correct visibility and reflectivity?
 - Road Markings
 - Do the carriageway markings clearly define routes and priorities?

Are the dimensions of the road markings appropriate for the speed limit/design speed of the road?

Have old road markings and road studs been adequately removed?
 - T, X, Y-Junctions
 - Have ghost island right turn lanes and refuges been provided where required?

Do junctions have adequate stacking space for turning movements?

Can staggered crossroads accommodate all vehicle types and movements?

- All Roundabouts
 - Are the deflection angles of approach roads adequate for the likely approach speed?
 - Are splitter islands necessary?
 - Is visibility on approach adequate to ensure drivers can perceive the correct path through the junction?
 - Where chevron signs are required, have they been correctly sited?
 - Are dedicated approach lanes required? If provided, will the road markings and signs be clear to all users?
- Mini Roundabouts
 - Are the approach speeds for each arm likely to be appropriate for a mini roundabout?
 - Is the mini roundabout appropriate for the likely traffic volumes?
 - Is the centre island visible from all approaches?
- Traffic Signals
 - Will speed discrimination equipment be required?
 - Is the advance signing adequate?
 - Are signals clearly visible in relation to the likely approach speeds?
 - Is “see through” likely to be a problem?
 - Would lantern filters assist?
 - Is the visibility of signals likely to be affected by sunrise/sunset?
 - Would high intensity signals and/or backing boards improve visibility?
 - Would high-level signal units be of value?
 - Is the stopline in the correct location?
 - Are any pedestrian crossings excessively long?
 - Are the proposed tactile paving layouts correct?
 - Are the markings for right turning vehicles adequate?
 - Is there a need for box junction markings?
 - Is the phasing appropriate?
 - Will pedestrian/cyclist phases be needed?
 - Does the number of exit lanes equal the number of approach lanes?
 - If not is the taper length adequate?
 - Is the required junction intervisibility provided?

List B4: Non-Motorised User (NMU) Provision

Item	Possible Issues
• Adjacent Land	Are accesses to and from adjacent land/properties safe to use? Has adjacent land been suitably fenced?
• Pedestrians	Are facilities required for NMUs at: a) junctions; b) pelican/puffin/zebra crossings; c) refuges or; d) other locations? Are crossing facilities placed and designed to attract maximum use? Are guardrails/fencing present/required to deter pedestrians from crossing the road at unsafe locations? Is tactile paving and flush kerbs proposed? Is it specified correctly and in the best location? For each type of crossing (bridges, subways, at grade) have the following been fully considered? a) visibility both by and of pedestrians; b) use by cyclists; c) use by mobility and visually impaired; d) use by older users; e) use by children/schools; f) need for guardrails in verges/central reserve; g) signs; h) width and gradient; i) surfacing; j) provision of dropped kerbs; k) avoidance of channels and gullies; l) need for deterrent kerbing; m) need for lighting;

- Cyclists
 - Have the needs of cyclists been considered especially at junctions and roundabouts?
 - Are cycle lanes or segregated cycle tracks required?
 - Does the signing make clear the intended use of such facilities?
 - Are cycle crossings adequately signed?
 - Do guardrails need to be provided to increase cyclist's awareness of potential hazards such as a road crossing?
 - Has lighting been provided on cycle routes?
 - Are any proposed drop kerbs flush with the adjacent highway?
 - Are any parapet heights sufficient?
 - Is tactile paving proposed? Is it specified correctly and in the best location?
- Equestrians
 - Should bridleways or shared facilities be provided?
 - Does the signing make clear the intended use of such paths and is sufficient local signing provided to attract users?
 - Have suitable parapets/rails been provided where necessary?

List B5: Road Signs, Carriageway Markings and Lighting

- | Item | Possible Issues |
|--|---|
| <ul style="list-style-type: none"> • Traffic Signs | <ul style="list-style-type: none"> Do destinations shown accord with signing policy? Are signs easy to understand? Are sign structures passively safe? Are the signs located behind safety fencing and out of the way of pedestrians and cyclists? Is there a need for overhead signs? Where overhead signs are necessary is there sufficient headroom to enable designated NMU usage? Is the sign reflectivity provided correct? Has sign clutter been considered? |
| <ul style="list-style-type: none"> • Variable Message Signs | <ul style="list-style-type: none"> Are the legends relevant and easily understood? Are signs passively safe or located behind safety fencing? |

- **Lighting**
 - Has lighting been considered at new junctions and where adjoining existing roads?
 - Is there a need for lighting, including lighting of signs and bollards?
 - Are lighting columns passively safe?
 - Are lighting columns located in the best positions e.g. behind safety fences and not obstructing NMU routes?
- **Road Markings**
 - Are road markings appropriate to the location?
 - a) centre lines;
 - b) edge lines;
 - c) hatching;
 - d) road studs;
 - e) text/destinations;
 - f) approved and/or conform to the Regulations.
- **Poles and Columns**
 - Are poles and columns passively safe?
 - Are poles and columns protected by safety fencing where appropriate?

ANNEX C: STAGE 3 ROAD SAFETY AUDIT CHECKLISTS – COMPLETION OF CONSTRUCTION

The Road Safety Audit Team should consider whether the design has been properly translated into the scheme as constructed and that no inherent road safety defect has been incorporated into the works.

Particular attention should be paid to design changes, which have occurred during construction.

List C1: General

Possible Issues

- Departures from Standards
 - Are there any adverse road safety implications of any Departures from Standard granted since the Stage 2 Road Safety Audit?
- Drainage
 - Does drainage of roads, cycle routes and footpaths appear adequate?
 - Do drainage features such as gullies obstruct footpaths, cycle routes or equestrian routes?
- Climatic Conditions
 - Are any extraordinary measures required?
- Landscaping
 - Could planting obscure signs or sight lines (including during periods of windy weather)?
 - Do earth bunds obscure signs or visibility?
 - Could trees (new or when mature) be a potential hazard to an errant vehicle?
 - Could planting affect lighting or shed leaves onto the carriageway?
- Public Utilities
 - Can maintenance vehicles stop clear of traffic lanes? If so, could they obscure signs or sight lines?
 - Are boxes, pillars, posts and cabinets located in safe positions away from locations that may have a high potential for errant vehicle strikes? Do they interfere with visibility?
 - Are any special accesses/parking areas provided safe?
 - Are there any utility inspection chambers in live traffic lanes and/or wheel tracks?
 - Are utility service covers and gullies located in the verge level with the surrounding ground so as not to present a potential hazard to an errant vehicle?
- Access
 - Is the visibility to/from accesses adequate?
 - Are the accesses of adequate length to ensure all vehicles clear the main carriageway?

- Skid Resistance

Do any joints in the surfacing appear to have excessive bleeding or low skid resistance?

Do surface changes occur at locations where they could adversely affect motorcycle stability?
- Fences and Road Restraint Systems

Is the restraint system adequate?

In the case of wooden post and rail boundary fences, are the rails placed on the non-traffic side of the posts?
- Adjacent Development

Have environmental barriers been provided and do they create a potential hazard?
- Bridge Parapets

Is the projection of any attachment excessive?
- Network Management

Have appropriate signs and/or markings been installed in respect of Traffic Regulation Orders?

List C2: Local Alignment

Item

Possible Issues

- Visibility

Are the sight lines clear of obstruction?
- New/Existing Road Interface

Is there a need for additional signs and/or road markings?

List C3: Junctions

Item

Possible Issues

- Visibility

Are all visibility splays clear of obstructions?
- Road Markings

Do the carriageway markings clearly define routes and priorities?

Have all superseded road markings and studs been removed adequately?
- Roundabouts

Can the junction be seen from appropriate distances and is the signing adequate?

Where chevron signs are required, have they been correctly sited?
- Traffic Signals

Can the traffic signals be seen from appropriate distances? Can drivers see traffic signal heads for opposing traffic? For the operation of signals:

Do signal phases correspond to the design?

Do NMU phases give adequate crossing time?

Can NMUs mistakenly view the “green man” signal for other NMU phases?

- T, X and Y Junctions
 - Are priorities clearly defined?
 - Is signing adequate?

List C4: Non-Motorised User (NMU) Provision

Item	Possible Issues
<ul style="list-style-type: none">• Adjacent Land	Has suitable fencing been provided?
<ul style="list-style-type: none">• Pedestrians	<p>Are the following adequate for each type of crossing (bridges, subways, at grade)?</p> <ul style="list-style-type: none">a) visibility;b) signs;c) surfacing;d) other guardrails;e) drop kerbing or flush surfaces;f) tactile paving.
<ul style="list-style-type: none">• Cyclists	<p>Do the following provide sufficient levels of road safety for cyclists on, or crossing the road?</p> <ul style="list-style-type: none">a) visibility;b) signs;c) guardrails;d) drop kerbing or flush surfaces;e) surfacing;f) tactile paving.
<ul style="list-style-type: none">• Equestrians	<p>Do the following provide sufficient levels of road safety for equestrians?</p> <ul style="list-style-type: none">a) visibility;b) signs;c) guardrails.

List C5: Road Signs, Carriageway Markings and Lighting

Item	Possible Issues
• Signs	Are the visibility, locations and legibility of all signs (during daylight and darkness) adequate?
	Are signposts protected from vehicle impact or passively safe?
	Will signposts impede the safe and convenient passage of pedestrians and cyclists?
	Have additional warning signs been provided where necessary?
• Variable Message Signs (VMS)	Can VMS be read and easily understood at distances appropriate for vehicle speeds?
	Are they adequately protected from vehicle impact or passively safe?
• Lighting	Does the street lighting provide adequate illumination of roadside features, road markings and non-vehicular users to drivers?
	Is the level of illumination adequate for the road safety of NMUs?
	Is lighting obscured by vegetation or other street furniture?
• Carriageway Markings	Are all road markings/studs clear and appropriate for their location?
	Have all superseded road markings and studs been removed adequately?

ANNEX D: ROAD SAFETY AUDIT TEAM STATEMENT

We certify that this Road Safety Audit has been carried out in accordance with HD 19/15.

AUDIT TEAM LEADER:

Name:	Signed:
Position:	Date:
Organisation:	
Address:	

AUDIT TEAM MEMBERS

Name:	Signed:
Position:	Date:
Organisation:	
Address:	

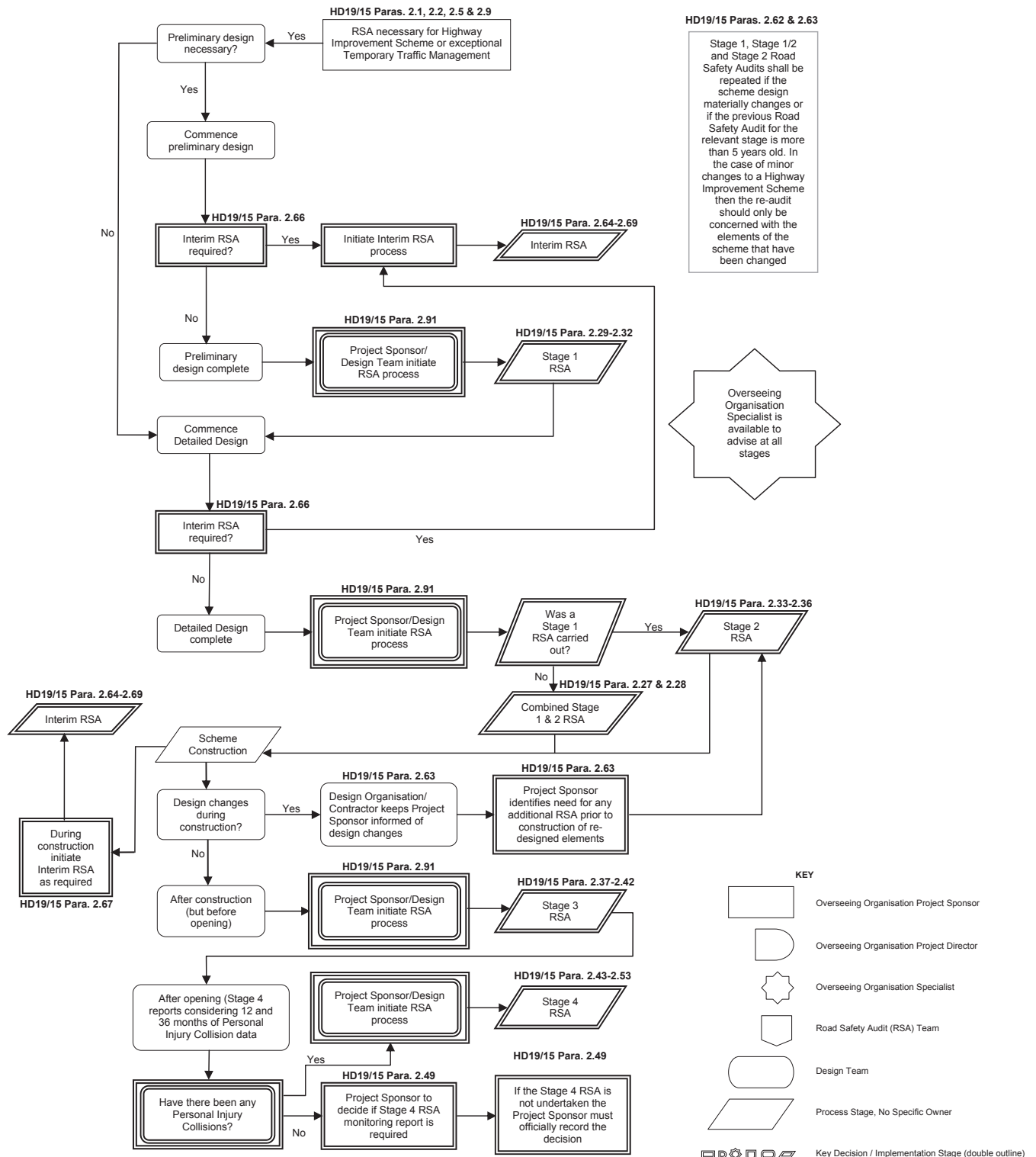
Name:	Signed:
Position:	Date:
Organisation:	
Address:	

OTHERS INVOLVED

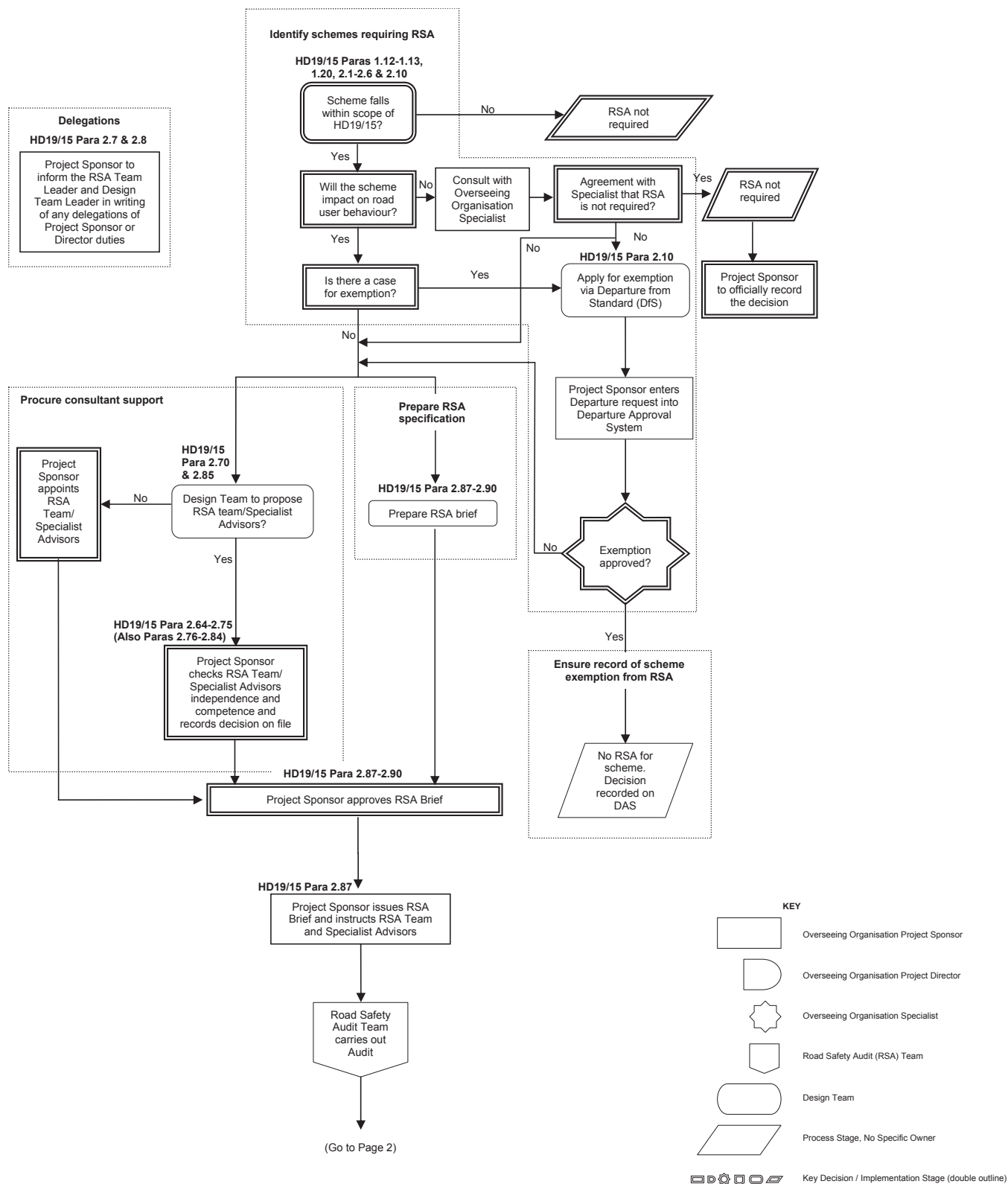
(E.g. Observer, Police, Network Management Representative, Specialist Advisor)

ANNEX I: ROLES AND RESPONSIBILITIES FLOW CHARTS

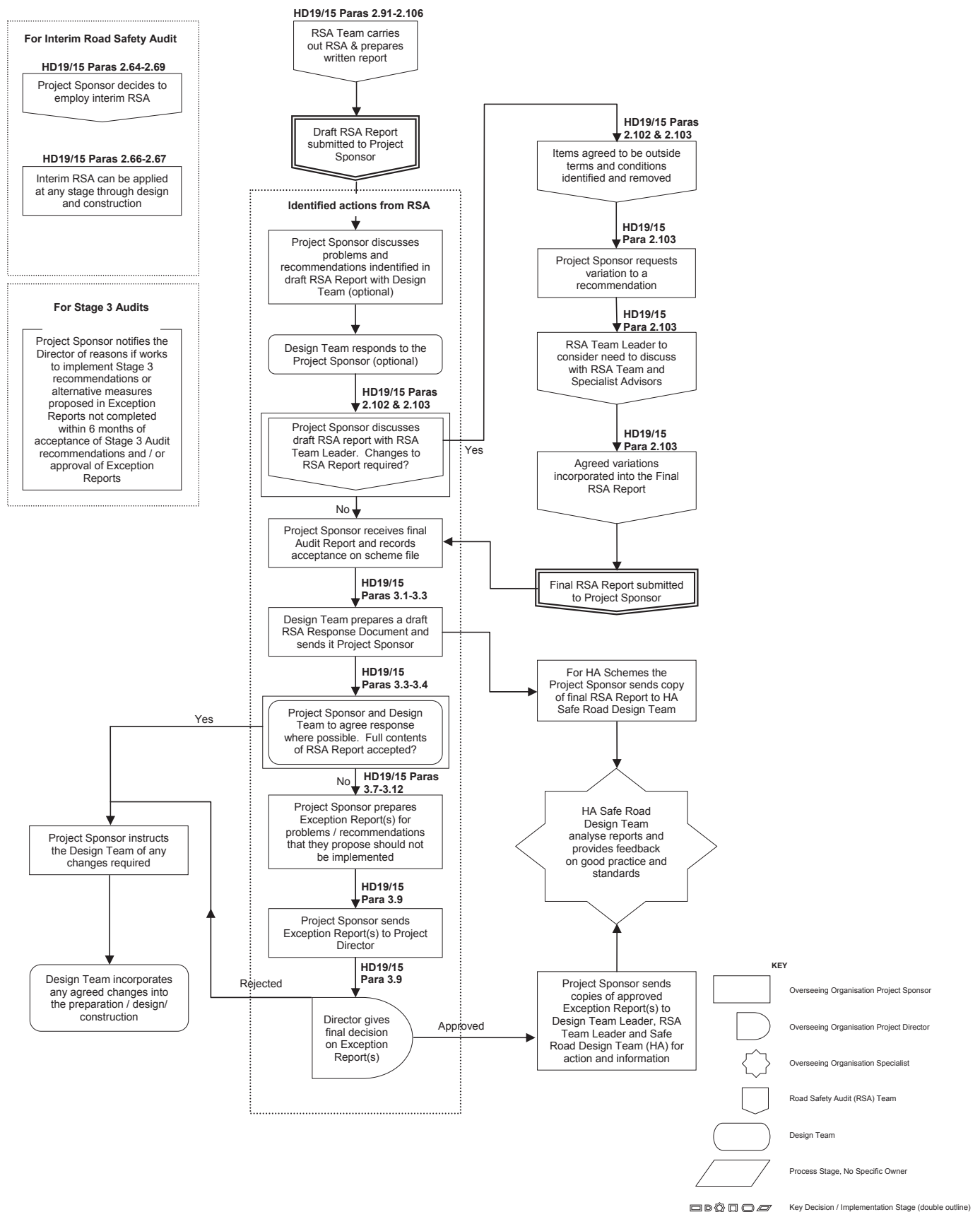
STAGES OF ROAD SAFETY AUDIT



ROAD SAFETY AUDIT PROCESS (1)



ROAD SAFETY AUDIT PROCESS (2)



ANNEX J: ROAD SAFETY AUDITOR CERTIFICATE OF COMPETENCY REQUIREMENTS

Introduction

- J1. This Annex provides guidance and requirements for organisations wishing to offer a Road Safety Auditor Certificate of Competency and how practicing Road Safety Auditors may attain Certificate of Competency in Road Safety Audit.

- J2. The information in this Annex supplements the advice and requirements contained in Section 2 of the main body of HD 19/15 and must be read in conjunction with the Standard.

Extent of Road Network where the Certificate of Competency is required

- J3. The content of this Annex applies to all Road Safety Audits undertaken on the motorway and trunk road network in England, Northern Ireland, Scotland and Wales. It is also commended for use on the other areas of the Trans European Road Network (TERN) in the UK.

Who will require the Certificate of Competency?

- J4. At least one Member of the Road Safety Audit Team (either the Road Safety Audit Team Leader or an Audit Team Member) undertaking Road Safety Audit on the motorway and trunk road network, must hold a Certificate of Competency in accordance with this Standard.

- J5. The Certificate of Competency requirements must be applied to all stages of Road Safety Audit, including Interim Road Safety Audit and Stage 4 monitoring Road Safety Audits. Consequently, it is required that Road Safety Audit Teams at Stage 1, Stage 2, Combined Stage 1 & 2, Stage 3, Stage 4 and Interim Road Safety Audit, all include at least one Road Safety Audit Team Member that holds a Certificate of Competency.

Road Safety Auditor Certificate of Competency Requirements

- J6. The Certificate of Competency requirements are consistent with the Road Safety Audit Team Training, Skills and Experience guidance contained in paragraphs 2.76 to 2.83 of this Standard. A Certificate of Competency in Road Safety Audit can only be awarded after a Road Safety Auditor has demonstrated sufficient training and experience in the field of Road Safety Audit.

- J7. There are two routes through which a Road Safety Auditor may obtain a Certificate of Competency: A Portfolio of Evidence route or a Training Course route. It is envisaged that either route may count towards the two days annual Continuing Professional Development (CPD) recommended in paragraph 2.83 of this Standard. The routes are described below:

Portfolio of Evidence Route

J8. A Certificate of Competency in Road Safety Audit may be obtained by a candidate demonstrating that their existing training, skills and experience meet with paragraphs 2.76 to 2.83 of this Standard for a Road Safety Audit Team Member or Audit Team Leader.

J9. A candidate must also demonstrate an appropriate knowledge and understanding of the core modules set out in the outline training curriculum (see paragraph J29 of this Annex to HD 19/15).

J10. Appropriate knowledge and understanding of the core modules set out in the outline training curriculum may be demonstrated by a candidate submitting a Portfolio of Evidence to an appropriate professional organisation or company.

J11. In summary, the Portfolio of Evidence must include:

- a) Details of how the candidate meets the Road Safety Audit Team training, skills and experience guidance contained in paragraphs 2.76 to 2.83 of this Standard, including:
 - All training undertaken, including dates and locations of courses attended.
 - Details of their Collision Investigation and Road Safety Engineering experience, focusing on work undertaken on the Strategic Road Network or comparable roads.
 - Details of CPD undertaken in the last 12 months, to meet the guidance identified in paragraph 2.83 of this Standard.
 - Details of all Road Safety Audits undertaken in the last 24 months as Road Safety Audit Team Member, Audit Team Leader, or Observer, including date of the Road Safety Audit, role of the candidate and scheme details. This information must focus on Road Safety Audits undertaken on the Strategic Road Network or comparable roads.
- b) Example Road Safety Audit Reports with details of the candidate's contribution to the Road Safety Audit process and production of the Road Safety Audit Reports.
- c) A Witness Statement from an appropriate person vouching for the content of the candidate's portfolio submission. This witness must hold a recognised qualification in the field of Road Safety, Civil Engineering or Transportation Planning or hold a senior professional position within a relevant company or organisation.
- d) The Portfolio of Evidence must demonstrate that the candidate has an acceptable level of understanding of the core modules identified in the outline training curriculum in paragraph J29 of this Annex to HD 19/15.

J12. The Portfolio of Evidence, signed by the candidate, must be submitted to an independent professional organisation or company who have had their certification process accepted by the Highways Agency on behalf of all the Overseeing Organisations as outlined in paragraphs J20 and J21 of this Annex to HD 19/15. This professional organisation or company will be responsible for reviewing candidate's submissions and where appropriate, issuing the Certificate of Competency in Road Safety Audit.

Training Course Route

J13. A Certificate of Competency may also be obtained by a candidate undertaking an appropriate structured training course.

J14. The training course must conform to the following requirements:

- a) It must be provided by an organisation or company independent from the candidate's employer.
- b) It must cover the core modules set out in the outline training curriculum in paragraph J29 of this Annex to HD 19/15.
- c) It must have had Highways Agency approval as detailed in paragraph J20 of this Annex to HD 19/15.

J15. Prior to completion of the training course and issue of a Certificate of Competency, the candidate must submit the following to the training provider:

- d) Evidence signed by the candidate, of how they meet the guidance in paragraphs 2.76 to 2.83 of this Standard in terms of training, skills and experience for a Road Safety Audit Team Member or Audit Team Leader. This information must focus on work undertaken on the Strategic Road Network or comparable roads.
- e) Example Road Safety Audit Reports with details of the candidate's contribution to the Road Safety Audit process and production of the Road Safety Audit Reports.
- f) A Witness Statement, from an appropriate person which vouches for the content of the above submissions. This witness must hold a recognised qualification in the field of Road Safety, Civil Engineering or Transportation Planning or hold a senior professional position within a relevant company or organisation.

J16. The independent course provider must verify that candidates meet the training, skills and experience guidance in paragraphs 2.76 to 2.83 of this Standard for a Road Safety Audit Team Member or Audit Team Leader prior to issue of a Certificate of Competency in Road Safety Audit.

J17. The course provider must also assess candidates regarding their understanding of the content of the training course.

J18. Where a candidate has demonstrated to the training provider that they meet the training, skills and experience guidance in paragraphs 2.76 to 2.83 of this Standard for a Road Safety Audit Team Member or Audit Team Leader and has understood the content of the training course, the training provider will be responsible for issuing the Certificate of Competency in Road Safety Audit.

Certificate of Competency Validity Period

J19. The Certificate of Competency will not have a finite validity period, nor is it intended that holding a Certificate of Competency will require a mandatory membership of an organisation. However, Road Safety Auditors should demonstrate CPD and continued Road Safety Audit experience in accordance with paragraphs 2.83 of this Standard, subsequent to the award of the Certificate of Competency.

Assessment/Authorisation of Certificate of Competency

- J20. Organisations wishing to offer a Certificate of Competency, to meet the requirements of this Standard, must have had their assessment and certification process reviewed and accepted in writing, by an appropriate member of the Highways Agency Safer Roads - Design Team. The Highways Agency is responsible for reviewing organisations wishing to offer a Certificate of Competency for the trunk road and motorway network in England and on behalf of the other Overseeing Organisations. Once accepted, the awarding organisation must not significantly change the review process leading to the issue of the Certificate of Competency, unless they have agreement to the change in writing, from the Highways Agency.
- J21. The Highways Agency and the other Overseeing Organisations have a duty to ensure that the quality and consistency of the detailed training curriculum, assessment and certification process, is appropriate. Therefore the representatives from the Highways Agency and other Overseeing Organisations may wish to review a selection of Portfolio of Evidence submissions where a Certificate of Competency has been awarded or are about to be awarded. Alternatively, a member of the Highways Agency or one of the other Overseeing Organisations may periodically attend a training provider's course, as an observer, to review the Training Course Route process.
- Certificates of Competency awarded before the entry into force of the EC Directive 2008/96/EC or Certificates awarded in other European Union Countries outside the UK**
- J22. The EC Directive 2008/96/EC states that certificates awarded before the implementation of the Directive shall be recognised. In addition, Certificates of Competency in Road Safety Audit awarded in other European Union countries outside the UK may be acceptable.
- J23. Where a Road Safety Auditor holds a Certificate of Competency awarded before a process was agreed by the Highways Agency or other Overseeing Organisations, then details of the training curriculum and assessment process met for the prior award of the Certificate of Competency, must be provided to the Overseeing Organisation Specialist for consideration. If a Road Safety Auditor holds a Certificate of Competency awarded in another European Union country outside the UK, they must provide details of the training curriculum and the assessment process met.
- J24. Before submitting the details of their previously awarded Certificate of Competency in Road Safety Audit to the Highways Agency, Road Safety Auditors must be satisfied that the training curriculum which led to the award of the Certificate of Competency covers all the core modules identified in the outline training curriculum in paragraph J29 of this Annex to HD 19/15. A Certificate of Competency awarded, based on a training curriculum that varies significantly from the outline training curriculum identified in paragraph J29 of this Annex to HD 19/15, will not be accepted by the Highways Agency.

- J25. In addition, Road Safety Auditors must provide evidence to demonstrate that they meet the guidance and requirements in paragraphs 2.76 to 2.83 of this Standard in terms of relevant training, skills and experience for a Road Safety Audit Team Member or Road Safety Audit Team Leader. The candidates training, skills and experience must be verified by a Witness Statement, from an appropriate person. This witness must hold a recognised qualification in the field of Road Safety, Civil Engineering or Transportation Planning or hold a senior professional position within a relevant company or organisation.

Training Curriculum

- J26. As detailed in paragraphs J9 to J18, a Certificate of Competency in Road Safety Audit may be awarded either by the Portfolio of Evidence Route or alternatively through the Training Course Route. The Training Course Route, through its content, and the Portfolio of Evidence Route through the assessment of the candidate's experience, must cover the core modules in the training curriculum in Figure J1.

- J27. The training curriculum is only intended to be an outline requirement and it is the responsibility of those who provide a Certificate of Competency in Road Safety Audit, to submit their detailed course curriculum or application assessment process to the Highways Agency Specialist for acceptance.
- J28. It is envisaged that a training course to cover the core modules in the training curriculum in Figure J1, will be of the order of two days duration.
- J29. The outline training curriculum in Figure J1 is intended to complement the guidance within Chapter 2 of this Standard, which indicates that appropriate candidates for Road Safety Audit Teams are individuals whose current employment involves Collision Investigation and Road Safety Engineering. However, there will be some flexibility when the Highways Agency reviews an organisation's detailed training curriculum or application assessment process, as it is recognised that experienced Road Safety professionals may have developed their careers from different backgrounds. It is expected that the organisation's detailed training curriculum would cover recent developments and areas for improvement, relating to the core modules in Figure J1. Organisations detailed training curriculum and assessment processes should be set at an appropriate level for both Road Safety Audit Team Members, as well as Road Safety Audit Team Leaders.

Figure J1 – Outline Training Curriculum

Core Module		Example Module Content
1	Road Safety Legal Issues, Legislation and Policy	<p>Review of the reasons why Road Safety Audit is undertaken, in terms of the 1980 Highways Act, 1988 Road Traffic Act and Roads (Scotland) Act 1984 where appropriate</p> <p>Introduction to the 2007 Road Death Investigation Manual</p> <p>The Corporate Manslaughter and Corporate Homicide Act 2007</p> <p>The Manslaughter by Gross Negligence Common Law</p> <p>The EC Directive 2008/96/EC</p> <p>Road Safety Policies, targets and strategies</p>

2	Collision Investigation	<p>Understanding and applying collision investigation techniques</p> <p>Update on any developments in collision trends</p> <p>(The contents of this module must focus on the Strategic Road Network or comparable roads)</p>
3	Road Safety Audit	<p>This module should focus on areas for improvement and clarification of known potential issues. It should cover:</p> <p>Roles and Responsibilities</p> <p>Road Safety Audit administration and practice Road Safety Audit reporting</p> <p>(The contents of this module must focus on the Strategic Road Network or comparable roads)</p>
4	Road Safety Engineering/Road Design	<p>This module should cover the developments in Road Safety engineering and its influence on road design, with focus on the motorway and trunk road network. The EC Directive specifically requires training or experience in road design. Road Safety Auditors should have an understanding of the Highways Agency Design Manual for Roads and Bridges (DMRB) Design Standards, and how good design principles reduce collision risk. The module could include the following:</p> <p>Road/Junction Geometry and Design</p> <ul style="list-style-type: none"> • Design Speed • Horizontal and vertical alignment, including cross sections, drainage, Stopping Sight Distances and adverse camber • Appropriateness of junction type • Visibility • Road surfaces, including the use of high friction surfacing <p>Roadside Features</p> <ul style="list-style-type: none"> • Passive infrastructure • Road Restraint Systems and guard railing • Landscaping • Highway lighting <p>Facilities for vulnerable road users</p> <ul style="list-style-type: none"> • Pedestrian/cycling/equestrian facilities • Mobility and visually impaired

G. BD 29/04 Design Criteria For Footbridges

VOLUME 2	HIGHWAY STRUCTURES: DESIGN (SUBSTRUCTURES) MATERIALS
SECTION 2	SPECIAL STRUCTURES

PART 8

BD 29/04

DESIGN CRITERIA FOR FOOTBRIDGES

SUMMARY

This Standard specifies design criteria for footbridges for use by pedestrians, cyclists and equestrians.

INSTRUCTIONS FOR USE

1. Remove existing Contents pages for Volume 2.
2. Insert new Contents pages for Volume 2 dated August 2004.
3. Remove BD 29/03 from Volume 2, Section 2, Part 8 and archive as necessary.
4. Insert BD 29/04 in Volume 2, Section 2, Part 8.
5. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



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**THE DEPARTMENT FOR REGIONAL DEVELOPMENT
NORTHERN IRELAND**

Design Criteria for Footbridges

<p>Summary: This Standard specifies design criteria for footbridges for use by pedestrians, cyclists and equestrians.</p>
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REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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**VOLUME 2 HIGHWAY STRUCTURES:
DESIGN
(SUBSTRUCTURES)
MATERIALS**

SECTION 2 SPECIAL STRUCTURES

PART 8

BD 29/04

DESIGN CRITERIA FOR FOOTBRIDGES

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1. INTRODUCTION

General

1.1 This Standard deals mainly with geometric and user requirements. Other design aspects such as strength and properties of materials are covered by other documents within the DMRB Series.

1.2 This Standard supersedes standard BD 29/87 including those aspects of Technical Memorandum BE1/78 that relate to footbridges. It is to be used where appropriate in conjunction with the relevant Parts of BS 5400 as implemented by the Overseeing Organisation except where otherwise specified by this Standard.

1.3 The major changes to this document are as follows:

- a) Advice is given on considering all relevant factors before deciding the form and layout of the footbridge with a view to developing structures that encourage greater use and appreciation by the public.
- b) The provisions for users with visual or mobility impairment have been incorporated into the general provisions.
- c) Figures have been included to illustrate certain provisions/advice.
- d) Definitions of terms have been provided.

Implementation

1.4 This standard shall be used forthwith on all future road schemes for the construction, implementation, improvement and maintenance of trunk roads. It shall apply also to schemes currently in preparation provided that, in the opinion of the Overseeing Organisation, this will not result in significant additional expense or delay progress. Design Organisations shall confirm its application to particular schemes with the Overseeing Organisation.

Definitions

1.5 For the definition of the general highway terms used in this Standard such as “highway types” (trunk road, motorway etc) and “components of the highways” (carriageway, verge etc) refer to BS 6100; Subsection 2.4.1.

1.6 Particular terms used in this standard are defined as follows:

Desire Line	Line likely to be taken by pedestrians finding the shortest route between two points.
Goal orientated users	Users making a journey to reach a specific destination.
Recreational users	Users making a journey for leisure purposes.
Bridleway	Public right of way open to pedestrians, equestrians and cyclists.
Cyclist	A pedal cyclist.
Footway	Public right of way for pedestrian use only.
Cycle Lane	A separate part of the footway or footbridge for use by pedal cycles.

Mandatory Sections

1.7 Sections of this document, which form part of the standards that the Overseeing Organisation expects in design, are highlighted by being contained in boxes. These are the sections with which the Design Organisation must comply, or have agreed a suitable departure from standard with the relevant Overseeing Organisation. The remainder of the document contains advice and enlargement that is commended to designers for their consideration.

Scope

1.8 This Standard specifies non-structural criteria for the design of footbridges for use by pedestrians, cyclists and equestrians, in urban and rural areas, which may be constructed of steel, aluminium alloy, reinforced or prestressed concrete, timber or other agreed materials.

1.9 Guidelines for the selection of other suitable forms of pedestrian crossings are outside the scope of this Standard. However, an Advice Note 'Provisions for Non Motorised Users' is under preparation by the Environment Group of the Highways Agency, and this will contain advice on the selection of appropriate NMU crossings.

2. GENERAL PRINCIPLES

General

2.1 This section describes the principles to be followed when designing footbridges for new and improved all-purpose trunk roads and motorways. The underlying principle is that the designer is given the maximum flexibility to develop footbridge designs that will meet the stated objectives of the Overseeing Organisation.

2.2 The designer should balance the full range of considerations such as modes of users, safety, aesthetics, environmental impact, cost, robustness, sustainability, buildability, operation and maintenance. Where there are options for alignment, layout and structural form, the selection process should include due consideration of these factors and any other relevant design constraint.

2.3 Footbridges can be more prone to various forms of damage, misuse and vandalism by users than road bridges and this shall be taken into account in the design and agreed with the Overseeing Organisation. See in particular paragraphs 2.4 and 8.1 below. Consideration should be given by the Designer to assessing any existing patterns or likelihood of vandalism at the location. Relevant authorities such as the local police may be consulted if necessary.

2.4 Materials of high scrap value may not be suitable for components vulnerable to removal. In locations with a high risk of unauthorised removal of parts, appropriate fixing details should be specified. Materials vulnerable to fire damage, or to graffiti that is difficult to remove, may in some situations be inappropriate.

Provision of Footbridges

2.5 One of the purposes of footbridges is to facilitate and encourage walking and cycling whilst ensuring safety for all road users. The type of crossing provided should therefore be such as to encourage people to use it, taking account of likely pedestrian flows and movements, and to encourage people to regard walking or cycling as an acceptable mode of transport. Such matters should be considered in liaison with the Overseeing Organisation.

2.6 Criteria to be considered in relation to use by visually or mobility-impaired persons are incorporated into the following sections of this standard. These criteria are of benefit to many types of users with impaired mobility e.g. older people, people with prams, those with walking difficulties, heavily-laden shoppers etc.

2.7 It is important to determine the user groups of the bridge and their main purpose before deciding on its location. For goal-orientated use, location on the desire line is usually the highest priority. For recreational use, where possible, the new crossing should be located to add value to the recreational route, e.g. by reducing exposure to traffic, introducing new views or creating a new circular route.

3. LAYOUT

Location

3.1 Where a footbridge crosses a dual carriageway carrying traffic with permitted speeds in excess of 48 km/h, both carriageways shall be crossed with a single span to avoid the need for a support in the central reserve.

3.2 Where a separate footbridge is installed alongside a road bridge it should be detailed such as to deter attempts by persons to cross between. This may be effected by making the gap between the structures at least 2m wherever possible. Where this cannot be provided, adequate alternative safety precautions should be taken to minimise the risk of persons falling through the gap.

3.3 Where a separate footbridge is located close to a highway bridge such that an errant vehicle could impact the footbridge, consideration should be given by the Designer to the provision of a road restraint system on the approaches to the footbridge to contain appropriate vehicles within the highway.

3.4 The position of a footbridge should be chosen to maximise the use of the topography so as to avoid or minimise the need for stairs and ramps. See Figure 1.



Figure 1 (ref para. 3.4)

3.5 Where a paved approach to the ramp or stairs of a footbridge is located immediately adjacent to the carriageway, it should, as far as practicable, be sited in such a way that pedestrians walking towards the bridge face oncoming traffic.

3.6 When a road, other than a motorway, is in cutting or has other ground modelling which provide side slopes on one or both sides, these should be used as far

as is practicable to provide access to the footbridge by incorporating ramps in the side slopes. See Figure 2.

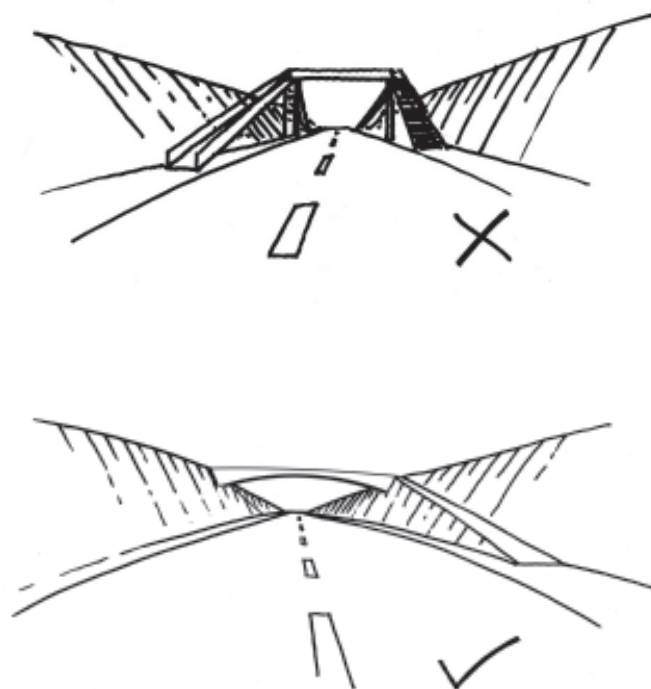


Figure 2 (ref para.3.6)

3.7 When the footbridge is in a cutting, particularly when visible on the skyline, the cutting slope should if possible extend at least up to deck level, using a false cutting if necessary. In such situations, where the footpath is within the cutting, the steps and ramps should be built into the face of the cutting. Alternatively, where the footpath is outside the cutting at original natural ground level, the access to the deck should be linked gradually into the footpath.

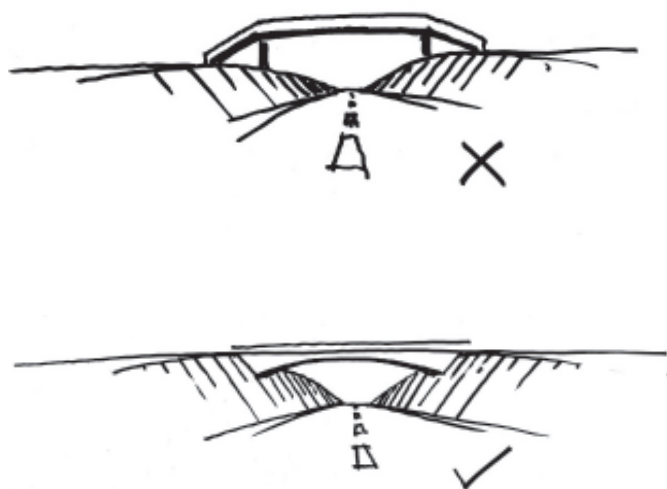


Figure 3 (ref para. 3.7)

3.8 Where a footbridge is installed to provide a crossing point for an existing rural footpath, any diversion of the footpath should commence as far from the carriageway or crossing point as is practicable to minimise the total route length and maintain the desire line to the footbridge. This will make the path more pleasant for users, provide better accessibility and help exploit the topography. However, rural footpaths frequently follow field boundaries and historic rights of way and care should be taken to avoid diversions that cut directly across fields. Further guidance on the diversion of existing Rights of Way can be found in Section 3 of the Highways Agency draft document “Provision for Non Motorised Users” (Ref. 4).

3.9 In order to avoid discouraging walking, as far as is practicable, rural footpaths should not be diverted to run beside unscreened, busy roads.

Access

3.10 Access to the deck of a footbridge should be provided by both ramps and stairs wherever practicable, unless ramps alone would provide the most direct route to the deck, in which case the stairs may be omitted. Access by stairs alone should only be considered in exceptional circumstances in consultation with the Overseeing Organisation and local access and disability groups. Access shall be as short and direct as practicable and follow the desire line of the main pedestrian flow wherever possible, avoiding long detours and unnecessary climbing.

3.11 Ramp geometry should be as simple as is practical, ideally following directly the desire line. Straight ramps with 180-degree turns or multiple levels should be avoided where possible. Spiral ramps can be very effective, with larger radii generally being more visually pleasing. However, the absence of landings in spiral ramps may lead to them being more difficult or even impossible to negotiate for mobility-impaired users, particularly wheelchair users. This should be taken into account in any decision on ramp layout.

3.12 Access to footbridges with combined cycle or equestrian use shall not be by stairs only.

3.13 Access stairs and ramps are often the most noticeable and environmentally damaging elements of a pedestrian bridge and should be minimised where possible. Where practicable, steps and ramps should be built into the contours of the landscape.

3.14 Pedestrians can be encouraged to use a footbridge, rather than crossing at grade, by the provision of suitable pedestrian guardrails or appropriate planting which prevent them from crossing the carriageway at road level.

3.15 Where access to a footbridge is such that a motor vehicle could be driven onto the structure, the access shall be restricted by spaced bollards or a system of staggered horizontal rails. The method of restriction adopted shall be appropriate to its environmental setting and shall allow the passage of wheelchairs and prams. Restrictions should be adequately marked in contrasting colour to reduce the risk of accidents, particularly to visually impaired persons. Further information can be obtained from Sense and Accessibility (Ref. 5), and the Sustrans information sheet Access Controls (Ref. 6).

3.16 Existing hedgerows or tree lines should be utilized as effectively as possible to minimise the visual impact of the steps and ramps. Where there are no trees in the area of the footbridge, landscaping with trees should be considered, especially in flat country. See Figure 4. Any proposed planting should be discussed if necessary with a landscape architect and should take into account the effect on any future maintenance liabilities for the structure. Planting schemes should be designed to avoid creating an enclosed area which might cause anxiety or a risk to users' personal security, or which may eventually cause trip or slip hazards to users from root and branch growth or falling foliage and berries.



Figure 4 (ref para. 3.16)

3.17 Where possible, the lower sections of ramps should be built on embankments that merge with the existing contours. Where necessary, sufficient land should be acquired to facilitate this. This detail will also help to prevent the accumulation of rubbish in inaccessible or confined spaces beneath the ramp.

3.18 Where stairs are provided, they should also be detailed such that the accumulation of rubbish in inaccessible or confined spaces beneath them is avoided.

3.19 There should be no concealed areas or recesses on the bridge that may cause bridge users to become concerned about their personal security while crossing.

Appearance

3.20 The appearance of a footbridge should be appropriate for its site. It should be aesthetically pleasing, enhance the environment and encourage people to use the bridge. In urban areas consideration should be given by the Designer to consulting the local planning authority about the appearance and location.

3.21 Footbridges which may have a significant visual impact on their local environment, or which may be situated in areas requiring special consideration such as Conservation Areas, Areas of Outstanding Natural Beauty, Heritage sites etc, are possible candidates for submission to the Commission for Architecture and the Built Environment (CABE). (The relevant bodies for Scotland and Wales are the Royal Fine Arts Commission for Scotland and the Design Commission for Wales. In Northern Ireland please consult the Overseeing Organisation.) The need for consultation with these bodies shall be discussed at an early stage with the Overseeing Organisation. The appearance of footbridges shall follow the advice given in the HA publication "The Appearance of Bridges and Other Highway Structures" (Ref. 7) particularly chapter 12, and the more general advice in BA 41 (DMRB 1.3.11) "The Design and Appearance of Bridges".

3.22 The long spans and relatively light loads of footbridges should be exploited and expressed in their appearance. Where the guidance in BA 41 (DMRB 1.3.11) is being followed to produce a family of bridges along a road with an occasional substantially different bridge to provide variation and respond to the topography, it is often appropriate to use a footbridge as the dramatic contrast. In this situation bolder, contrasting forms of structure could be considered, with the agreement of the TAA to give it drama. Whether the form is simple or more complex it should be expressed with clarity, simplicity and elegance.

3.23 The appearance of the footbridge, from all viewpoints, should be considered. The overall proportions of the bridge in elevation should be designed to satisfy the road users or distant observer. The approaches, the handrailing, the detailing and close-up effects should be designed to satisfy those who will appreciate the bridge at close quarters and at a slower pace. The highest standard of detailing is required. See Figure 5.



Figure 5 (ref para. 3.23)

3.24 Visual clarity of the structure and all of its elements is essential. To this end the mounting of signs or signal equipment on the bridge structure or in its immediate environment, which create an impression of clutter, should be avoided. Where the provision of gantry signs in close proximity to a footbridge is unavoidable their interaction should be taken into account from the earliest stages of design. Because the plane of the sign is fixed relative to the road alignment, the line of the footbridge should follow this to avoid awkward clashes in angle.

4. BRIDGE SUPPORTS

4.1 Footbridge supports and foundations shall be designed in accordance with the current Departmental requirements, in particular BD 37 (DMRB 1.3.14) for loading and BD 60 (DMRB 1.3.5) for collision loading.

4.2 Where footbridge sub-structures are sited on Railway or Waterway property, the appropriate Authority's requirements shall be satisfied.

4.3 For new bridges over existing roads, the foundations shall be designed to cause the minimum delay to traffic during construction.

5. DESIGN STANDARDS

General

5.1 Steel and concrete footbridges shall be designed in accordance with the relevant Parts of BS 5400 as implemented by Departmental Standards or where implemented, by the relevant European Code.

5.2 The loading and loading effects to be used for the design of timber and aluminium footbridges shall be those given in BD 37 (DMRB 1.3.14) and BD 60 (DMRB 1.3.5) for collision loading. For timber structures, where permissible stress methods of design are used, the unfactored nominal values shall be applied.

5.3 Timber and aluminium footbridges shall generally comply with the requirements of BS 5268 and BS 8118 respectively or where implemented, by the relevant European Code.

Vibration and Dynamic Response

5.4 Due consideration shall be given by the Designer to the susceptibility of any footbridge to vibrations induced by pedestrians and by other bridge users. Particular consideration shall be given to the possibility that vandals may deliberately attempt to excite the structure into motion or that the passage of large numbers of people may unintentionally do so. All footbridges shall satisfy the vibration serviceability requirements set out in BD 37 (DMRB 1.3.14) Appendix B5.5. Designers should be aware that footbridges having modes of oscillation with frequencies less than 5Hz involving vertical motions of the deck, and/or less than 1.5Hz involving horizontal motions of the deck, are particularly susceptible to unacceptably large oscillations caused by the passage of large groups of people who may unconsciously or deliberately synchronise their walking patterns. Such oscillations can present a hazard to pedestrians on the structure and can risk damaging the structure itself. The possibility of the synchronisation of a large number of people to vertical motions should

particularly be considered. For any footbridge having modal frequencies below these limits consideration should be given by the Designer, in agreement with the Overseeing Organisation, to any requirements needed for carrying out appropriate dynamic testing in order to verify that the footbridge is suitable for entry into service, and to the provisions needed for the future installation if required of vibration reduction devices such as dampers. Criteria for accepting or rejecting a design on the basis of its expected dynamics shall be agreed with the Overseeing Organisation.

Minimum Thickness of Metal Sections

5.5 The minimum thickness of metal structural elements shall be as follows:

Steel plates and sections other than hollow sections	6mm
Steel hollow sections effectively sealed by welding	5mm
Aluminium alloy plates and sections	4mm

6. DIMENSIONAL STANDARDS

Clearances

6.1 The vertical clearances to the carriageway shall be in accordance with Departmental Standard TD 27 (DMRB 6.1.2). The vertical and horizontal clearances to railways, canals and watercourses shall be agreed with the Appropriate Authority. For example, the vertical and horizontal clearances to rivers and watercourses in England shall be agreed with the Environment Agency and the Land Drainage Authority.

6.2 The horizontal clearance from the edge of the carriageway to the bridge supports shall be a minimum of 4.5m unless otherwise agreed with the Overseeing Organisation. Where a clearance of 4.5m or greater cannot be achieved, the bridge supports shall be designed for collision loading to BD 60 (DMRB 1.3.5) and/or provided with appropriate road restraint systems.

Width

6.3 The clear width of the bridge, ramps and stairs, which shall be not less than 2m, shall be derived on the following basis to meet the peak pedestrian flows:

- a) On the level or up to 1 in 20 gradient: 300mm of width per 20 persons per minute.
- b) On steps or ramps steeper than 1 in 20 gradient: 300mm of width per 14 persons per minute.
- c) For shared use with cyclists and equestrians the requirements contained in Section 12 shall also be complied with.

Gradients on Bridge Structure

6.4 Where the bridge structure incorporates an inclined deck, the slope requirements regarding plain ramps shall apply. However, the requirements regarding spacing of landings on ramps may not be practical across a deck structure and for this reason the deck slope should normally be no steeper than

1 in 20. Where a deck is steeper than 1 in 20 the requirements regarding landings may be waived across the deck in agreement with the Overseeing Organisation, having given due regard to the likely mobility levels of the bridge users in consultation with the local access and disability groups.

6.5 Normally, gradients on the deck shall be no steeper than those adopted for the access ramps. However, where the deck form incorporates a varying slope (e.g. suspension, trafficked arch, stressed ribbon etc.), this requirement may be relaxed over localised lengths of the deck by agreement with the Overseeing Organisation, having given due regard to the likely mobility levels of the bridge users in consultation with the local access and disability groups.

Stairs

6.6 Access stairs to footbridges shall comply with the dimensional and safety requirements of BS 5395 for 'public' stairs, except as amended below (see also Figure 6):

- (a) The number of risers in a single flight shall not be more than 13.
- (b) A maximum of three successive flights may be used in line, provided any adjacent flights provide a change in direction of at least 30 degrees.
- (c) The risers and treads of each step in a flight of stairs shall be uniform.
- (d) Risers shall not be variable in height over their width.
- (e) The riser shall be not more than 150mm.
- (f) The tread width shall be not less than 300mm and not greater than 350mm.
- (g) Landing lengths shall be not less than 2m measured along the centre line of the stairs, or not less than the width of the stairs, whichever is the greater.

Further guidance can be obtained from Inclusive Mobility (Ref. 8).

6.7 Completely open risers shall not be used. Stairs may, however, have perforated risers, in which case the openings shall meet the following requirements:

- (a) The principal dimensions of the perforation shall not exceed 50mm.
- (b) The ratio of the open area to the total area of the riser shall be not greater than 0.4.

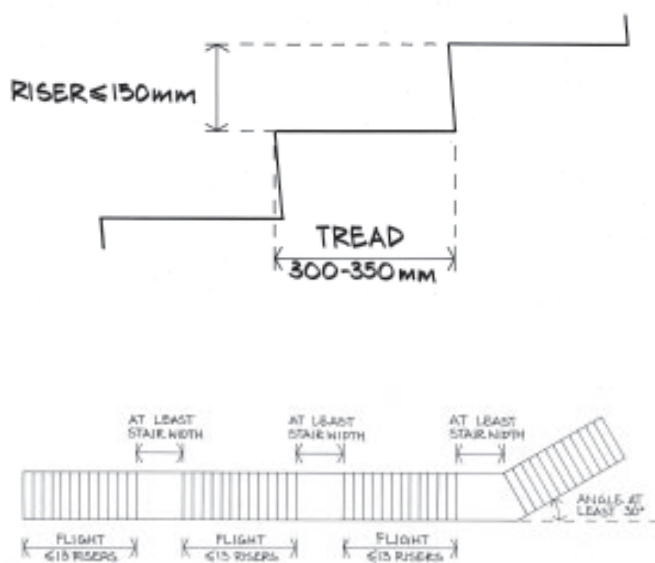


Figure 6 (ref para. 6.6)

6.8 Consideration should be given by the Designer to the provision of solid infill panels to parapets and step risers to protect the privacy of users and screening to protect the privacy of neighbouring dwellings.

Ramps

Plain Ramps

6.9 Ramps for pedestrians, cyclists and equestrians shall not be steeper than 1 in 20 unless agreed otherwise with the Overseeing Organisation. For reasons of keeping the access on the desire line, or to avoid long diversions, or to avoid damage to the environment, or for reasons of limitations of space, a steeper ramp may be used, preferably no steeper than 1 in 15. However, no ramp shall be steeper than 1 in 12.

6.10 Where the ramp is steeper than 1 in 20, for safety reasons there should normally be a significant change either of direction (30 deg or more) or in horizontal alignment (e.g. offset by at least one ramp width), at least at every 3.5m rise of the ramp at an intermediate landing.

6.11 For ramps of gradient steeper than 1 in 20, successive sloping ramps in one line may be used in agreement with the Overseeing Organisation where either no other arrangement of ramps is possible on the site or where it provides more encouragement to pedestrians to use the footbridge by shortening the walking distance.

6.12 The footway, cycleway or equestrian approaches to the footbridge or ramps shall not, for the purpose of design to this Standard, be regarded as part of the footbridge structure.

Spiral and Curved Ramps

6.13 The effective gradient for spiral and curved ramps shall comply with the requirements for plain ramps. The effective gradient and governing dimensions shall be measured 900mm from the edge of the walkway surface on the inside of the curve. The minimum inside radius of walkway surfaces for curved and spiral ramps shall be 5.5m.

Landings

6.14 For straight or spiral ramps of gradient 1 in 20, landings shall be provided at equal intervals of maximum rise 2.5m. For gradients flatter than 1 in 20, intermediate landings are not required.

6.15 For straight ramps of gradient steeper than 1 in 20, horizontal landings shall be provided at intervals producing a rise of no more than 650mm between landings.

6.16 The length of a landing shall not be less than 2m measured for straight ramps on the centreline of the ramp or for spiral ramps circumferentially at 900mm from the walkway edge on the inside of the curve.

7. PARAPETS

7.1 All bridge spans, ramps and stairs shall be provided with parapets. Parapets shall conform to the current requirements of the Overseeing Organisation given in the IRRRS or, when implemented, by EN1317 Part 6, and the following:

- (a) No upstand is required under the parapet on stairs.
- (b) Where the parapet is provided with a bottom rail, the clearance from the rail to the nose of the stairs shall be not less than 50mm and not greater than 100mm.
- (c) The height of the parapet shall be measured vertically above the line joining the noses of the stairs.
- (d) For plain or spiral ramps the height of the upstand shall be not less than 25mm and not more than 50mm.
- (e) If glass is used it shall be laminated. A rigorous risk assessment shall be undertaken during the selection of the glazing system. It shall be demonstrated that the panels, if damaged in service, would retain sufficient post fracture strength to remain in place within its fixings on the structure. Shards created during the shattering of the outer plies shall be large enough to be retained by the laminating materials.

7.2 In areas of high prevailing winds or where a footbridge is designed for pedestrian use only, and the headroom under the bridge is greater than 10m, the height of the parapet may be increased to 1.30m with the agreement of the Overseeing Organisation. Alternatively, an enclosed form of superstructure should be considered – see Section 8.

7.3 Where structural members of a footbridge serve as a parapet, the height of the parapet, the infilling of open areas, the upstand at the edge of the walkway surface and the climbability of any part shall be in accordance with requirements of 7.1. The climbability aspect requires particular attention where diagonal members at intermediate heights are employed.

Handrails

7.4 Handrails shall be provided on both sides of stairs, ramps and to decks with a gradient steeper than 1 in 20. Handrails shall be designed in accordance with BS 8300. Additional central handrails need only be provided where the width of the stairs or ramps exceeds 3m. Handrails may either be fixed to the parapet or be self-standing. The height of the handrail shall be not less than 900mm or more than 1000mm, measured vertically above the line joining the noses of the stairs or above the line of the ramps as appropriate.

7.5 Handrails of circular section should preferably have a diameter of 40 – 50mm and if within an enclosure should have a clearance from any part of the frame of 50 – 60mm. Those of non-circular section should preferably be 50mm wide by 38mm deep with rounded edges.

7.6 Handrails should be of a contrasting colour to the parapet to which it is attached, to aid those with visual impairment. Further guidance on provision of handrailings can be found in Inclusive Mobility (Ref. 8).

7.7 The handrail and its fixings shall be designed to resist a uniformly distributed load of 700 N/m applied separately in the horizontal and vertical directions in such a way that the system is designed for the most severe effects. This loading is not additional to the loading for parapets.

8. ENCLOSED FOOTBRIDGES AND CLEARANCE GAUGE

8.1 Where it is considered that there is a high risk of objects being dropped or thrown from the footbridge, or if there is a high risk of persons jumping onto the carriageway, consideration shall be given by the Designer to full or partial enclosure of the crossing and its ramps or stairs, where these are over the highway. The need for such provision shall be agreed with the Overseeing Organisation. The National Institute of Mental Health can help identify problem areas, in pursuance of the National Suicide Strategy for England (Ref. 9). The design of an enclosure shall be such that unauthorised access to the sides or the roof is prevented.

8.2 Consideration should be given by the Designer to enclosing footbridges when they are on sites exposed to very adverse weather, e.g. high winds, or where they are of such a height above the road that pedestrians may feel insecure. The need for such provision shall be agreed with the Overseeing Organisation.

8.3 Where bridge enclosures are proposed, aerodynamic effects shall be considered. Wind tunnel testing may be required and guidance is given in BD 49 (DMRB 1.3.3). Requirements shall be agreed with the Overseeing Organisation.

8.4 Normally, fine unclimbable stainless steel mesh infill will be suitable as cladding to the enclosure frame but if solid panels are specified they should be transparent with provision made for cleaning. Depending on the particular site problems, high parapets with an inward canted top or full enclosure may be required. Flush glazing outside the face of the structure is an acceptable form for enclosure walls and arched mesh roofs are an acceptable form for preventing roof access. Particular care in detailing is required to prevent access at the end of main spans where the bridge is over a cutting. Enclosures shall comply with the parapet requirements of 7.1.

8.5 The minimum headroom inside the enclosure shall be as follows:

Pedestrian only	2.3m
Pedestrian and Cyclist	2.4m
Equestrian (dismounting provisions in accordance with 12.14)	2.7m
Equestrian (mounted)	3.7m

8.6 A vertical clearance envelope shall be maintained at all locations on decks, stairs and ramps whether open or enclosed appropriate to the respective user groups. No part of any structural items such as cable stays, enclosure frames etc, or any signing or other attachments, shall intrude into the envelope. The clearance envelope shall be formed by a vertical line flush with the innermost surface of each parapet, fence or handrail, and a horizontal line complying with the height requirements given in 8.5. Where shared facilities exist, the height shall be the greatest height of the respective users.

9. DRAINAGE

9.1 Provision shall be made for the drainage of water from the footbridge and its roof in the case of enclosed footbridges. All walkway surfaces, steps, ramps and roof shall have adequate falls and suitable detailing to allow water to run off.

9.2 With the exception of stair treads and perforated decks, water should not be allowed to discharge or spill from the structure on to the carriageway or footpaths or to stain exposed surfaces, but shall be carried away either to a drainage system or to a soakaway.

9.3 Positive drainage of bearing shelves shall be provided beneath all deck movement joints.

10. WALKWAY SURFACES

10.1 It is intended to establish an Approval/Registration System for materials and systems to provide appropriate fitness for purpose for surfacing for various user types, and until this is in place the fitness for purpose of the combined substrate/surfacing system for the respective user type shall be agreed with the Overseeing Organisation as an Aspect Not Covered by Standards. This should address such requirements as corrosion resistance, resistance to slip, environmental deterioration, durability, and additionally for equestrian use, noise attenuation.

10.2 On the traversed areas of decks, stairs and ramps, the upper substrate surfaces shall be waterproofed or otherwise protected against deterioration from surface contaminants, and the surfacing shall be fit for purpose with respect to the user type.

10.3 The minimum slip resistance of traversed areas shall be equivalent to a mean corrected Pendulum Test Value of 45 units using a standard skid resistance pendulum test (prEN 13036-4).

10.4 The Designer, or for existing structures the Maintaining Agent, shall ensure that the Maintenance Manual for the structure states the installation date and minimum expected life from the surfacing or surfacing/waterproofing system.

10.5 Exposed gaps in walkway surfaces shall not be in excess of 12mm in width. Cover plates to gaps and joints shall be set flush with the top of the surfacing to prevent tripping, and the upper surfaces shall be suitably profiled or treated to reduce the likelihood of slippage.

11. LIGHTING

11.1 Footbridges shall be illuminated if they are located in areas where public lighting is provided and any lighting shall conform with the requirements of BS 5489: Part 6. Lighting systems, fixings and connections shall be robust and tamper proof.

11.2 Footbridges shall normally be illuminated by means of existing road or footway lighting augmented, if necessary, by additional ground level mounted lighting columns and lanterns. Where this is impracticable, for instance in the case of a covered walkway, the footbridge shall be illuminated by parapet lighting fittings or lighting columns mounted on the bridge structure, using fixings incorporated in the bridge design. All components of lighting systems, their fittings and connections shall be robust and tamper proof. Parapet members shall not be used as cable ducts.

12. REQUIREMENTS FOR COMBINED USE BY PEDESTRIANS AND CYCLISTS OR EQUESTRIANS

12.1 For guidance on the layout and surfacing of Non Motorised User (NMU) provision to the footbridge approaches beyond the ramp and stair ends, see Highways Agency draft Guidance Note “Provision for Non Motorised Users” (Ref. 4). For additional information on tactile surfacing for combined use situations see “Guidance on the use of tactile paving surfaces” (Ref. 12).

Footbridge Designed for Combined Use by Pedestrians and Cyclists

12.2 Shared facilities may be segregated or unsegregated. The form of segregation on the structure as determined locally shall be compatible with the segregation on the approaches. Where practical, and where agreed with the Overseeing Organisation, differing surface textures on segregated footways to aid visually impaired users may be continued across the structure.

12.3 Where the crossing is part of a pedestrian and cycle route, specific provision shall be made in accordance with the guidance on shared use by cyclists and pedestrians contained in Local Transport Note 2/86 (Ref. 10) or any current update of that document. In Scotland, reference shall be made to ‘Cycling by Design’ (Ref. 13).

12.4 The minimum widths for a footpath (or footway) and a cycle track on a bridge and ramps shall be:

	Pedestrian Path	Cycle Path	Total Width
When segregated by kerb not less than 50mm high	1.75m	1.75m	3.5m
When segregated by railings not less than 900mm high	1.95m	1.95m	3.9m
When segregated by a white line, colour contrast or surface texture	1.5m	1.5m	3.0m
Unsegregated	-	-	2.0m

12.5 On footbridges with cycle facilities the minimum height of a parapet shall be 1.40m. Design criteria and details for this parapet shall be as specified in 7.1 above, but where cyclists are physically segregated from pedestrian facilities the increased parapet height need only be provided on the cycle track side of the bridge.

12.6 Whether ramps are segregated or not, for long ramps, consideration should be given by the Designer to providing chicane barriers to slow down mounted cyclists. This should be done in such a way that the passage of perambulators and wheelchairs or mobility and visually impaired users would not be hindered, and should preferably be located on level landings especially where ramp slopes are steeper than 1 in 20.

Footbridge Designed for Combined Use by Pedestrians and Equestrians

12.7 Where a crossing is designated for equestrian use, it shall be designed in accordance with BD 37 (DMRB 1.3.14) and 7.1 above. All crossings catering for equestrians shall be designed for combined pedestrian/equestrian use.

12.8 The minimum width of a footbridge for combined pedestrian/equestrian use shall be 3.5m.

12.9 Where the crossing is not part of a designated bridleway, consideration should be given by the Designer to providing mounting/dismounting blocks on the approaches to the bridge to enable horses to be led across.

12.10 In pursuance of 12.7 above, where agreed with the Overseeing Organisation the use of solid infill panels higher than the minimum requirement defined in the documents referred to in 7.1 above may be permitted in order to reduce the risk of horses being startled by traffic on the carriageway below. Due account shall be taken of the effects of this on aesthetics and potential loss of utility to other users.

12.11 Wherever possible the bridge should be aligned such that all user types can see the entire length of the structure from the approaches and, where practical, suitably sized equestrian waiting areas should be provided off the structure to allow users the option to cross when the deck is clear.

12.12 The upper face of cover plates to expansion joints at deck level shall be provided with a suitable slip resistant coating.

12.13 Suitable signage shall be erected on the approaches to the footbridge to warn other users of the potential presence of horses, requesting cyclists to take particular care or give way to equestrians.

12.14 Where the minimum headroom on the structure is not designed for mounted use in accordance with 8.5, mounting/dismounting blocks shall be provided and suitable signs erected to indicate that equestrians should dismount.

12.15 Where the deck is constructed of steel or timber or any other material where the sound made while crossing the bridge could alarm the horses, warning notices to this effect shall be erected. Alternatively, suitable noise attenuation measures, for example special surfacing, may be agreed with the Overseeing Organisation.

13. REFERENCES

1. British Standards: BSI
BS 5400: Code of Practice for the Design of Steel, concrete and composite bridges
BS 6100: Subsection 2.4.1. Glossary of Building and Civil Engineering Terms, Highway Engineering
BS 5268: Structural use of timber
BS 8118: Structural use of aluminium
BS 5395: Part 1: Code of Practice for the Design of Straight Stairs
BS 8300: Design of buildings and their Approaches to meet the needs of disabled people - Code of Practice
BS 5489: Part 6: Lighting for bridges and elevated roads
BS 5395: Part 1: Code of Practice for the Design of Straight Stairs
2. Design Manual for Roads and Bridges (DMRB): TSO
BD 37 Loads for Highway Bridges (DMRB 1.3.14)
BD 60 The Design of Highway Bridges for Vehicle Collision Loads (DMRB 1.3.5)
BD 74 Foundations (DMRB 2.1.8)
BD 30 Backfilled Retaining Walls and Bridge Abutments (DMRB 2.1.5)
BD 49 Design Rules for Aerodynamic Effects on Bridges (DMRB 1.3.3)
BA 41 The Design and Appearance of Bridges (DMRB 1.3.11)
TD 27 Cross Sections and Headroom (DMRB 6.1.2)
Technical Memorandum BE1/78
3. Manual of Contract Documents for Highways Works (MCHW): TSO
Specification of Highways Works. (MCHW)
4. Draft Guidance Note on Non-Motorised Users, Highways Agency
5. Sense and Accessibility, Countryside Agency Publications, 2000
6. Sustrans Information Sheet FF22 – Access Controls, Sustrans 1998
7. The Appearance of Bridges and Other Highway Structures, Highways Agency, 1996
8. Inclusive Mobility, Department for Transport, London, 2000
9. National Suicide Prevention Strategy, Department of Health, London 2002
10. Local Transport Note 2/86 – Shared use by Cyclists and Pedestrians – August 1986, HMSO
11. Interim Requirements for Road Restraint Systems (IRRRS)
12. Guidance on the Use of Tactile Paving Surfaces. Department for Transport (1998)
13. Cycling by Design: A Consultation Paper – December 1999, Scottish Executive

14. FURTHER READING

Traffic Signs (Amendment) Regulations:1982. Statutory Instrument 1982, No 1879 – December 1982, HMSO

DETR Traffic Advisory Leaflet 3/00; Walking
Bibliography

DETR Traffic Advisory Leaflet 4/00; Cycling
Bibliography

Highways Report HR6 – Equestrian Use of Trunk Road
Structures, Transport Research Laboratory, 2002

15. ENQUIRIES

All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

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H. DfT Inclusive Mobility 2005

1 Introduction

The Government is committed to comprehensive civil rights for disabled people. An integrated transport policy, which encompasses accessible public transport, public transport infrastructure and a barrier-free pedestrian environment is fundamentally important to delivering that commitment.

Part III of the Disability Discrimination Act 1995 (DDA) gives disabled people a right of access to goods, facilities, services and premises. These rights are being phased in over the period 1996 to 2004. Since 1996, it has been unlawful for service providers to treat disabled people less favourably than other people for a reason related to their disability.

Since October 1999 service providers have had to take reasonable steps to change practices, policies and procedures which make it impossible or unreasonably difficult for disabled people to use a service; to provide auxiliary aids or services which would make it easier for, or enable, disabled people to use a service; and to overcome physical features, which make it impossible or unreasonably difficult for disabled people to use a service, by providing the service by a reasonable alternative method. From October 2004, service providers may have to alter the physical features of premises if the service continues to be impossible or unreasonably difficult for disabled people to use.

These requirements apply to facilities and services in the pedestrian environment and in transport related infrastructure: bus stations and stops, airports and rail stations¹ for example. Transport vehicles are covered by separate provisions under Part V of the DDA.

There is already a range of advice, guidance and codes of practice drawn up to guide highway engineers and others in local authorities and the transport industries on the best ways to meet the needs of disabled people. The recently published British Standard (BS) 8300, Design of buildings and their approaches to meet the needs of disabled people Code of practice, for example, covers many aspects of good design for disabled people. Outside the United Kingdom (UK), many other countries have produced guides to good practice, as they too move towards attaining better access for disabled people. Relevant publications that were consulted during the preparation of this report are listed in the bibliography.

The introduction of legislation in this field requires a fresh look at what guidance already exists, whether it is up-to-date, consistent and comprehensive and whether there are overlaps and omissions. Ultimately the courts will determine whether a service provider is in breach of the new laws. These guidelines do not have any legal status and compliance with them should not be regarded as complying with the DDA, but they will provide guidance on established best practice in a general sense that relevant organizations can apply to their particular situation.

Although the main purpose of these guidelines is to provide good access for disabled people, designs that satisfy their requirements also meet the needs of many other people. Those who are travelling with small children or are carrying luggage or heavy shopping

will all benefit from an accessible environment, as will people with temporary mobility problems (e.g. a leg in plaster) and many older people. Thus, the overall objective of this guide is to provide inclusive design and through that achieve social inclusion.

One further point should be borne in mind when using this guide. Part V of the DDA enables regulations to be made concerning access onto and within buses, coaches, taxis and trains. The amount of space that is available, particularly in taxis and smaller buses, is quite restricted and because of this the dimensions required by the regulations, for example to accommodate a passenger in a wheelchair, are limited. Generally there is more space available in the built environment, and the guidelines in this report recognize that fact. People who wish to travel by public transport, particularly those who use a wheelchair, should take account of the amount of space available on buses, taxis and trains and should not be misled into believing that a wheelchair that can be used in the pedestrian environment will necessarily be usable on public transport vehicles. The Department for Transport (DfT) and the British Healthcare Trades Association (BHTA) have issued advice to wheelchair user on public transport in *Get Wheelchair Wise* which is available free of charge from the DfT's Mobility and Inclusion Unit.

There are solutions to the majority of access difficulties in existing buildings and in the pedestrian environment. Frequently the best options are not the most expensive nor the most disruptive. Access audits can provide detailed analysis of potential and actual problems and can be made based on plans for new buildings as well as by surveying existing ones. Where access audits are made, they must take account of the full range of requirements of disabled people, including those with sensory and cognitive impairments. Audits should be carried out by recognized, specialist auditors or consultants. Improvements to access in existing buildings may be made most economically as part of regular repair, maintenance, refurbishment and redecoration. Whenever work of this kind is to be undertaken, access provision should be reviewed to see how it can be improved.

Beyond specific opportunities like these, auditing problems of access should be part of the process of developing guidance, strategies and implementation programmes, which themselves should form part of Local Transport Plans, local bus and local walking strategies.

Where the area concerned is an historic environment, changes needed to improve accessibility should be made with sensitivity for site context. Early consultation with those responsible for managing the historic environment should ensure that any changes made do not detract from the appearance of the area.

The sequence of topics described in this guide generally follows that used by the Institution of Highways and Transportation (IHT) in their 1991 Revised Guidelines, *Reducing Mobility Handicaps Towards a Barrier Free Environment*. Thus it starts with the pedestrian and street environment and then goes on to deal with public transport buildings and infrastructure. At the start of the first section there is basic information on the space needed by people; walking, using wheelchairs, walking with sticks etc. Towards the end of the guide, there is a list of the sources of information used in its

preparation, subdivided by subject area. There is also a summary card listing the dimensions given in the text.

¹The Strategic Rail Authority published a revised code of practice, Train and Station Services for Disabled Passengers in February 2002. That code should be used as the main reference document for disability provision in the rail environment.

2 Basic human factors information

2.1 Definitions

It is essential that design for people with mobility impairments should be to the highest possible standards. This requires knowledge of the capabilities of different types of person. This section provides information on the basic human requirements for ease of movement. In designing or modifying facilities the aim should be to be generous in the allocation of space.

The term disability is a broad one. It includes people with physical, sensory or mental impairment; at a conservative estimate between 12 and 13 per cent of the population have some degree of impairment. Many, though not all, face barriers to movement in the environment. This guide is intended to show how these barriers can be removed or at least reduced, but it does have a wider relevance because there are many other people not conventionally considered to have a disability who also encounter barriers to movement.

People with small children, people carrying heavy shopping or luggage, people with temporary accident injuries and older people can all benefit from good design of the pedestrian and transport environment. Without a barrier free environment, many of these people will be mobility impaired.

While it is true that there are many aspects of design in the pedestrian environment that are helpful to all or most disabled people (and many others as well) there are also some specific facilities needed by people with a particular kind of impairment.

Manual wheelchair users need sufficient space to be able to propel the chair without banging their elbows or knuckles on door frames or other obstacles. But someone who walks with sticks or crutches also needs more space than a non-disabled walker; so too does a long cane user or person carrying luggage, or a lot of shopping bags, or with small children. Thus providing adequate clear space on pavements, along passages in public buildings, through doorways etc, is of benefit to many people.

Similarly, visually impaired people need a good level of lighting in transport buildings and elsewhere and, if information such as a train or bus timetable is displayed, a print size that they can read easily. But almost everyone else benefits from good lighting, not least because it gives a greater sense of security, and practically everyone finds reading timetables easier if the print is clear and large.

These are just two examples of design requirements that are essential for people with a particular impairment but which have a much wider relevance.

More specific needs, however, can be just as important for people with certain types of impairment. For example, the rotating cone below the push button box on a controlled pedestrian crossing is essential if a deaf blind person is to know when the steady green man signal is lit.

This guide attempts to cover both those requirements that are general in nature and those that are more specific.

As noted at the start of this section, the term disability is a broad one. The DDA defines a person as having a disability if he has a physical or mental impairment which has a substantial and long term adverse effect on his ability to carry out normal day-to-day activities.

There are various ways or models used to define disability, but in functional terms this guide is mainly concerned with the following:

Locomotion, which includes people who use wheelchairs and those who can walk but only with difficulty often using some form of aid such as a stick or walking frame. Approaching 70% of disabled people have locomotion difficulties: those with walking difficulties outnumber wheelchair users by about 10:1.

Seeing, which can be sub-divided into blind and partially sighted people. It is estimated by the Department for Work and Pensions (DWP) that there are almost two million people in Great Britain with a significant sight loss.

Hearing, which can also be sub-divided into those who are profoundly deaf and those with impaired hearing, ranging from severe to mild deafness. The Royal National Institute for Deaf People (RNID) estimates that there are over eight million deaf or hard of hearing people in the UK of whom approaching 700,000 are severely or profoundly deaf.

Reaching, stretching and dexterity, frequently the result of arthritis, which can make these movements painful and difficult, or of muscular dystrophy causing a loss of muscular strength, or of complaints of the nervous system.

Learning disability, making it hard to understand complicated information or to use complex machines (like some ticket machines).

It should be remembered that these categories are not mutually exclusive. Many disabled people, particularly older people, have more than one impairment. The following paragraphs give some basic information on the space needed by people when they are standing or moving. Of course there is a lot of variation in this, but if the dimensions

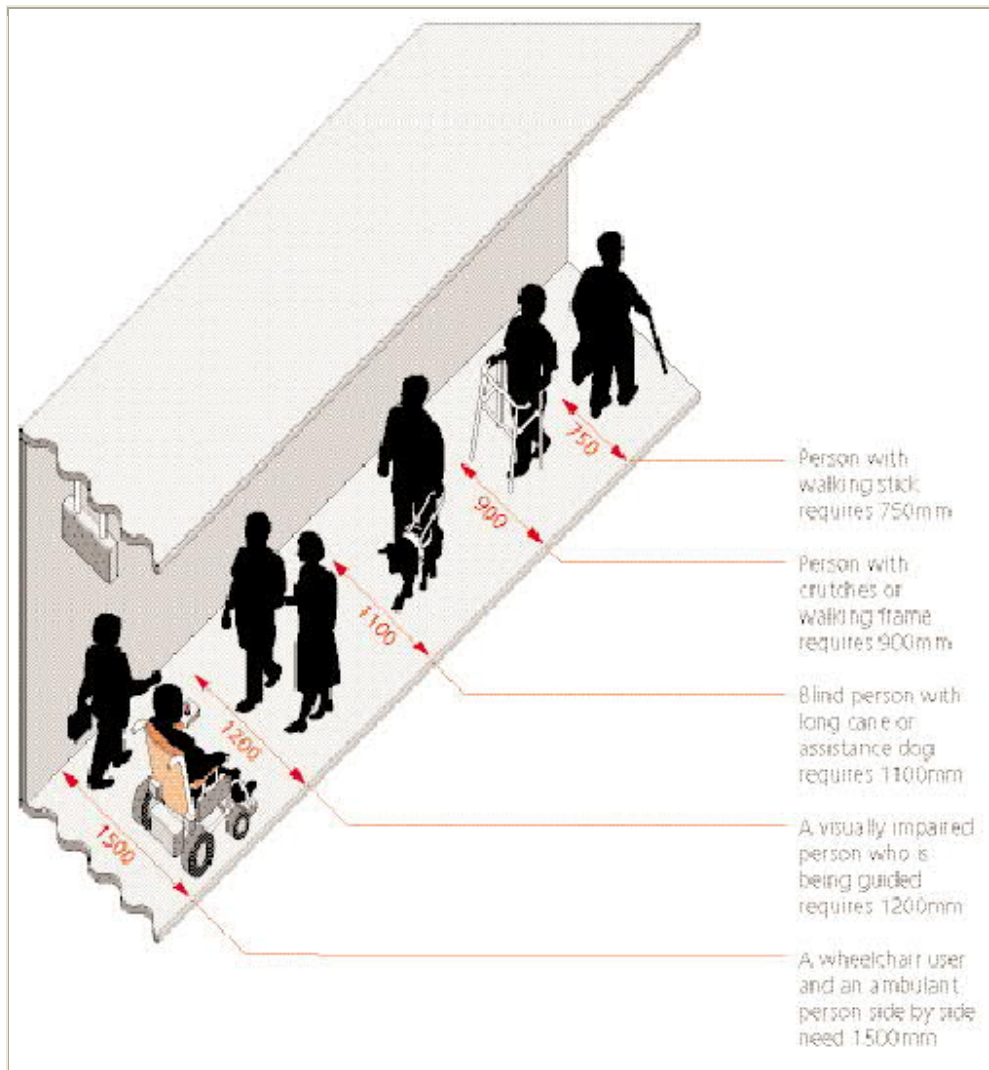
given below are used then the great majority of disabled people will be able to move around buildings and the environment much more easily.

2.2 Mobility impaired and visually impaired people

Someone who does not use a walking aid can manage to walk along a passage way less than **700mm** wide, but just using a walking stick requires greater width than this; a minimum of **750mm**. A person who uses two sticks or crutches, or a walking frame needs a minimum of **900mm**, a blind person using a long cane or with an assistance dog needs **1100mm**. A visually impaired person who is being guided needs a width of **1200mm**. A wheelchair user and an ambulant person side-by-side need **1500mm** width.

Unobstructed height above a pedestrian way is also important, especially for visually impaired people. Generally, this should be a minimum of **2300mm** except on sub-surface station platforms where it should be **3000mm**. Where a sign is suspended over a footway or pedestrian area, for example in a railway station a minimum clearance of **2100mm** is acceptable (**2300mm** on cycleways). Where trees overhang a footway it is advisable to cut them back to at least **3000mm** clear height to allow room for regrowth.

Mobility impaired and visually impaired people



2.3 Wheelchair users

Although a minority among disabled people, wheelchair users need quite a lot of space to move around comfortably and safely: usually more than mobility impaired people, although those who walk with two sticks can occupy a greater width than someone using a wheelchair.

A comprehensive set of measurements of wheelchair visitors to the Mobility Roadshow (1999) gave the figures for length and width summarized on the opposite page. The range of dimensions is considerable, particularly that for overall length. The greatest lengths are those of conventional wheelchair users with leg supports (maximum 1545mm, though this was the only measurement out of 745 of more than 1500mm) and electric scooters with a maximum of **1500mm**. Conventionally seated wheelchair users do not occupy more than approximately **1250mm**. However, if a wheelchair user has a personal assistant, their combined length will be typically **1750mm**.

The figures given for width, with a 95th percentile of slightly over **700mm** at maximum (for powered chairs), do not make allowance for the wheelchair users elbows and hands. The ISO standard for wheelchairs (ISO 7193) notes that to propel a wheelchair manually needs a clearance of not less than **50mm**, preferably **100mm**, on both sides.

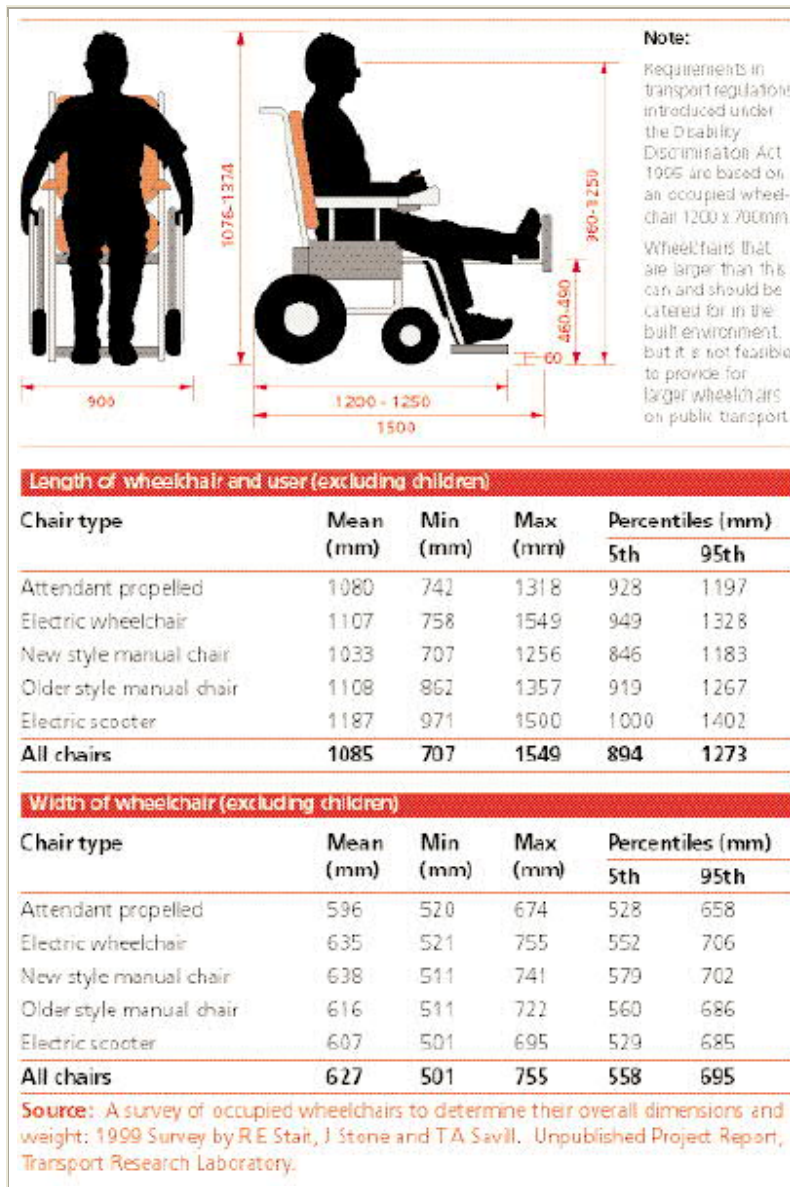
The Mobility Roadshow survey also measured the heights of wheelchair / users. The overall mean height for all types of wheelchair users was **1243mm**, with a 5th percentile of **1076mm**, 95th percentile of **1374mm** and a maximum of just over **1450mm**. As with overall length, scooter users gave slightly greater figures, with a mean height of **1340mm**, 5th and 95th percentiles of **1202mm** and **1438mm** respectively and a maximum of **1502mm**.

Other basic measurements which are of importance when considering design standards to accommodate wheelchair users are:

- Eye height, which is around **120-130mm** below seated height giving a 5th-95th percentile range for wheelchair users from **960mm** to **1250mm** (**1080mm** to **1315mm** for scooter users)
- Knee height, **500mm** to **690mm**
- Seat height, **460mm** to **490mm**
- Ankle height, manual wheelchair users **175mm** to **300mm**; electric wheelchair users **380mm** to **520mm**
- Height to bottom of foot support, **60mm** to **150mm**.

The ability of a person in a wheelchair to reach, sideways or forward, is also important and a number of guidelines give figures for this.

Wheelchair users



The distance that an individual can reach varies with both the size of the person and the height to which they are reaching. Reach distance forms an arc based on the shoulder level of the wheelchair user and can be measured as easy or comfortable (reach without much movement of the torso) and maximum or extended (just possible with movement of the torso). Recent research done for the preparation of the new Code of Practice (BS 8300) gives figures for comfortable and extended reach ranges. These are shown in the table below. The Code of Practice, which gives further and more detailed guidance on reach ranges, should be consulted when designing anything which people will have to touch, push, turn etc.

Dimensions associated with comfortable and extended reach ranges

Person	Access	Reach angle	Height (H)		Depth (D)	
			Comfortable mm	Extended mm	Comfortable mm	Extended mm
Wheelchair user	Front	+ 70°	1,000	1,150	90	120
		horizontal	(750)	(750)	180	230
		- 24°	650	650	120	200
	Side	+ 70°	1,060	1,170	100	135
		horizontal	(750)	(750)	220	310
		- 24°	665	630	165	230
Ambulant Disabled	Front	+ 70°	1,500	1,625	200	250
		horizontal	(850)	(850)	280	400
		- 24°	750	700	180	310

Note 1 Dimensions have been rounded to the nearest 5 mm.

Note 2 Dimensions in brackets are for the horizontal reference plane.

Note 3 It is assumed that any kneehole allows full reach capabilities.

Note 4 Maximum heights are measured from the 70° line; minimum heights from the -24° line

Note 5 For some activities, the recommended dimensions in the standard are extended beyond those resulting from the research trials on the basis of accepted practice.

Source: BS 8300 Design of buildings and their approaches to meet the needs of disabled people – Code of Practice.

The height of the feature button, handle etc, - which the wheelchair user has to reach is also important. As a general rule any features that are intended for use by people in wheelchairs, such as push buttons, switches, coin slots etc, should be no less than **750mm** and no more than **1200mm** above ground level. By leaning forward or sideways it is possible for a wheelchair user to reach beyond this range US data suggests an absolute range for sideways reach height from 230mm to 1370mm but placing controls or other features towards the extremes of this range should be avoided if at all possible.

Forward reach measurements are also important. Some wheelchair users find it difficult or impossible to lean forward: if practicable the distance forward, measured at chest height, should be no more than **500mm**; **600mm** should be the absolute maximum.

Manoeuvring space is needed for a wheelchair to turn corners or turn around. Skilled users of manual wheelchairs can turn through 360° in a space no more than **1500mm x 1500mm**, but this is insufficient for larger chairs, particularly outdoor electric wheelchairs (turning circle **2420mm**), electric pavement vehicles (turning circle **4350mm**) and for wheelchair users with extended leg rests.

Within transport related buildings, the following dimensions should be taken as the minima acceptable:

- Right angle turn (along corridor) **1200mm x 1200mm**
- 180° turn (within corridor) **1600mm (width) x 2000mm (length)**

Users of electric scooters and large electric chairs may need greater space than this for 180° turns, but the dimensions given (as minimum) will accommodate users of self-propelled wheelchairs and the majority of electrically powered wheelchairs.

2.4 Walking distances

Walking distances were researched in some detail in the late 1980s and, based on the findings from these studies, the following are recommended:

Impaired group	Recommended distance limit without a rest
Wheelchair users	150m
Visually impaired	150m
Mobility impaired using stick	50m
Mobility impaired without walking aid	100m

These figures are average measures; there is a lot of variation between individuals. Gradients, weather conditions, whether there are handrails etc, will also affect the distances people are able to walk. US regulations, for example, note that on distances over 100 feet (30m) disabled people are apt to rest frequently. These regulations suggest that to estimate travel times over longer distances allowance should be made for two minutes rest time every 30 metres.

Research based on a follow-up study to the London Area Travel Survey found that of all the people with a disability who were able to walk at all, approximately 30 per cent could manage no more than 50 metres without stopping or severe discomfort and a further 20 per cent could only manage between 50 and 200 metres.

2.5 Standing

Standing is difficult and painful for some disabled people, particularly those with arthritis, rheumatism and back problems. In the same study as that mentioned above, nine per cent of the survey respondents could only stand for less than a minute without discomfort, 24 per cent could manage between one and five minutes and a further 22 per cent could stand for up to ten minutes. The findings from this study emphasize the importance of providing plenty of appropriately placed and designed seating at places where people may have to wait and along pedestrian routes.

3 Footways, footpaths and pedestrian areas

The distinction between a footway and a footpath is that a footway (usually called the pavement) is the part of a highway adjacent to, or contiguous with, the carriageway on which there is a public right of way on foot. A footpath has no contiguous carriageway. Where reference is made to one, it can generally be regarded as applying to the other for design purposes.

3.1 Widths

A clear width of **2000mm** allows two wheelchairs to pass one another comfortably. This should be regarded as the minimum under normal circumstances. Where this is not possible because of physical constraints **1500mm** could be regarded as the minimum acceptable under most circumstances, giving sufficient space for a wheelchair user and a walker to pass one another. The absolute minimum, where there is an obstacle, should be **1000mm** clear space. The maximum length of restricted width should be **6 metres** (see also Section 8.3). If there are local restrictions or obstacles causing this sort of reduction in width they should be grouped in a logical and regular pattern to assist visually impaired people.

It is also recommended that there should be minimum widths of **3000mm** at bus stops and **3500mm** to **4500mm** by shops though it is recognized that available space will not always be sufficient to achieve these dimensions.

Where a cycle track runs alongside a footway or a footpath best practice is to physically segregate the two as advocated in Local Transport Note (LTN) 2/86 Shared Use by Cyclists and Pedestrians.

If this is not possible, appropriate tactile surfaces should be used to identify the cycle and pedestrian paths (see Section 4.5). The cycle track should be at least **1400mm** wide with the cycle symbol on the ground every 50 yards. The pedestrian part should meet the standards given earlier in this section and should be separated from the cycle track by a raised dividing line **150mm** wide and **12 to 20mm high**, with a **50mm** wide top face.

3.2 Gradients (see Section 8.4 for design of steps and ramps)

There is general agreement among guidelines from many countries that an 8 per cent (1 in 12) slope is the maximum that may be used; anything greater than this will cause difficulties for manual wheelchair users. Most guidelines also agree that 5 per cent (1 in 20) is preferred. (A ramp is generally defined as a pathway with a slope of more than 5 per cent). The effects of different gradients have been described in the Swedish publication *Streets for Everybody* as:

- **1%** (1 in 100) - is never an obstacle.
- **2%** (1 in 50) - can be managed by most people (and also provides good drainage).
- **2.5%** (1 in 40) - can be managed by many people.
- Steeper than **2.5%** - impossible for many manual wheelchair users.

These figures may be regarded as a counsel of perfection as the terrain in many places imposes steeper gradients than 2.5 per cent, but the standard of 5 per cent should be borne in mind when designing new footpaths and pedestrian areas.

Steeper gradients than these can be managed by some wheelchair users, but only over very short distances (1000mm or less), for example on a ramp between a bus entrance and the pavement. Even over these short distances the maximum gradient used should be no more than **10 per cent (1 in 10)**. As a general rule, however, **8 per cent (1 in 12)** should be used as the absolute maximum. Not only is the physical effort of getting up a steeper gradient beyond many wheelchair users, but there is also a risk of the wheelchair toppling over.

Crossfall on footways and footpaths may be necessary to provide good drainage², but if too great, can make it difficult for wheelchair users. Recommendations contained in guidelines vary somewhat but, under normal circumstances, a figure of **2.5 per cent (1 in 40)** should be regarded as the maximum acceptable. Where possible, it is preferable to have a crossfall between **1 and 2 per cent**.

Variable crossfall, such as may be found when travelling along a street with vehicle cross-overs, can be irritating as it affects the steering of wheelchair users and can also cause problems for people with walking difficulties. Local authorities should take these problems into account when considering their policies on front garden parking in residential areas, which may result in the installation of cross-overs.

3.3 Fences and guardrails

If there is a steep slope or drop at the rear of the footway, precautions must be made to prevent wheelchair users running over the edge or blind or partially sighted people walking over it. Guardrails and barriers at the side of or across footways should be at least **1100mm high**; preferably **1200mm** measured from ground level.

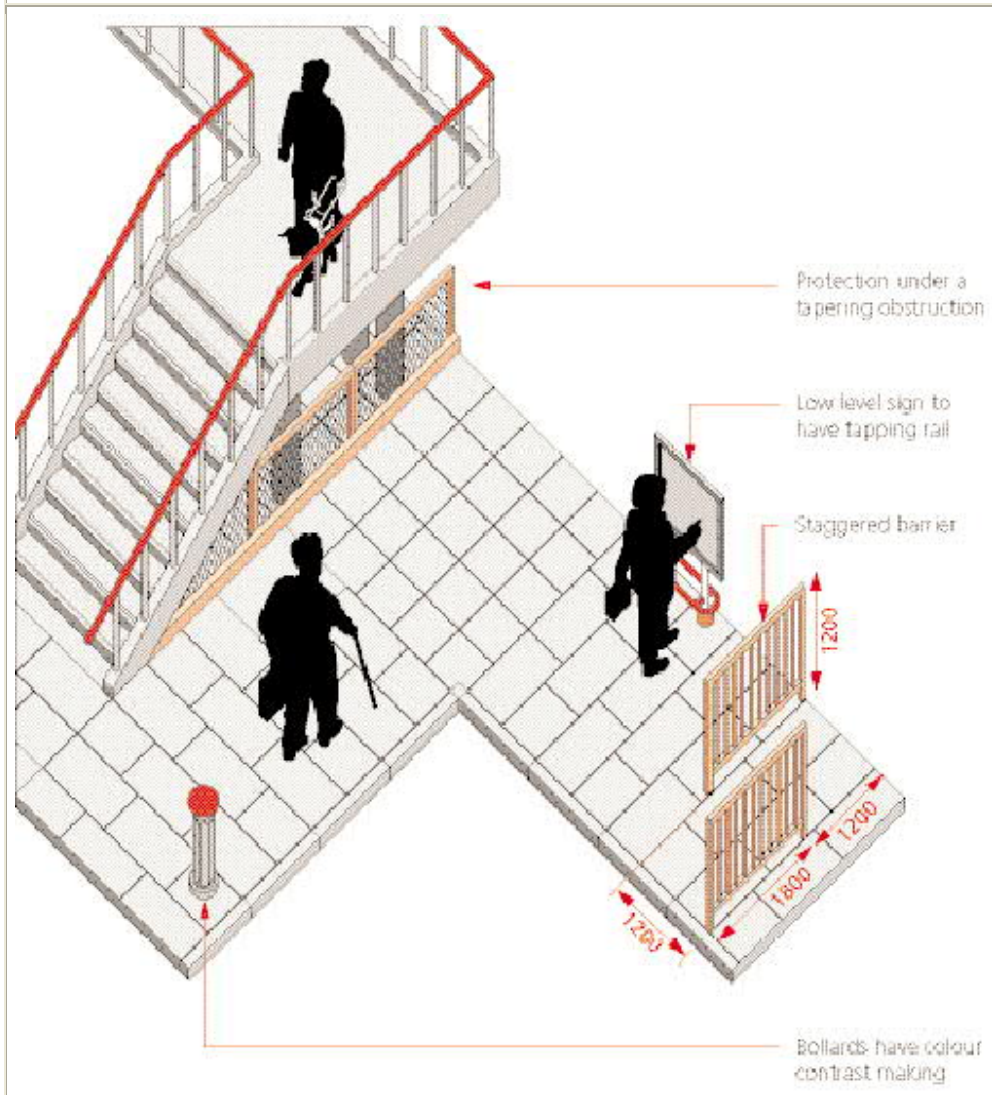
In common with other street furniture on or close by footways, guardrails should be clearly colour contrasted from their surroundings: simple galvanized railings are not acceptable. If, for reasons of economy, this type of railing has to be used it should at minimum have colour contrasted markings on it. These requirements also apply to rails around street works.

Guardrails should also be designed to prevent guide dogs from walking under the rails, but there should be sufficient openings between vertical members to ensure that children and wheelchair users can see, and be seen, through the railings. The top rail should have a smooth profile and, if intended to provide support, should be circular with a diameter of between **40 and 50mm**.

There should also be an upstand a minimum of **150mm** in height at the rear of the paved area, which can then act as a tapping rail for long cane users as well as a safeguard for wheelchair users.

BS 7818 includes more detailed information on this area.

Fences and guardrails



3.4 Seating

As mentioned in Sections 2.4 and 2.5, mobility impaired people need seating at reasonably frequent intervals. In commonly used pedestrian areas, and transport interchanges and stations, seats should be provided at intervals of no more **50 metres**. Wherever possible seats should also be provided at bus stops and shelters. Seating should be placed adjacent to, but not obstructing, the pedestrian route and should be picked out in contrasting colours to help people with visual impairment (the design of seating is described in Section 9.3).

3.5 Barriers on footways

Where it is necessary to provide staggered barriers across footways and footpaths in order to prevent conflict with other forms of traffic (for example at junctions with main roads) the barriers should be constructed of vertical bar sections **1200mm** high and colour contrasted with their surroundings. An offset between the two barriers of **1200mm** allows wheelchair users convenient passage but discourages the riding of bicycles. Requirements to give visibility through the railings, as mentioned in Section 3.3, also apply to barriers.

3.6 Ramps and steps

Detailed design guidelines for ramps and steps are given in Section 8.4. The recommended dimensions apply equally to the external as well as the internal environment.

3.7 Street furniture

Street furniture can cause problems for both wheelchair users and for people who are visually impaired. It is essential, taking account of heritage issues, to consider both the position of any furniture and the means of making it apparent to people with reduced vision.

Posts, poles, bollards etc should be positioned to leave at least the minimum footway widths given in Section 3.1. It helps visually impaired people if, within an area, the positioning of posts etc is consistent and away from general lines of movement. Thus lamps (and signs) should be mounted on walls or buildings whenever possible; if not, then placing them at the back of the footway as near the property line as possible is acceptable. In this position the maximum distance from the property line to the outer edge of the pole should be **275mm**. If they are placed on the road side of the footway, they should be at least **500mm** away from the edge of the carriageway, increased to **600mm** where there is severe camber or crossfall. If there is more than one pole, they should be at least **1000mm** apart.

Waste bins should be approximately **1300mm** in height, should continue down or close to ground level and should be of a rounded design. The bin opening should be about **1000mm** above ground level. Bins should be colour contrasted to their surroundings.

Bollards are recommended to be at least **1000mm** in height. The same minimum height (**1000mm**) applies to other freestanding objects such as raised flowerbeds, which should also be designed with rounded edges. Under no circumstances should adjacent bollards be linked with chain or rope as this is a hazard for blind and partially sighted people.

Low level signs supported on two vertical poles (eg city maps) should have a lower tapping rail or skirting between the posts to prevent blind pedestrians inadvertently walking between them and colliding with the sign. The rail or skirting should be **300-400mm** above ground level. The sign should not extend more than **150mm** beyond the supporting posts.

Colour contrasted bands (**150mm** deep) on poles and colour contrast on the tops of bollards will help partially sighted people, but the choice of colour for the overall post or bollard also affects visibility. Grey poles in particular are often problematic as they tend to blend into the general background. The incorporation of a light at the top of bollards is also an effective way of making them more easily seen.

Overhead signs (and any other obstacles over a footway) should give the height clearances specified in Section 2.2 (**2100mm** minimum below suspended signs, **2300mm** otherwise).

Tapering obstructions are usually inside buildings, but can also be found in the outside environment, for example where there is a pedestrian bridge over a road. Any part below a stairway which is **2100mm** or less in height should be protected with a barrier to warn blind and partially sighted pedestrians. In some circumstances (where there is sufficient space) protection can be given by a warning surface which extends out from the obstacle. In this context it should be remembered that pedestrians take time to come to a halt. Finnish guidelines, for example, give a braking distance for pedestrians of 500mm and a reaction distance of 1400mm.

3.8 Street works

Street works not properly safeguarded pose a hazard for many disabled people and particularly blind and partially sighted pedestrians. Street works should be guarded for their full extent by a continuous barrier, minimum **1000mm** high, maximum **1200mm**, with a tapping rail (depth **150mm** to **200mm** with its bottom edge on the ground or up to a maximum height of **200mm** above the ground). The barriers must be placed so that they cannot be knocked over and should be reasonably rigid. The requirements for clear level footway space around roadworks including temporary footpaths should follow the standards given in Section 3.1. Illumination of the street works at night-time helps partially sighted people; audible warnings help blind people. Colour and tonal contrasting of the protective barriers is essential (see Section 3.9).

Streetworks

disabled people. An audible warning at the beginning and prior to the end of the travelator is essential for visually impaired people.

Travelators should have a minimum unobstructed level run-off at each end of **6 metres**. The maximum gradient for a travelator should be **5 per cent (1 in 20)**.

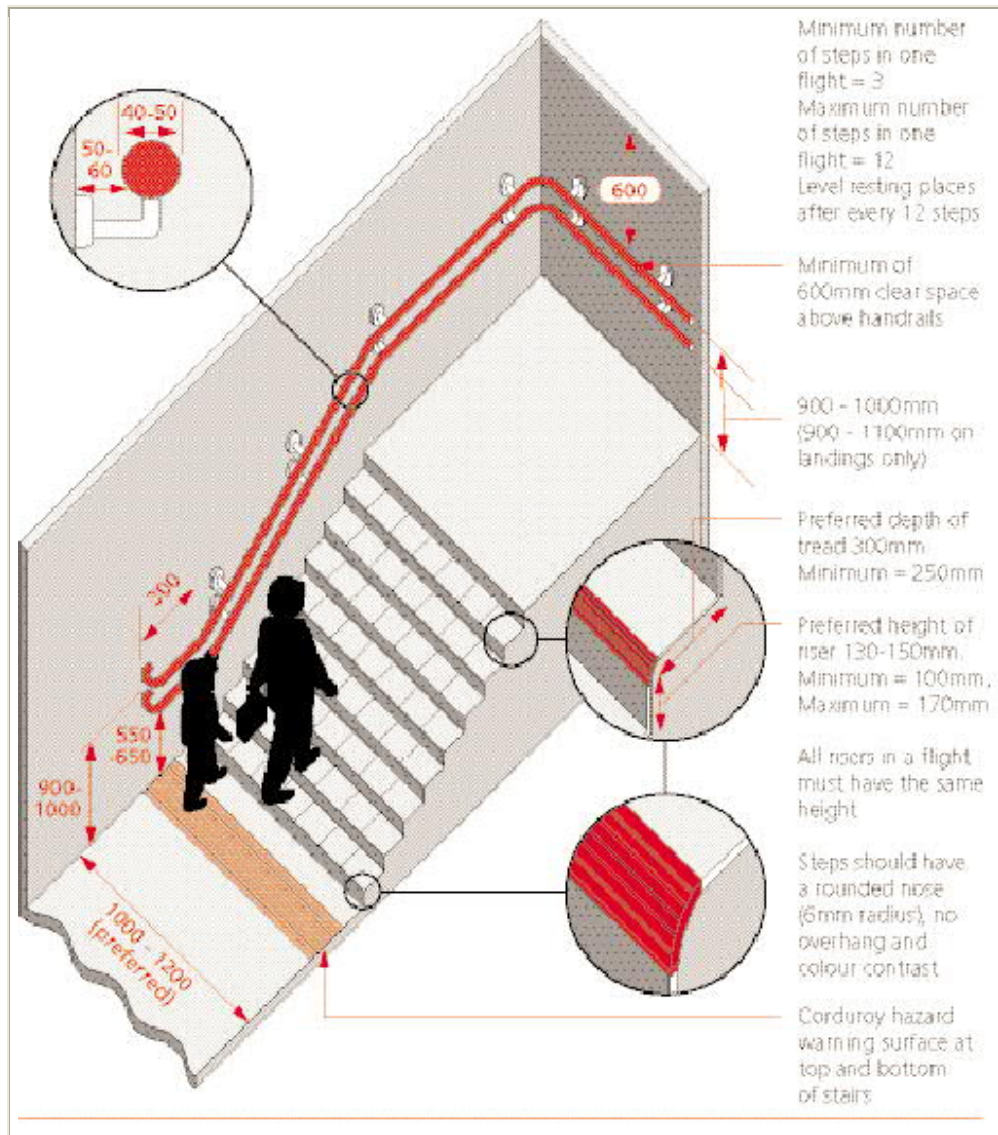
8.4 Changes in level [6](#)

Even a single step will prevent access for the great majority of wheelchair users (and be a trip hazard for others), so alternatives must be provided; either ramps or lifts. However, the design of steps and stairs themselves is important. Good design can greatly assist ambulant disabled people and those with visual impairment.

8.4.1 Steps and stairs

A considerable amount of research on dimensions and design of steps and stairs was carried out in the 1970s and 1980s and there is reasonable consistency between the dimensions given in various national guidelines. A riser height of **150mm** can be managed by most people; a little more than this is possible if there are well designed handrails but **170mm** should be regarded as the maximum in normal circumstances. Steps with very shallow risers can cause problems and should be avoided; **100mm** is the absolute minimum.

Steps and stairs



Tread depth or going should be **300mm** deep (approximately the length of a size 9 shoe), never less than **250mm** and the nose of the step should be rounded (**6mm** radius) without any overhang. People with walking difficulties often pull their feet up the face of the riser; any overhang will catch their foot.

Common criteria from several guidelines are that all steps in a flight must have the same dimensions, that open tread staircases are to be avoided, as are curved or spiral staircases and that there should be tactile warning surfaces at the foot and head of the stairs (see Section 4). Stairs should be well lit (minimum **200 lux**, see Section 11) and surfaced with a slip resistant material. Colour contrast on the step noses is essential for visually impaired people and should extend across the full width of each tread, **55mm** deep on both tread and riser.

People with walking difficulties cannot manage long flights of steps. The maximum number of risers in a flight should be **12**, with resting places between successive flights. Resting places should be at least **1200mm** long, preferably **1800mm**, and across the full width of the stairway. The minimum number of steps in a flight should be **three**; fewer than this is less safe.

Stairs should have a minimum clear width between handrails of **1000mm**, preferably **1200mm** which is sufficient for a disabled person and companion. Handrails should be provided on both sides (see Section 8.4.3) and, where stairways have a clear width of more than **1800mm**, a centre handrail should also be provided⁷. Stairs of this width are needed where there is concurrent two-way movement. Stairs that lead to a platform, on which people will be carrying luggage, should be **3000mm** wide (with centre handrails).

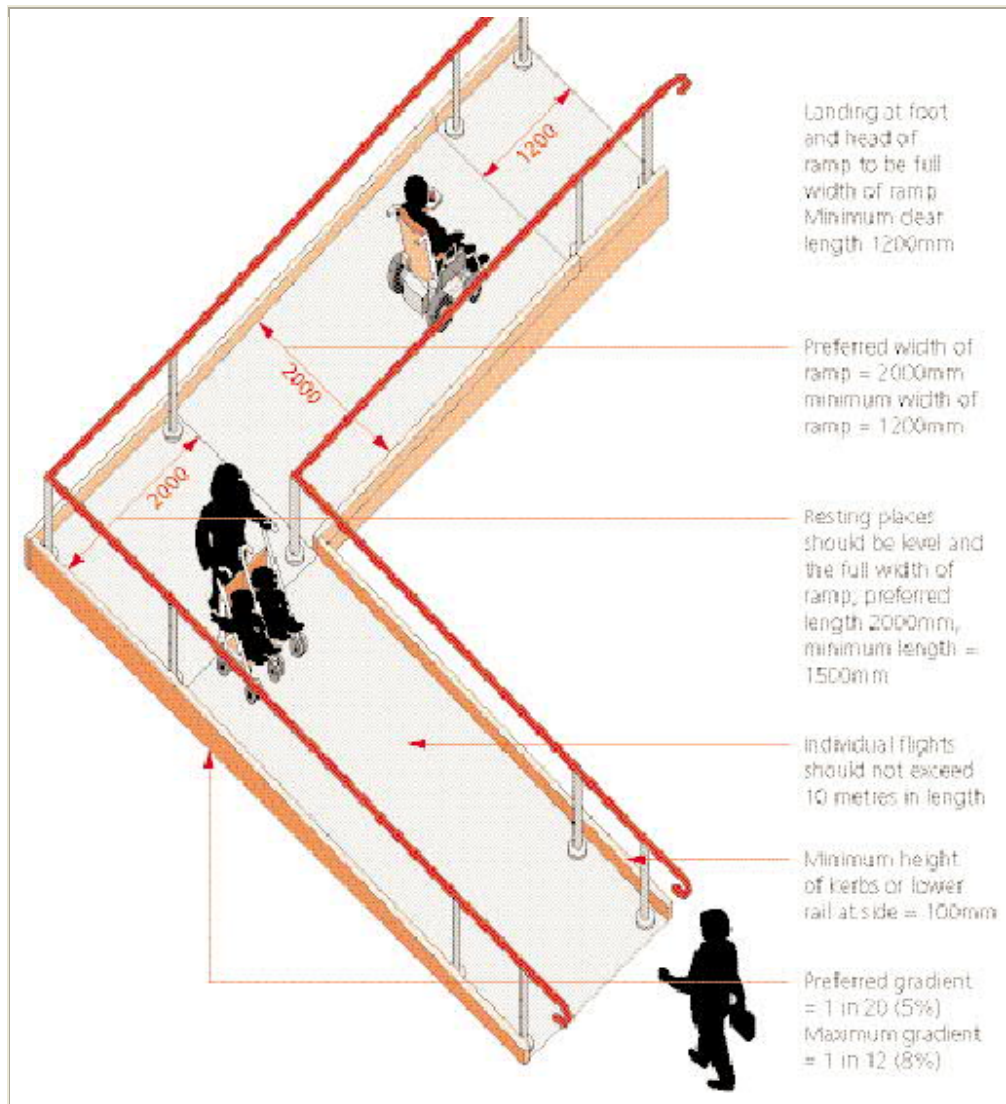
As mentioned in Section 3.7, means should be provided to limit the risk of people colliding with the underside of freestanding stairs or ramps at any point where the clear height is less than **2100mm**. The appropriate hazard warning surface should also be provided at the top and bottom of steps (as detailed in Section 4.2).

There should be unobstructed landing space at the top and bottom of each flight of stairs of a length at least equal to the unobstructed width of the stairway.

8.4.2 Ramps

In many places ramps (defined as a gradient of more than 1 in 20) will provide the alternative access to stairs for wheelchair users. Where the change in level is no more than **200mm** a ramp may be used without alternative steps.

Ramps



As described in Section 3.2, most guidelines specify **5 per cent (1 in 20)** as the preferred gradient and **8 per cent (1 in 12)** as the absolute maximum acceptable. There is a relationship between the length of a ramp and the gradient that people can manage; the longer the ramp the less severe the gradient that is feasible. One possible approach to this is, where a lengthy ramp is necessary, to design more frequent landings and lesser slopes for each successive segment.

BS 8300 states that a ramped approach should have the lowest practical gradient and should be within the limits shown in the table below.

Going of a flight	Maximum gradient	Maximum rise
Not exceeding 2m	1:12	167mm
Not exceeding 5m	1:15	333mm
Not exceeding 10m	1:20	500mm

A slightly steeper gradient of **1 in 10** is acceptable over very short distances, for example a ramp covering a distance of **600mm**. Gradients steeper than 1 in 10 are not only physically difficult to manage but may cause the wheelchair to overbalance.

If more than one flight is needed, there must be rest places between the flights. These should be level if under cover (**1 in 50** gradient if outside to drain surface water) should be at least **1500mm** long and the full width of the ramp. The landings at the foot and head of a ramp should be at least **1200mm** long, clear of any obstruction such as door swing and, again, should be the full width of the ramp.

The minimum surface width of a ramp should be **1200mm**, but as with stairways, two-way movement requires more space preferably **2000mm** (minimum **1800mm**).

Handrails should be provided on each side, with a minimum clear width rail to rail of **1000mm**. Where this unobstructed width exceeds **2000mm**, a central, continuous handrail may be used as an alternative to a handrail on each side.

The sides of a ramp should be protected by a raised solid kerb at least **100mm** in height. Australian standards also state that if the kerb height exceeds **75mm** there must be no slot or gap greater than **20mm** in the range of **75mm** to **150mm**. This is done to avoid the possibility of the footplate of a wheelchair riding over the kerb or becoming trapped. These standards also require the ramp-side face of the kerb to be flush with, or no more than **100mm** away from the ramp-side face of the handrail.

Transition between level and inclined parts of the ramp should be sufficiently rounded to ensure that a wheelchair user does not get caught by the foot supports. There is rarely a need for cross fall on a ramp. If drainage is thought likely to be a problem, the use of a pervious surface should be considered.

Physically fitting a ramp into the available space can be a problem if a lift cannot be made available. South Yorkshire Passenger Transport Executive has calculated that a ramp needed to give an over-rail clearance of 4.8 metres above platform level would require some 76 metres in length at 1 in 12 or 126 metres at 1 in 20, both measurements allowing for rest points. It is not clear how practicable ramps of this length would be for wheelchair users. Many manual wheelchair users would probably not be able to manage these distances unaided, though what constitutes a reasonable maximum length is not known; this is an area where further research is needed. The report of the European COST 335 project on Passengers Accessibility of Heavy Rail Systems states that ramps should never be longer than **132 metres** in total and preferably no longer than **50 metres**. The preferred figure (50 metres) means that ramps should not be used to bridge between platforms. No individual flight of a ramp should have a length of more than **10 metres** or rise more than **500mm**.

Where railway stations are being refurbished provision of lifts should be considered where the alternative would be a long ramp. However, it would be unrealistic to expect that lifts will always be provided so, in spite of their drawbacks, lengthy ramps are likely

to remain the only way of providing access for wheelchair users in some places. Where a long ramp is unavoidable, stairs should also be provided; some people prefer to climb a shorter staircase (properly designed) than a very much longer ramp.

The hazard warning tactile surface should be used at the foot of ramps to on-street LRT platforms, but should not be used at other ramps. Ramp surfaces must be slip resistant and non-reflective. A colour and tone contrasting V shaped marking on the ramp surface is helpful, with the apex of the V at the top of the ramp or ramp section.

If portable or temporary ramps have to be used to give access to an existing building where space is limited, they should be positioned and their presence identified so that they do not constitute a hazard to passers-by. These ramps should have a surface width of at least **800mm**, a drainable, slip-resistant surface and upstands to prevent wheelchair tyres veering off the edge.

8.4.3 Handrails

Handrails should be provided on both sides of stairways and ramps and down the centre of stairs when their unobstructed width (ie between handrails) exceeds **1800mm** (see Section 8.4.1). The recommended height to the top of the principal handrail is between **900mm** and **1000mm** above the pitchline of the steps or above the surface of the ramp. On landings the top of the handrail should be between **900mm** and **1100mm** from the surface.

Handrails should continue beyond the end of the ramp slope or end of the stairs by a (minimum) distance of **300mm** and should either return to the wall or down to the floor or have a minimum rounded downturn of **100mm**.

Second, lower handrails for children and people of restricted growth are helpful and should be at heights of between **550mm** and **650mm**.

The handrail itself should be smooth and comfortable to use by people with arthritic hands that is they should not be too small in diameter. Circular handrails should have a diameter between **40mm** and **50mm**; if not circular the handrail should be a maximum of **50mm** wide by **38mm** deep with rounded edges (radius of at least **15mm**).

There should be a clear space between the handrail and any adjacent wall of at least **50mm**, preferably **60mm**. Handrails should be supported centrally on the underside so there is no obstruction to the passage of the hand along the rail. There should also be a minimum of **600mm** clear space above the handrail.

Colour / tonal contrasted handrails are essential to assist partially sighted users.

8.4.4 Escalators

Entrances to buildings	150 lux
Passages and walkways	150 lux
Steps and stairs, at tread level	200 lux
Ramps, at top and bottom	200 lux
Station platforms and forecourts	50 lux
Underpasses	50 lux
Directional signage	200 lux
Maps and displays, text panels	200 lux
Counter tops	250 lux
Telephones	200 lux
Control panels (eg on lifts)	100 lux
Ticket and other interactive machines	
- interactive area	200 lux
- background level (around machine)	50 lux
Lifts, internal minimum (uniformly distributed)	100 lux
Lifts, landing area	200 lux
Accessible toilets	100 lux

It should be remembered that good levels of lighting will be of benefit to everyone who uses transport and pedestrian facilities. Bright, well-lit premises will encourage the use of public transport and lighting that eliminates dark areas or corners will give a greater feeling of security to passengers. Wherever possible, buildings should be designed to make maximum use of natural lighting, though care should be taken to minimize glare and strong reflections off surfaces.

12 Access in the countryside

Although this guide is mainly concerned with accessibility in the urban environment, access to the countryside is also important. Those who are involved in the design, planning and provision of access to the countryside should consult the British Telecom (BT) Countryside for All Standards and Guidelines (1997).

Many of the dimensions recommended in the BT Guidelines are similar to those given in this report. The following paragraphs summarize the key recommendations.

To allow for two-way pedestrian traffic paths should be at least **2000mm** wide with a clear visual distinction between the path surface and the ground next to it. If the path width has to be less than **1500mm**, passing places (minimum **1500mm** wide by **2000mm** long) should be provided every **50 metres**.

Where there are gates on a path, there should be clear space **2000mm** long, with **300mm** extra width adjacent to the latch side, on the side of the path into which the gate opens.

Where there are changes in level both steps and ramps should be provided, but if there is insufficient space for both provide a ramp. (The BT Guidelines give detailed recommendations for maximum ramp lengths and gradients in different countryside settings).

All accessible path surfaces should be compact, firm, stable, non-slip and obstacle free. Suitable materials include concrete, bitumen macadam, stone, timber, brick/paving and grass. Sand, loose gravel, woodchips and cobbles should not be used.

Bridges and boardwalks should have a minimum clear width between handrails or edging boards of **1200mm** for one-way traffic and **2000mm** for two-way traffic. At the start of a boardwalk the lip should not be more than 5mm high and gaps between boards (laid at right angles to the directions of pedestrians flow) should not be more than **12mm** wide. All boardwalks and bridges should have edge protection at least **75mm** high and also handrails.

The recommendations for the design of steps are similar to those given earlier in Section 8.4 of this report and include advice to avoid single steps, to use colour contrasting for step noses and to provide handrails.

Viewing points should, wherever possible, be accessible to everyone including wheelchair users. The provision of seating or resting places is important, as is ensuring that any information or interpretation points do not obscure the view for wheelchair users. If telescopes are provided they should have a variable height control and there should be knee space between the telescope and the ground to give wheelchair users access. Safety barriers should be provided where necessary and should take account of the viewing height of wheelchair users, though safety considerations are paramount.

Detailed advice on the design of gates and stiles, including a type of stile that can be used by people unable to climb over traditional stiles, is given in the BT Guidelines.

Seats and perches should be placed at regular intervals along paths in the countryside. They should be located no more than **100 metres** apart and should be set back from the main route by at least **600mm** to allow the free passage of through traffic. Surfaced resting places at least **900mm** square should be provided next to seats so that wheelchair users can sit next to family and friends.

Sheltered information and interpretation boards are helpful for visitors and can double up as shelter from the weather. They should be accessible to all visitors and, where possible, incorporate seats or perches under the shelter. The roof of the shelter should not just cover the information board, but also people who are reading it and the roof should be at least **2100mm** from the ground so that it is not a hazard for blind or partially sighted people. The BT Guidelines also include advice on signage and way marking, car parking and the provision of facilities including toilets and telephones.

13 Consultation, training and management

13.1 Consultation and participation

I. LTN 1/04 Policy Planning and Design for Walking and Cycling



LTN 1/04 - Policy, Planning and Design for Walking and Cycling

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1. Introduction

1.1 Context

1.1.1 The Government's policy for integrated transport has introduced a substantial change in the approach to transport schemes. In promoting an integrated transport system, the Government recognises the necessity for improving conditions for pedestrians and cyclists, with particular emphasis on the needs of disabled people. Promotion of walking and cycling is important in helping to support other major Government objectives such as improved public health, better air quality, and sustainable land-use planning.

1.1.2 This Local Transport Note (LTN) applies to rights of way under the control of local highway authorities. Two other LTNs accompany it. LTN 2/04 *Adjacent and Shared Use Facilities for Pedestrians and Cyclists* provides updated guidance on the application and design of off-carriageway facilities for cyclists and pedestrians (supersedes LTN 2/86). LTN 3/04, *Signs and Markings for Cycle Routes* provides guidance to designers of cycling facilities on the use of *Traffic Signs Regulations and General Directions, 2002* and it includes some common layouts (supersedes LTN 2/87).

1.1.3 All three LTNs refer to parts of the Design Manual for Roads and Bridges (DMRB). However, while the DMRB is a useful source of standards and advice for trunk roads, it is often not appropriate in the context of local roads. Local authorities should therefore consider how it is applied with care. Ultimately, local authorities are the arbiters of what happens on local roads. Guidance for accommodating non-motorised users along and across trunk roads is available from the Highways Agency.

1.1.4 Developments and innovations for walking and cycling are reported in Traffic Advisory Leaflets (TALs) available from the Department for Transport (DfT).

1.1.5 This document sets out the policy context that supports the promotion of pedestrian and cycling facilities (Chapter 2). It also describes common design principles for pedestrian and cycle provision (Chapter 3). These include:

- an overarching principle that any new measures proposed for pedestrians and cyclists should represent a real improvement over the existing situation, particularly in terms of accessibility, and, where practical and appropriate, offer users a positive advantage over motor traffic;
- the role of land use planning in enabling users to undertake more journeys on foot or by cycling;
- a hierarchy of users, which can assist in prioritising the needs of different transport modes where there are conflicting demands on carriageway space, or there is incompatibility in the highway layouts suiting different modes;
- hierarchies of provision, which provide a systematic approach to determining the best engineering solution for pedestrians and cyclists at a particular site;
- minimum requirements which should be met if the infrastructure is to be Convenient, Accessible, Safe, Comfortable and Attractive for pedestrians and cyclists;
- the various needs of different "design cyclists" and "design pedestrians" which should be considered when planning appropriate infrastructure; and
- the need for monitoring and evaluation to ensure that measures are fulfilling their intended purpose.

1.1.6 The decision-making framework for selecting and designing pedestrian and cycle infrastructure covers network planning, cycle/pedestrian review, scheme selection, scheme design and audit, and scheme implementation. The selection process uses the hierarchies of provision, and guides the designer to consider traffic reduction and speed reduction as the first options, followed by various on-carriageway solutions for cyclists. Where routes follow existing roads, the designer should only consider new off-carriageway options for cyclists or new alignments/grade-separated facilities for pedestrians if all on-carriageway solutions (including traffic and speed reduction) have been rejected as insufficient or inappropriate. However, this does not necessarily apply where the intention is to improve an existing off-carriageway route or where there is a specific need for a new route away from the road. LTN 2/04 gives guidance on the introduction of off-carriageway routes for cyclists.

1.1.7 Chapter 4 of this LTN outlines in more detail the infrastructure techniques available to cater for walking and cycling, and provides references for further guidance on these techniques. Examples are provided of how the policy and principles of the design process might be applied to promote walking and cycling.

2. Policy

2.1 Walking, cycling and integrated transport

2.1.1 The need to provide for pedestrians and cyclists is emphasised in the Government's *Guidance on Full Local Transport Plans* and in *Transport 2010 - The 10 Year Plan* in which the delivery mechanisms for the Transport White Paper are outlined. These documents emphasise the key role of walking and cycling as the main modes used for short trips (especially to local facilities such as shops, schools, etc) and in providing access to public transport for longer journeys.

2.1.2 The role of walking and cycling in helping to create liveable towns and cities and to promote health improvement and social inclusion has not always been recognised in the past. Around 25% of all journeys, and 80% of journeys of less than one mile are made on foot. Almost all other journeys include an element of walking. Three in ten households in the UK do not have access to a car, and in many one car households the majority of trips are made by non-car modes. Ensuring that there is safe and convenient access to jobs, education, health care, other services, and local facilities for non-motorised road users is an essential part of promoting social inclusion. Walking and cycling are low-cost travel modes available to almost all ages and have an important role to play.

2.1.3 The need to take the whole journey into account is important when considering public transport. Safe pedestrian and cycle access, and secure appropriate cycle parking (short and long term) at interchange facilities can help to stimulate greater use of these modes in conjunction with public transport. Improved cycling facilities can significantly increase the catchment of public transport stops, helping to boost patronage on the services. Improved access to public transport is an important element in reducing social exclusion.

2.1.4 High quality design of townscapes and rural transport infrastructure can help to encourage walking and cycling and assist with tackling social exclusion in many ways (see *Towards an Urban Renaissance*, DETR 1999, and *Making the Connections - Transport and Social Exclusion*, Social Exclusion Unit, ODPM 2003). Improvements to the walking and cycling environment are an inherent part of improving public spaces in towns and cities, and of providing access to work, education and healthcare in urban and rural areas. The emphasis on mixed use in new developments should help to bring about an increase in the number of shorter journeys undertaken on foot or by bike, and create attractive environments for pedestrians and cyclists.

2.1.5 Promoting walking and cycling is an important part of the Government's drive to raise the quality of life through the creation of sustainable communities. These are well designed, liveable places that are safe, visually attractive, and function well - places where people want to live and work. In order to realise high quality sustainable communities, the Government has placed good design at the heart of its planning policy. Policy Planning Guidance notes PPG1 and PPG3 make it clear that design is a material consideration of the planning system. PPG13 (Transport), promotes development patterns that encourage walking and cycling. PPG6 (Town Centres) places a strong emphasis on attractive pedestrian environments, keeping locations of the various activities and uses within walking distance of each other.

2.2 Walking, cycling, health and the environment

2.2.1 Walking and cycling for utility trips provide the opportunity to undertake daily exercise without the need for specialist equipment. Britain has a higher rate of coronary heart disease (CHD) and associated illnesses than most European countries. A modest amount of regular moderate intensity exercise such as walking or cycling can help to protect against developing such illnesses as CHD, stroke, non-insulin-dependent diabetes, osteoporosis and, by improving strength and co-ordination, it can also protect against falls, fractures and injuries (Davis, A, *Active Transport*, HEA 1999). Non-exercisers cycling approximately 30km per week can make significant gains in fitness, sufficient to considerably reduce any propensity to develop CHD (TAL 12/99, *Cycling for Better Health*).

2.2.2 Encouraging walking and cycling is included in the policy document *Our Healthier Nation*, DoH 1999. Air pollution can be attributed as a contributory cause to many respiratory diseases. Walking and cycling for short trips can help to reduce emissions to meet the objectives of the Government's Air Quality Strategy, DETR 2000.

2.2.3 The Government published the UK's Climate Change Programme in 2000. The programme sets out how the UK plans to meet its Kyoto target to cut greenhouse emissions to 12.5% below 1990 levels by 2008-2012, and move towards its domestic goal to cut carbon dioxide emissions to 20% below 1990 levels by 2010.

2.3 Walking, cycling and road safety

2.3.1 The Government has set the following casualty reduction targets for 2010 ¹ in its policy document *Tomorrow's Roads: Safer for Everyone*, DETR 2000:

- a 40% reduction in the number of people killed or seriously injured in road accidents;
- a 50% reduction in the number of children killed or seriously injured in road accidents; and
- a 10% reduction in the slight casualty rate, expressed as the number of people slightly injured per 100 million vehicle kilometres.

2.3.2 Child casualty reduction is a special focus of the 2010 Road Safety Strategy, which acknowledges the need to improve Britain's record, aligning it with the levels achieved in some other European countries.

2.3.3 Government also wishes to encourage more walking and cycling to improve public health and the environment, and to reduce congestion. Encouraging more children to walk and cycle to school is a key aim of the Government. This is demonstrated by its support, through the LTP process, for Safer routes to Schools and School Travel Plans.

2.3.4 Delivering increases in walking and cycling while reducing casualty numbers for these modes will require significant action by highway authorities, the police and others with responsibility for rights of way. Chapter 4 of this LTN provides examples of appropriate infrastructure measures that will create environments where it is safer to walk and cycle. It should be noted that walking and/or cycling journeys may take place along routes away from the highway network on footpaths, bridleways, canal towing paths and other rights of way. It is important that user safety is fully considered in the design of such routes.

2.3.5 Excessive and inappropriate speed is by far the biggest single contributor to recorded casualties in Britain. It can also be a significant deterrent to walking and cycling by creating a perception of danger. *New Directions in Speed Management, a Review of Policy*, DETR 2000, recommends reviewing the function of roads, and specifically their importance for walking and cycling journeys, to assist in setting speed limits.

2.4 Strategies for encouraging walking and cycling

2.4.1 During the last two decades, the number of walking journeys per person has fallen by 10% and the average distance walked by 24% (see *Providing for Journeys on Foot*, IHT 2000. The quality of the walking environment has deteriorated in many places as a result of increased motor traffic, worsened

perceptions of crime and assault, and a reduction in environmental quality. Although some areas have witnessed increases in cycle use since 1996, in many parts of the UK, cycling has remained at the base level of around 2% of all trips.

2.4.2 Local walking and cycling strategies set out how highway and planning authorities aim to encourage and facilitate the use of these modes. The inclusion of local walking and cycling strategies is a requirement in the guidance on preparing full Local Transport Plans. Successful strategies are often linked to employer and school travel plans or to health promotion initiatives. Sources of guidance on developing local walking and cycling strategies are listed in the bibliography.

2.5 Monitoring and re-evaluation

2.5.1 Local authorities should monitor progress towards the targets set in their walking and cycling strategies, and they should periodically re-evaluate these strategies to ensure that they are using the most effective means to achieve the targets. Cycling strategies would usually be expected to contain targets for modal shift, since in most areas, the level of cycling is extremely low. Such an indicator may be less relevant to walking, particularly in inner-urban areas where a high proportion of journeys is already undertaken on foot. TAL 2/00, *Framework for a Local Walking Strategy*, suggests key objectives, measures, outcomes and performance indicators, and gives advice on how to measure these. Many practical examples are included in *Walking: Making it Happen*, London Walking Forum 2000. The Annual Progress Report of the Local Transport Plan should include an assessment of progress towards the targets that a local authority hopes to achieve within the life of the plan.

2.5.2 Planning, monitoring and evaluation should involve studies of usage and demand to gain an understanding of which routes people use and why they use them. This will inform the development and improvement process, and help in establishing the necessary maintenance procedures.

¹ The baseline values for the 2010 casualty reduction targets are the average casualty rates for 1994-1998

3. Planning and Design principles

3.1 Introduction

3.1.1 Integrated transport plays an important part in realising the Government's aims of creating well designed sustainable communities. This issue is less constrained by finance than it was in the past and should lead to a greater range of infrastructure solutions to accommodate the conflicting demands of different modes in any given situation. Particular attention is drawn to the role of walking and cycling in supporting these aims.

3.1.2 This chapter describes the key concepts used in designing for pedestrians and cyclists. These include minimum pedestrian and cyclist requirements, the design pedestrian and design cyclist, and the hierarchies of provision. Recommended processes for selecting appropriate infrastructure for pedestrians and cyclists are presented at Annex A in Figures 1 and 2 respectively.

3.1.3 With careful design and traffic management, it is sometimes possible to cater for the needs of pedestrians and cyclists without providing obvious measures such as cycle lanes and sub-ways etc. This concept is often referred to as "invisible infrastructure" and its importance should not be underestimated.

3.2 Design requirements

3.2.1 Planning and designing high quality infrastructure involves developing very localised solutions in close consultation with local people, but there are some basic requirements that need to be satisfied, and these are summarised below. The underlying principle is that measures for pedestrians and cyclists should offer positive provision that reduces delay, diversion and danger. The design requirements should be considered in conjunction with the hierarchy of users (Section 3.3), hierarchies of provision (Section 3.6) and take into account the achievable traffic conditions (Section 3.7) to determine the most appropriate design solution.

3.2.2 Five core principles have been established common to both pedestrians and cyclists. They have been derived from the requirements for pedestrians included in *Guidelines for providing for journeys on foot*, IHT 2000 (Connectivity, Conspicuity, Convenience, Comfort, and Conviviality) and the requirements for cyclists included in *Cycle Friendly Infrastructure*, IHT 1996 (Coherence, Directness, Comfort, Safety, and Attractiveness). They are:

3.2.3 *Convenient*: Networks should allow people to go where they want, and new facilities should usually offer an advantage in terms of directness and/or reduced delay compared with existing provision. Routes and key destinations should be properly signed and street names should be clearly visible. On-street route maps can be particularly helpful in certain locations. Published route maps should also be made available. Ideally, routes should be unimpeded by street furniture, pavement parking and other obstructions which can be particularly hazardous to visually impaired pedestrians. There should be the minimum practicable delay for pedestrians and/or cyclists waiting at signalled crossings, and they should not face long detours along their route. Trip-end facilities should be clearly marked, conveniently located, and appropriate for the likely length of stay. Designers should consider the future ease of maintenance, including access to vehicles for sweeping, trimming grass verges and making surface and lighting repairs along off-road routes.

3.2.4 *Accessible*: Pedestrian and cycling routes should form a network linking trip origins and key destinations including public transport access points. The routes should be continuous and as direct as possible in terms of distance and journey time (type and colour of surfacing can be used to stress route continuity as appropriate). There should be proper provision for crossing busy roads and other barriers in urban and rural areas, and in some areas there should be a positive advantage over private motorised traffic. As far as is practicable, all parts of each route (including crossing points) should be situated on desire lines. Routes should be provided into and through areas normally inaccessible to motor vehicles such as parks and shopping centres, as this may help to encourage modal shift. Safe access for pedestrians and cyclists should be maintained at all times during road works. The needs of people with various types and degrees of disability should be taken into account at the design stage by consulting local groups representing them.

3.2.5 *Safe*: Not only must infrastructure be safe, but for the well being of users, it must be perceived to be safe. Traffic volumes and speeds should be reduced where possible in order to create the desired conditions. Reducing the impact of motor traffic also facilitates the implementation of other measures

beneficial to pedestrians and cyclists which might not otherwise be viable. Opportunities for redistributing space within the highway should be fully explored including moving kerblines and street furniture, providing right-turn refuges for cyclists or separating conflicting movements by using traffic signals. The potential for conflict between pedestrians and cyclists should be minimised. Maintenance plays an important part with regard to safe operation, and surface defects should not be allowed to develop to the extent that they become a hazard. Similarly, vegetation should be regularly cut back to preserve available width and sight lines. The latter is particularly relevant with regard to crime and the fear of crime. Apart from long sight lines, the risk of crime can be reduced through the removal of hiding places along the route, provision of lighting, and the presence of passive surveillance from neighbouring premises or other users. Waiting rooms, cycle parking etc, should be sited where people using the facilities can feel safe. In rural areas, the needs of pedestrians, cyclists and equestrians should be considered where their routes cross busy roads, and where a satellite village or district is separated from a town or city by a major ring road or bypass.

3.2.6 Comfortable: Infrastructure should meet design standards for width, gradient, and surface quality etc, and cater for all types of user, including children and disabled people as appropriate. Pedestrians and cyclists benefit from even, well-maintained and regularly swept surfaces with gentle gradients. Dropped kerbs are particularly beneficial to users of wheelchairs, pushchairs and cycles, and tactile paving needs to be provided to assist visually impaired people. Dropped kerbs should be properly flush with the road surface. Even a very small step can be uncomfortable and irritating for some users, especially if there are several to be negotiated along a route. Seating at regular intervals is desirable to enable people to stop and rest. Comfort is enhanced when users are free from the fear of crime.

3.2.7 Attractive: Aesthetics, noise reduction and integration with surrounding areas are important. The walking and cycling environment should be attractive, interesting and free from litter, dog mess and broken glass. If possible, routes should cater for users wishing to stop, chat and rest. The ability for people to window shop, walk or cycle two abreast, converse or stop to look at a view makes for a more pleasant environment. Public spaces need to be well-designed, finished in attractive materials, and be such that people want to stop in them to spend some time there. The surfaces, landscaping and street furniture must be well-maintained and regularly cleaned, and in keeping with the surrounding area. Issues of light pollution should be considered in addition to personal security in rural and semi-rural routes.

3.3 Hierarchy of users

3.3.1 The concept of a hierarchy of users has been established for use in the planning and design processes for new developments and proposed traffic management schemes. This places pedestrians at the top, followed by cyclists then public transport, with unaccompanied private car-users last. The objective of such a hierarchy is to ensure that the needs of the most vulnerable road users are fully considered in all highway schemes, but not necessarily to give priority to pedestrians and cyclists in every location.

3.3.2 Adoption of a hierarchy of users is recommended as one of the elements of good practice in Local Transport Plans, and is one of the recommendations in the *Government's Response to the Select Committee on Walking in Towns and Cities*, DTLR 2001.

3.4 The design pedestrian and design cyclist

3.4.1 This is a useful concept to distinguish between the differing priorities assigned to various aspects of a route (for example, safety versus directness) for users with different requirements due to their journey purpose, level of experience or physical ability. The design of the most appropriate infrastructure needs to take account of the anticipated type of user.

3.4.2 The design pedestrian types are:

- Commuter - prefers a fast direct route between home and work or when accessing public transport, regardless of quality of environment;
- Shopper/leisure walker - looks for ease of access, attractive retail environments, and attractive routes;
- Disabled person - requires level, clearly defined easy access and careful attention in the design and placement of street furniture, including resting points. Satisfying these requirements will also satisfy the needs of all other users, especially older people, people with heavy shopping/young children, and people with temporary impairments or low levels of fitness; and
- Child - requires a high level of segregation from motorised traffic and/or other measures to reduce the dominance of motor vehicles, such as speed reduction, together with good passive surveillance from other users. These are important factors where children and young people make independent journeys, especially journeys to school.

3.4.3 The design cyclist types are;

- Fast commuter - confident in most on-road situations, and will use a route with significant traffic volumes if it is more direct than a quieter route;
- Other utility cyclist - may seek some segregation at busy junctions and on links carrying high-speed traffic;
- Inexperienced utility, commuter and leisure cyclist - may be willing to sacrifice directness in terms of both distance and time, for a route with less traffic and more places to stop and rest. May travel more slowly than regular cyclists;
- Child - may require segregated, direct routes from residential areas to schools, even where an on-road solution is available. Design needs to take account of personal security issues. Child cyclists should be anticipated in all residential areas and on most leisure cycling routes;
- Users of specialised equipment - includes disabled people using hand-cranked machines and users of trailers, trailer-cycles, tandems and tricycles. This group requires wide facilities free of sharp bends and an absence of pinch-points or any other features which force cyclists to dismount. Cycle tracks and lanes where adult cyclists frequently accompany young children should be sufficiently wide to allow for cycling two abreast. This enables the adult to ride on the offside of the child when necessary.

3.4.4 All types of pedestrian and cyclist will use high quality well maintained traffic-free routes away from the carriageway if they are more direct than the equivalent on-road alternative and there are no personal security issues.

3.5 Route function and journey purpose

3.5.1 For most journeys, convenience (in terms of journey time and distance) and an acceptable degree of traffic safety and personal security are the most important design requirements for pedestrians and cyclists. This is particularly the case for access to public transport interchanges or other time critical journeys. These should be the main factors to take into consideration when planning networks of routes.

3.5.2 The journey purpose is important in defining the value attached to attractiveness. There are situations where walking or cycling for pleasure may be the only reason for the journey. These include rural leisure routes, parks, urban squares and tourist destinations. There are also multi-function environments such as shopping arcades, market places and public transport interchanges where people may wish to meet, relax or trade, but which may also serve as through-routes for pedestrians and cyclists.

3.5.3 Careful urban design can ensure that these areas are attractive and functional - it is important to get the balance right. Guidance on how to deliver a high quality environment is set out in *By Design*, DETR 2000. Advice on how to accommodate the conflicting requirements of multi-function urban roads and town centres is contained in *Transport and the Urban Environment* IHT 1998. The design of good quality urban pedestrian space is covered in *Going to Town - Improving Town Centre Access - a companion guide to PPG6*, DfT 2002, *Designing Streets for People*, ICE 2000, and *Guidelines on Pedestrianised High Streets* IHT 2001. *Inclusive Mobility - A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*, DfT 2002 sets out guidance on providing for access by disabled people to footways, footpaths, pedestrian areas, public transport and car parks. Guidelines and principles for good quality design of residential areas are included in *Places, Streets and Movement: A Companion Guide to Design Bulletin 32, Residential Roads and Footpaths*, DETR 1998, and *Better Places to Live*, DTLR 2001.

3.5.4 In order to accommodate the differing and sometimes conflicting needs of various user types and functions, it may be necessary to combine measures or to create dual networks offering different levels of provision, with one network offering greater segregation from motor traffic at the expense of directness and/or priority. Such dual networks may be considered analogous to a busy main road carrying through-traffic and a service road catering for access to homes and shops at lower speeds.

3.6 Hierarchies of provision

3.6.1 The majority of pedestrian or cycle routes use the *existing* road network. The first step in planning pedestrian or cycle infrastructure measures is to assess if any change is needed to existing provision. If so, selecting the appropriate measures should generally follow a preferred hierarchy for each mode (See Table 3.6). The hierarchy does not necessarily apply to schemes where it is intended to construct totally new cycle tracks/footpaths to a high standard which offer a more advantageous route than the equivalent route for motorised traffic. For pedestrians on narrow rural roads where speeds can be difficult to control and sightlines are often restricted, a new footway is often the preferred option.

Table 3.6: Hierarchies of provision

	Pedestrians	Cyclists
Consider first	Traffic reduction	Traffic reduction
	Speed reduction	Speed reduction
	Reallocation of road space to pedestrians	Junction treatment, hazard site treatment, traffic management
	Provision of direct at-grade crossings	Redistribution of the carriageway (bus lanes, widened nearside lanes etc)
	Improved pedestrian routes on existing desire lines	Cycle lanes, segregated cycle tracks constructed by reallocation of carriageway space, cycle tracks away from roads
Consider last	New pedestrian alignment or grade separation	Conversion of footways/footpaths to unsegregated shared-use cycle tracks alongside the carriageway

3.6.2 Both hierarchies include traffic reduction and speed reduction as the first and second options because these treatments are likely to offer wider community benefits in terms of road safety, streetscape, community severance and noise reduction, and make effective use of existing road space. Increased walking and cycling and improvements in streetscape, local environment and community safety are entirely compatible and mutually reinforcing.

3.6.3 The options at the bottom of each table should normally be considered last (unless they offer greater overall advantage - see 3.6.1) because they do not address the safety issues that preclude pedestrians or cyclists from using existing highway infrastructure. In some cases, new or grade-separated pedestrian alignments and cycle tracks may be less direct or may be problematic in terms of personal security. Designers must take these issues into account to ensure that a facility is useable. The measures in the hierarchy are not mutually exclusive - for example, reducing traffic speeds or volumes may be a pre-requisite for enabling an at-grade pedestrian crossing, cycle lane or a cycle track to be installed. For cyclists, the design also needs to take account of the traffic conditions discussed in section 3.7.

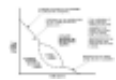
3.6.4 It is important that each option is considered thoroughly before resorting to any measure further down the hierarchy. Motor traffic reduction may appear quite difficult to achieve because of initial public resistance or resistance from traders or other interest groups, but it should not simply be discarded in favour of what seem to be less onerous measures further down the table. Sometimes it may be appropriate to introduce a trial scheme to gain public acceptance. Full consideration must be given to motor traffic reduction before it is dismissed as it may deliver benefits in terms of pedestrian safety, improved retail environments, and is usually the optimum solution for encouraging cycling. In the event that none of the options brings about any improvement, doing nothing may well be the best course of action. The introduction of sub-standard measures should be discouraged, and authorities should seek opportunities to upgrade existing measures where these have proven to be inadequate. Provision for walking and cycling should always be of good quality, to both attract and retain users.

3.6.5 Unsegregated shared-use by pedestrians and cyclists should normally be at the bottom of the hierarchy. The decision to adopt this option by taking space from pedestrians must not be taken lightly - see LTN 2/04.

3.7 Cycling infrastructure for different traffic speeds and volumes

3.7.1 In most situations cyclists have to be accommodated within the existing highway boundary. The decision to integrate cyclists with motor traffic, or physically separate them from it will depend on the speed and volume of that traffic. Where possible, speed and volume of traffic should be reduced to enable cyclists to use the carriageway in safety, but on roads where this is not possible, some form of segregation is desirable. Sustrans uses a form of the diagram below for the UK National Cycle Network (values have been omitted here because the diagram is only meant to demonstrate the principles involved). Clearly site-specific factors such as visibility and available lane widths need to be considered, but the diagram is a good starting point in design. It is important to consider the effect on pedestrians of any decision to create an off-road route, and this is discussed in LTN 2/04.

Link speed/flow diagram - selection of cycle route type



(Based on Sustrans' National Cycle Network Guidelines and Practical Details 1997 and CROW Sign Up for the Bike 1993)

3.8 Infrastructure planning

3.8.1 When designing infrastructure for pedestrians and cyclists, it is important to ensure that it is not simply being provided because an opportunity exists to do so. The demand for walking and cycling routes is influenced by the need to provide permeable development that does not result in long detours to gain access or to cross busy roads, nor undermine personal safety. Good safe links to public transport for multi-modal journeys, and trip-end facilities at destinations are important. Development planning and detailed design should assume that short journeys will be undertaken on foot or by bike through the availability of suitable and direct access routes. Poor planning or design can result in an unattractive scheme which may be technically correct but does not address the needs of users. Conversely, high quality public space can lead to drivers, pedestrians and cyclists modifying their behaviour and as a result, bring about a reduction in the dominance of motorised traffic without the need for special facilities. Some key issues are summarised in Table 3.8 below.

3.8.2 The decision-making process needs to take into account existing and potential users, levels of use, route function and the main journey purpose of users. Early consultation with likely users through transport fora, local user groups (particularly those representing disabled people), Local Authority Access Officers, and residents likely to be affected is important in defining the scope of the scheme. Later consultation is valuable for refining the design. Facilities should also be revisited following a settling down period after implementation to ensure that they are working as intended and to identify the need for any further modification.

Table 3.8: Key planning issues for walking and cycling

Permeable Infrastructure	Transport Connections	Positive Planning
<ul style="list-style-type: none"> ● Residential, retail and industrial development permeable to the passage of pedestrians and cyclists ● Exemption from traffic management measures ● Accessible, barrier-free environment ● Providing priority calls for pedestrians and cyclists at signals and crossings, and giving them priority at side road crossings ● Area wide traffic calming ● Home Zones and 20mph zones ● Safe Routes to School ● Clear signing and mapping 	<ul style="list-style-type: none"> ● Pedestrian- and cyclist-friendly links to public transport and interchanges ● Trip-end facilities tuned to user needs (e.g. seating, waiting rooms, cycle parking etc) ● Safe, direct, and convenient routes to town centres, shopping streets, schools, supermarkets, parks, libraries etc. 	<ul style="list-style-type: none"> ● Co-ordinated land-use and transport planning ● Positive development control for pedestrians and cyclists ● Rights of Way Improvement Plans ● Travel plans for school, work, shopping and leisure facilities, including where appropriate, personal travel plans ● User audits ● Promotion of walking and cycling

3.8.3 The flowcharts in Annex A summarise the pedestrian and cyclist infrastructure design processes, commencing with identification of demand (existing or potential), followed by a review of existing conditions and problem identification. This is followed by scheme selection adopting the hierarchies of provision, and finally by pedestrian/cycle audit to identify any deficiencies in the scheme. This is a simplistic overview of the process, and it may well be that a combination of measures is the most appropriate solution for any one location or route section. The flow charts do not include cycle parking, seating or other trip end facilities for pedestrians and cyclists, the need for which should be considered as a matter of course when planning for walking and cycling.

3.9 Audit and review

3.9.1 An audit is a check on the design of a scheme to ensure that it does not unduly affect people who are not part of the group the scheme is mainly aimed at. For example, if a scheme is designed to improve conditions for cyclists, a pedestrian audit will help ensure that the improvements do not cause difficulties for people on foot. A cycle audit on a cycling scheme should be unnecessary because the design process itself should make such an audit redundant. A review is a process which entails examining the existing infrastructure to explore ways of improving conditions for people who the proposed scheme is meant to serve. A cycle review should therefore precede the design of a scheme of cycling improvements.

3.9.2 Pedestrian audits, cycle audits, vulnerable road user audits together with their equivalent review processes can help to identify opportunities to improve conditions for pedestrians and cyclists. There will inevitably be times when the needs of different users conflict and planners have to make a professional judgement as to what the most appropriate course of action is. In some cases, it may be desirable to

involve the local community or user groups in audit and review procedures as part of the consultation process. Events such as 'Planning for Real' and 'Community Street Audits' can yield detailed local information to feed into the design process to ensure an integrated approach that deals with wider local issues.

3.9.3 Audit procedures should be applied to all new transport schemes (including land use developments) to ensure that opportunities to improve conditions for walking and cycling are properly considered and to ensure that, at the very least, conditions are not inadvertently made worse for these modes.

3.9.4 Audits should be applied to all schemes on urban roads. In rural areas the conditions require a different approach. If there is a general desire to facilitate cycling, such as may be the case where a primarily rural route links two villages within, say, 8km of each other, or where routes are likely to be promoted for recreational cycling, a cycle audit should be carried out. Pedestrian audits in rural areas are useful where gaps in the right of way network currently result in people walking along the highway, or where there is a significant or potentially significant amount of walking between residential areas and village schools or other services. On rural roads where cycling and walking is less likely to be significant, established safety audit procedures should pick up any features likely to introduce hazards for non-motorised users.

3.9.5 In rural areas and at the edge of urban areas there is often significant equestrian use of roads and other rights of way and this should be considered as part of the design process.

3.9.6 Audits may be undertaken at up to four stages of the design process:

- Preparation of a design brief.
- Preliminary design.
- Detailed design.
- Substantial completion.

3.9.7 Pedestrian Review and Cycle Review are systematic procedures for looking at existing transport routes or networks to identify shortcomings and potential enhancements. The review procedures are valuable in assisting with identifying a pedestrian or cycle priority network on which the bulk of funds and efforts to improve conditions will be targeted. Pedestrian/Cycle Review can be applied to part or all of a local transport network in order to identify priorities for action. Alternatively, it can be used reactively in response to a programmed land use development or highway scheme (bus priority for example) to identify aspects of the network that should be improved as part of the larger scheme.

3.9.8 The document *Guidelines for Cycle Audit and Cycle Review* was published by IHT in 1998, and is summarised in TAL 7/98, *Cycle Audit and Review*. An outline Pedestrian (Mobility) Audit Checklist and a Pedestrian Review Form are included at Appendices C and B respectively in *Guidelines for Providing for Journeys on Foot*, IHT 2000. Audit and review procedures are evolving as practitioners gain more experience. The Traffic Advisory Leaflet Bibliographies for cycling and walking are a useful source of information.

3.10 Land use planning

3.10.1 The principles of mixed-use planning and high-density urban form are outlined in *Planning Policy Guidance 13: Transport*, DETR 2001. PPG13 states that: "Land use planning has a key role in delivering the Government's integrated transport strategy. By shaping the pattern of development and influencing the location, scale, density, design and mix of land uses, planning can help to reduce the need to travel, reduce the length of journeys and make it safer and easier for people to access jobs, shopping, leisure facilities and services by public transport, walking and cycling."

3.10.2 The importance of high-density, permeable, mixed-use planning to walking and cycling is that it helps to meet the requirements of convenience and accessibility. Because such developments can be easily served by non-car modes (and are consequently much less car dependent), it is generally easier to provide high levels of accessibility and safety. By creating human-scale developments where there is a variety of urban forms and functions within a short distance of each other, comfort and attractiveness can also be addressed.

3.10.3 There are limits to the distances generally considered acceptable for utility walking and cycling. The mean average length for walking journeys is approximately 1 km (0.6 miles) and for cycling, it is 4 km (2.4 miles), although journeys of up to three times these distances are not uncommon for regular commuters. The distances people are prepared to walk or cycle depend on their fitness and physical ability, journey purpose, settlement size, and walking/cycling conditions. Useful guidance on desirable, acceptable and preferred maximum walking distances for different purposes is included in Tables 3.2 and 3.3 of *Providing for Journeys on Foot*, IHT 2000.

3.10.4 Since most journeys start or end at home, the location of new housing and how it connects to the existing movement framework is particularly important. *Planning Policy Guidance Note 3: (Housing)*, DETR 2000 calls for more sustainable patterns of development and better use of previously developed land. To achieve this, local planning authorities are required to:

- place the needs of people before ease of traffic movement when designing the layout of residential development;
- avoid inflexible planning standards, reduce road widths and traffic speeds, and promote a safer environment for pedestrians;
- seek to reduce car dependence by facilitating more walking and cycling through improved links with public transport between housing, jobs, local services and amenities, and by planning for mixed use; and
- promote good design in new housing development in order to create an attractive high-quality and sustainable living environment where people will choose to live, work and spend their leisure time.

3.10.5 Further sources of guidance on the subject of designing pedestrian and cycle routes through residential areas are Circular 2/93, *Public Rights of Way*, DoE 1993 and Circular 5/94, *Planning out Crime*, DoE 1994.

3.11 Consultation and publicity

3.11.1 Planning for pedestrians and cyclists requires a high level of carefully detailed design. Early consultation with local residents, businesses and user groups can save time in the design process and ensure that plans meet the needs of the intended users. It is recommended that organisations representing disabled people are contacted at local and national level, and that consultation materials are available in forms that are accessible to disabled users, including spoken word, Braille and electronic formats. Consultation events should be held at venues accessible to disabled users, and at times when people are likely to be able to attend. In areas where a significant proportion of the population does not usually speak English, it may be appropriate to prepare materials in more than one language and have staff with appropriate language skills available at events.

3.11.2 It is important to publicise the consultation as widely as possible using written media, as well as others such as local radio. Similarly, it can be important to publicise completed schemes to make it clear how they are intended to operate, especially where innovative or unusual infrastructure has been introduced. Other education and training initiatives can be used to publicise new road safety measures and to encourage compliance with speed limits, parking restrictions and advanced stop lines, etc.

3.11.3 When a local authority chooses to reject the outcomes of public consultation, or implements development or design that does not comply with national and local policies or design guidance, it should be able to demonstrate the rationale for such a decision to the groups and individuals who are adversely affected.

4. Applying The Design Options

4.1 Introduction

4.1.1 This chapter outlines the main engineering techniques used in providing for pedestrians and cyclists, and lists references for further information. It is arranged in the order in which the designer should consider design options, as defined by the hierarchies of provision (Section 3.6). Traffic reduction and speed reduction (approaches common to the hierarchies for both pedestrian and cyclist provision) are described first (4.2 to 4.3), followed by the remainder of the hierarchy for pedestrian provision (4.4 to 4.7) and that for cycling provision (4.8 to 4.13).

4.1.2 The engineering techniques are based on the assumption that existing highways infrastructure is in place. However, there is no reason why some of the techniques cannot be incorporated into new-build schemes. Advice on providing for pedestrians and cyclists in new development, and where new highways are required, may be found in documents such as *Better Places to Live*, ODPM 2001 and *Going to Town*, ODPM, National Retail Planning Forum 2002. The core principles set out in 3.2.3 to 3.2.7 apply equally to new and existing pedestrian and cycling networks.

Cycle Parking



Providing attractive accessible space for pedestrians and cyclists helps to improve the urban environment and can contribute to urban regeneration. (Photo: Adrian Lord)

4.2 Traffic reduction

4.2.1 Reducing the overall volume of traffic or restricting selected types of vehicle helps improve road safety and the quality of the local environment. Such moves can assist pedestrians and cyclists by increasing the footway and carriageway space available to them and may give them a time advantage over motor traffic.

4.2.2 Consideration needs to be given to:

- the potential impact of traffic diverting to other routes;
- signing that facilitates route-finding; and
- ensuring that speeds do not increase.

Vehicle restricted areas

4.2.3 TAL 9/93, *Cycling in Pedestrian Areas*, concludes that there are no real factors to justify excluding cyclists from pedestrianised areas, which suggests that cycling could be more widely permitted than it currently is without detriment to pedestrians. Accidents between pedestrians and cyclists in pedestrianised areas are very rare. When pedestrian density increases cyclists behave accordingly by slowing down, dismounting, or taking avoiding action as required. Where there are appreciable flows of pedestrians or cyclists, a defined route for cyclists through the area aids orientation and assists effective movement. At lower flows users mingle readily. When considering the safety aspects of allowing cyclists into a pedestrianised area, the risk to cyclists forced to use alternative on-road routes should be taken into account. This is particularly important if the alternatives are not safe or direct and cannot be made so (LTN 1/87, *Getting the Right Balance - Guidance on Vehicle Restriction in Pedestrian Zones*).

Road signs and parking stands



Bus Lanes and High Occupancy Vehicle Lanes provide road space that can also be used by cyclists, while road user charging can help to reduce traffic volumes. Off-carriageway space created by installing a delivery bay has been used for cycle parking stands and road signs, leaving the main footway (which is off to the left of the picture behind a wall) unobstructed. (Photo: Adrian Lord)

4.2.5 Chapter 9 of *Cycle Friendly Infrastructure*, IHT 1996 outlines the regulatory and design solutions to integrate cycling within pedestrianised areas. These include:

- pedestrian-only areas
- restrictions on selected vehicle types; and
- time- or date-based restrictions.

4.2.5 The following examples illustrate some of the techniques available.

Pedestrianised area - New Street, Birmingham



New Street, Birmingham (closed to vehicles except for access, deliveries and cyclists). The use of coloured block paving emphasises the fact that this is predominantly a space for pedestrians and cyclists. The road surface in the background is delineated by a half-height kerb. There is no formal cycle route demarcated. Seats and cycle parking stands are provided at regular intervals. (Photo: Adrian Lord)

4.2.6 LTN 1/87, *Getting the Right Balance - Guidance on Vehicle Restriction in Pedestrian Zones* provides more detail on the required Traffic Regulation Orders and signing requirements. In York and some other city centres, certain streets are open to pedestrians, cyclists and delivery vehicles before 10:00 and after 16:30 but to pedestrians only, between these times. (TAL 9/93 *Cycling in Pedestrian Areas*). This constructive approach enables the streets to be used by cycle commuters at times when they are not busy with shoppers.

Enclosed cycle lane



London Road, Kingston, a vehicle restricted area with a defined cycle track with a difference in level, colour and texture, leading to a signalised crossing. (Photo: Adrian Lord)

Traffic cells, point closures, bus gates, turning restrictions and one-way orders

4.2.7 Traffic cells can be created in existing town centres or residential areas by allowing private motorised traffic to enter and exit by a limited number of routes while allowing pedestrians, cyclists and public transport more numerous (and direct) access points into and between cells. This treatment offers significant local environment and safety benefits by reducing through traffic and providing a time advantage for sustainable modes.

4.2.8 Cyclists should be exempted from point closures, turning restrictions and one-way orders and permitted to use bus gates unless there are overriding safety considerations that cannot be resolved. Further guidance on bus priority and traffic management techniques is available in publications from DfT and IHT. LTN 3/04, *Signs and Markings for Cycle Routes* describes layouts and signing requirements for exempting cyclists from one-way orders.

Weight and height limits

4.2.9 A disproportionately high number of serious and fatal injuries to cyclists involves large goods vehicles. These accidents occur almost exclusively in urban areas and most commonly at junctions. The introduction of weight restrictions along cycle routes or the provision of cycle routes along roads with existing weight limits can improve cyclists' safety and comfort. TAL 5/97, *Cycles and Lorries* sets out a

range of other engineering measures that can be introduced to minimise cycle/lorry conflicts.

Techniques to discourage use of selected routes by motorists

4.2.10 Signal staging can be set to discourage particular manoeuvres by minimising the green time available to them. This can reduce rat-running along inappropriate routes while enabling access by residents and other essential users. The provision of advanced stop lines at traffic signals combined with extended or more frequent pedestrian signal phases should help limit delay for cyclists and pedestrians.

4.2.11 Similarly traffic calming, in addition to reducing speeds, encourages motorists to use other, more appropriate routes. Traffic calming techniques are covered more fully in 4.3.

Right turn lane and cycle gap



Right turn lane and cycle gap at residential road closure (Photo: DfT)

Signing strategies

4.2.12 In rural, suburban, and larger urban centres, direction signs can be used (often in conjunction with traffic calming on the minor road route) to direct most traffic along major roads, while retaining quieter through routes along minor roads for cyclists, pedestrians and local access. Signing must be consistent and well-maintained, but no more than is required. The deliberate omission of destinations from certain road signs may reduce the volume of motor traffic on minor roads, but this strategy needs to be applied with care, especially in rural areas where cyclists may be unfamiliar with the local area. It can also lead to cyclists being led onto major roads when a more suitable minor road is available.

Car parking management

4.2.13 One of the most effective ways of reducing urban traffic is through robust parking policies. Reducing the amount of long stay parking in city centres can help deter commuter traffic, while residents' parking schemes can help to control long stay parking at edge-of-town sites and near commuter stations. Removing on-street parking can help to release road space for pedestrian and cycle facilities and can lead to improved safety although the needs of disabled persons' parking card (the Blue Badge) holders must be taken into account when restricting vehicular access. Controlling the capacity of available parking by introducing features to prevent verge side parking is a technique often employed in rural areas with high levels of tourism.

Road user charging and workplace parking levies

4.2.14 Lower levels of motor traffic help stimulate walking and cycling. The Transport Act 2000 enables local authorities to introduce road user and workplace parking charges. Cycle use in central London increased significantly following the introduction of congestion charging. Some Travel Plan schemes offer employees the opportunity to trade in a valuable parking space in exchange for a cash reward, which can be used to purchase a bicycle or travel pass. Other schemes introduce a direct payment in exchange

for a parking place.

Bypasses

4.2.15 Towns in the Bypass Demonstration Project were given additional funding to introduce traffic calming and environmental improvements. The reduction in traffic levels allowed speed limits to be reduced and former through-roads to be re-engineered to reflect their change in status. This has created improved conditions for pedestrians and cyclists. Care in the design of the bypass itself can avoid the severance effect of such roads for pedestrians and cyclists.

Safer Routes to Schools

4.2.16 Safer Routes to Schools schemes offer the opportunity to introduce measures to facilitate walking and cycling throughout the catchment area of a school or group of schools. Measures should always take into account the needs of the wider local community, and should consider personal safety implications in addition to road safety issues.

Children crossing a road with roadworks



It is important to provide crossings and a higher level of segregation on routes to schools. At such sites, the level of pedestrian activity may be insufficient to warrant a crossing using the traditional numeric approach, but there is clearly a need for additional facilities. LTN 1/95 offers a more flexible approach to pedestrian crossing assessment. (Photo: Jon Toy)

Park and Ride

4.2.17 Bus-based park and ride sites are often linked to the city centre by bus priority measures, which may also benefit cyclists. Cycle parking at the park and ride site enables users to cycle to the site and then use the bus for the busier part of the route, or to drive the longer rural part of a journey and cycle the final urban section.

Cycle Stands



Cycle stands and lockers at a park and ride site near York. (Photo: DfT)

4.3 Speed reduction

4.3.1 At the heart of the integrated transport policy *A New Deal for Transport - better for everyone*, DETR 1998 is the encouragement of public transport, cycling and walking, and discouragement of using the car for inappropriate journeys. Traffic calming has a significant role to play in achieving these objectives by improving the safety and environment of vulnerable road users. A forthcoming LTN, *Traffic Calming*

Measures, will provide comprehensive guidance on the use of traffic calming measures. It covers relevant legislation and the design, effectiveness and installation (including signing and lighting) of traffic calming, and incorporates design features to assist cycling and walking.

4.3.2 Walking has a major role in transport and the Government wants walking to be easier, more pleasant and safer than it is now. Advice to local authorities is given in TAL 2/00, *Framework for a Local Walking Strategy*, and reiterated in *On the Move: By Foot*, DfT 2003 a discussion paper reflecting the issues raised in a series of seminars during 2002. The most important problem is inappropriate vehicle speed. Reducing speeds, particularly in residential areas and along busy pedestrian routes, would reduce accidents significantly and make injuries much less severe.

4.3.3 By reducing the speed, dominance and, at times, the volume of motor vehicles, traffic calming can benefit cyclists. In older towns and cities where space is at a premium, traffic calming would be an appropriate means of facilitating cycling, as lower speeds and flows can lessen the need to separate cyclists from motor traffic, IHT 1996.

4.3.4 From the outset, local authorities should view traffic calming schemes as an opportunity to improve conditions for cyclists, and scheme designs should be cycle-friendly. The Institution of Highways and Transportation publication *Guidelines for Planning and Design of Cycle-Friendly Infrastructure*, IHT 1996, includes advice on cyclists and traffic calming.

4.3.5 Other sources of detailed design advice include the *National Cycle Network: Guidelines and Practical Details Issue 2*, Sustrans 1997, and the *CSS Traffic Calming guide* CSS et al 1994. Particular care needs to be exercised in rural areas to ensure that engineering measures do not introduce inappropriate 'urban' features. *Rural Routes and Networks*, Countryside Agency/Institution of Civil Engineers 2002, gives appropriate examples. A regularly updated Traffic Calming Bibliography is available from DfT, giving many references that may be useful when considering a scheme.

20 mph zones

4.3.6 A TRL review of 20 mph zones with traffic calming found that speeds were reduced by about 9 mph and traffic flows reduced by 27%. This led to a 60% reduction in overall accident frequency.

4.3.7 Reductions in pedestrian and cyclist accidents of 63% and 29% respectively have been measured where 20 mph zones were introduced in the UK. Child pedestrian and child cyclist accidents were reduced by 70% and 48% respectively after the introduction of 20 mph zones.

4.3.8 Since 1999, it has been permissible under certain conditions to apply 20 mph speed limits without any accompanying traffic calming.

Home zones

4.3.9 These are intended to improve the quality of life of residents. Hard landscaping is often used to create an environment where vehicle speeds are reduced to very low figures. Pedestrians, motor traffic and cyclists often share a common surface. The power to designate a home zone is contained in Section 268 of the Transport Act 2000.

Home zone road sign



In home zones, pedestrians, cyclists and vehicles mix at low speeds (Photo Wayne Dueden)

Speed limit reduction in villages and on rural links

4.3.10 A range of measures such as village gateways, rumble strips etc can often benefit pedestrians, cyclists and equestrians by reducing speeds. 'Quiet Lanes' are minor rural roads (or networks of roads) that are appropriate for shared use by walkers, cyclists, horse riders and motorised users. These roads carry small amounts of motor traffic travelling at low speeds. The DfT's expectation is that 30 mph speed limits will apply on all roads that pass through villages. Further information on the design of roads in rural areas is available from the DfT and the Countryside Agency (*Roads in the Countryside*, Countryside Agency 1995, *Design Issues for Rural Traffic Management*, Countryside Agency 2000 and *Rural Routes and Networks*, ICE/Countryside Agency 2002).

Traffic calming

4.3.11 Vertical measures include full width humps, speed cushions, speed tables and rumble strips. Round and flat topped humps with steep ramps can be uncomfortable for cyclists and some disabled people. Sinusoidal profile humps are usually more comfortable, but require careful design and construction (TAL 9/98). Pre-cast sinusoidal humps are available from some manufacturers. Cyclists are normally able to ride through the gap between speed cushions but side ramp faces should not be steeper than 1:4 and on/off ramps not steeper than 1:8 as sometimes it is impossible to avoid riding over the cushions. Full width flat topped speed humps sometimes become informal crossing points for pedestrians, and can be beneficial to wheelchair users and people with pushchairs. Rumble strips and corrugated surfacing (with cycle gaps) can be used, although care needs to be taken to ensure that there is no noise disturbance to nearby properties.

4.3.12 Horizontal measures include build-outs, chicanes, and central refuges. Motorists will not usually attempt to overtake cyclists where the available width is 3.0m or less (TAL 9/94 *Horizontal Deflections*, and TAL 1/97 *Cyclists at Road Narrowings*). Widths between 3.1m and 3.9m should be avoided as it is in this range that motorists will often attempt to overtake cyclists where there is insufficient room to pass safely. Cycle bypasses should be provided where possible, but careful design detailing is needed to avoid problems with drainage, sweeping and to prevent obstruction by parked vehicles. A bypass should not require cyclists to travel additional distance, or require them to give way before rejoining the main carriageway. Central refuges are helpful to pedestrians, and can encourage people to cross the carriageway at places where there is good visibility. For a central refuge to safely accommodate cyclists, wheelchair users and pedestrians with pushchairs, it needs to be at least 2.0m wide

4.4 Reallocation of road space to pedestrians

Footway widening

4.4.1 *Inclusive Mobility*, DfT 2002, recommends a footway width of 2.0m as the minimum under normal circumstances, with an acceptable minimum of 1.5m. At restrictions or obstacles, an absolute minimum useable width of 1.0m is acceptable for short distances (maximum length 6.0m). Footways less than 1.2m wide can be inconvenient and sometimes unpleasant to use, and it is often necessary for pedestrians to step into the carriageway to pass each other. At bus stops, a minimum footway width of 2.0m should be provided where pedestrian flows are low, increasing to a minimum of 3.0m where they are high. Widths of 3.5m to 4.5m are recommended outside shops. Carriageway space to widen footways can often be released as a result of introducing traffic management schemes or parking restrictions. Scheme designers should take care that the carriageway width is not reduced to such an extent that cyclists' safety is compromised. It may be necessary to introduce speed reduction methods to maintain the safety of cyclists on the carriageway.

Widened footway - Broad Street, Birmingham



In Broad Street, Birmingham, the widened footway has enabled street cafes and bars to thrive in what has become the entertainment quarter of the city centre. Some of the advantage of the widened footway has been lost through businesses placing A-frame advertisements on it, which can be hazardous for blind people. (Photo: Adrian Lord)

Central median

4.4.2 On some wider streets and boulevards the central median can become an attractive feature for pedestrians, but it is important to provide sufficient numbers of crossing points, carefully situated so as not to compromise the character of the streetscape.

Central median



The footways were widened and a central median provided as part of work to improve The Strand, London (Photo: Adrian Lord)

4.5 Provision of at-grade crossings for pedestrians

At-grade crossings

4.5.1 These can be introduced at junctions and along link sections of the highway where there is a pedestrian crossing demand. In addition to the installation of crossings in response to an accident problem, there may be a need to re-assess facilities in the light of increased or altered traffic flows following a new development or change of use, or where a new pedestrian desire line has been identified. LTN 1/95

recommends a methodology for local authorities to assess where pedestrian crossings are needed and to decide what type of crossing is best for a particular site. LTN 2/95 gives advice on the design of pedestrian crossings. This LTN is supplemented by Traffic Advisory Leaflets 1/01 and 1/02 about puffin crossings, and they need to be read together.

Example of a zebra crossing



Zebra Crossing, Westminster (Photo: DfT)

4.5.2 In all cases, local authorities should aim to develop the most pedestrian-friendly environment that can be achieved, consistent with meeting the local casualty reduction target and with properly serving the interests of other road users. This may be a matter of a simple change; for example replacing a staggered pelican crossing by a straight-across puffin crossing. Or, it may need changes much further back in the planning process to achieve other aspects of the hierarchy of provision such as, for example, reducing traffic speeds and flows at particular locations to levels where guard rails are not required. In some cases it may mean putting crossings on all arms of a junction at the expense of capacity for motor traffic.

4.5.3 In urban areas, at-grade crossings are usually preferable to grade separated crossings such as subways and footbridges which can raise fears about personal security and are sometimes inaccessible to disabled people. However, grade-separated solutions may be the only safe option on high-speed suburban and inter-urban roads. Controlled and uncontrolled at-grade crossing points should normally be marked with tactile paving and have dropped kerbs installed **fully** flush with the road surface. It is not acceptable to allow water to pond at a dropped kerb. Good workmanship is essential here to ensure that drainage is properly provided. *Inclusive Mobility*, DfT 2002, gives the current recommendations for visually impaired people and wheelchair users. *Guidance on the Use of Tactile Paving Surfaces*, DETR 1998, gives advice on the installation of these surfaces. Crossing points should not be installed on a kerb radius.

Stop lines

4.5.4 Increasing the distance between the stop line and the crossing studs from 2m to 3m has been proven to improve safety and comfort for pedestrians by positioning waiting motor vehicles further from the crossing point. Advanced stop lines for cyclists can also have this effect.

4.6 Improved pedestrian routes on existing desire lines

Improved pedestrian alignments

4.6.1 There is often evidence of a desire line for pedestrians across planted or grassy areas, or where a guard rail or fence has been broken or removed. It is important to create direct pedestrian routes to and within areas such as car-parks, bus stops, bus and rail stations and other journey attractors. In new developments, the movement of pedestrians into and through an area is often ill-considered and routes can become tortuous and unpleasant to use, particularly where there are long cul de sacs.

4.6.2 The improvement of existing pedestrian routes often requires a series of minor changes such as rationalising street furniture to create a clear unobstructed route. This could involve moving signs and lighting columns to the edges of the pedestrian path, improving the paving, and creating at-grade crossings of side roads by using flat topped speed humps possibly in conjunction with localised road narrowing. It can also include re-timing traffic signals to reduce delay to pedestrians and cyclists at signal controlled crossings, or introducing additional crossings at junctions.

4.7 New pedestrian-only alignment or grade separation

New alignment

4.7.1 New pedestrian alignments are particularly valuable where they create a short-cut compared with an existing route. Alongside major roads, especially in suburban and rural areas, it may be appropriate to move an existing footway from being immediately adjacent to the carriageway for safety or environmental reasons, so that there is some physical separation such as a verge or hedge. Alternatively, a new alignment may be completely away from the highway. In such circumstances, there may be an opportunity to introduce a new cycle track at the same time if this is desirable and appropriate.

Grade-separated crossings

4.7.2 Where a pedestrian route crosses a major road or a railway line, the most desirable solution may be grade separation. Both ramps and steps should be provided where practicable. Parapet height should be a minimum of 1.4m if cyclists are expected to use a bridge (legally or otherwise), or 1.8m if equestrian use is also expected. See *BD 52/93, Design of Highway Bridge Parapets, Design Manual for Roads and Bridges*, Highways Agency 1993. Widths for different circumstances are specified in *Inclusive Mobility*, DfT 2002, and other references (see 4.7.3).

Example of a grade-separation crossing - Paradise Circus Queensway, Birmingham



If possible, the design of the scheme should ensure that pedestrians have a minimal change of level by, for example, putting the road in a cutting such as here at Paradise Circus Queensway, Birmingham. This scheme enabled expansion of the city centre into an area that was previously cut off by the inner ring road. (Photo: Adrian Lord)

4.7.3 Key references are *Inclusive Mobility*, DfT 2002, and *Design Manual for Roads and Bridges TD36/93 Subways for Pedestrians and Pedal Cyclists: Layout and Dimensions*, Highways Agency 1993. Acceptable pedestrian ramp gradients range from less than 5%, up to 10% in exceptional circumstances. Cycle ramp gradients should preferably be less than 3% and should not normally exceed 5%. If space is very restricted, a gradient of up to 7% may be used. Ramps may need to include landings as resting points for wheelchair users. Guidance on distances between landings is given in *Inclusive Mobility*.

4.8 Complementary and trip-end facilities for pedestrians

Signing, Route Maps and Information

4.8.1 Signing is essential for visitors to an area, and signing of key destinations from railway/bus stations and other points of arrival is important. Where non-highway standard direction signing is used for pedestrians and cyclists, it must be clear and legible with good colour contrast between letters and backgrounds. Signs and tactile maps for visually impaired people should be designed in accordance with *Inclusive Mobility*, DfT, 2002.

4.8.2 Street maps can be installed at strategic locations throughout the town centre, and should also be available from information points at transport interchanges. Route maps offer opportunities for the promotion of walking for health and leisure through themed walks, such as fitness walks or historic walks.

Example of a Street Map



Good on-street information with local maps and public transport timetables. (Photo: Adrian Lord)

Seating

4.8.3 Seating can be used to positively enhance the quality of an urban area and is greatly valued by less mobile pedestrians. Care needs to be taken to ensure that seats are not placed in a position where they impede heavy flows of pedestrians or pose a hazard to visually impaired people. Research suggests that the maximum walking distance without a rest for many mobility impaired people is around 100 metres and, in heavily used pedestrian areas and interchanges, seats should be provided at 50 metre intervals. Advice on the design and positioning of seating facilities is given in *Inclusive Mobility*, DfT 2002.

Means of access to public transport interchanges

4.8.4 Providing wheelchair access to public transport interchanges can also assist cyclists, people with pushchairs, and other less mobile travellers. Anticipating the use of facilities by a variety of different user groups can help in designing out potential conflict and ensure that dimensions are adequate. Accessible entrances should always be clearly sign posted.

4.9 Junction treatment, hazard site treatment and traffic management for cyclists

Advanced Stop Lines

4.9.1 ASLs enable cyclists to position themselves ahead of other traffic during the red phase at signalised junctions. Cyclists at ASLs are more visible to other traffic and are therefore better placed to execute manoeuvres that might otherwise conflict with the movement of motor vehicles. Cyclists also benefit from being able to queue away from harmful exhaust emissions. ASLs allow cyclists who want to go straight ahead to get in front of motor vehicles intending to turn left. They are also useful to cyclists who need to make a right turn. (TAL 5/96 and TAL 8/93). ASLs can also benefit pedestrians, as motor vehicles are required to wait further from the crossing area and are therefore less intimidating.

Example of an Advanced Stop Line (ASL)



ASL with mandatory feeder lane (Photo: Adrian Lord)

Cycle route priority crossing

4.9.2 Off-carriageway cycle tracks parallel to a main route may have to cross a number of side roads. These crossings are normally configured so that the side road has priority over the cycle track. Where appropriate, the priority may be reversed by placing the cycle track on a flat topped speed hump and putting give-way markings on the side road. This may be reinforced by other traffic calming measures.

Cycle Track



Cycle track with priority over side road. (Photo: Tony Russell)

4.9.3 Mandatory cycle lanes within the carriageway cannot be continued across the mouth of a side road. In these circumstances, the mandatory lane is terminated each side of the junction and the lane continues past the side road as an advisory one (often with coloured surfacing to reinforce visibility).

Toucan crossing

4.9.4 A Toucan crossing is an unsegregated signal controlled crossing for cyclists and pedestrians. Cyclists may use the crossing without dismounting. It is important that there is enough width on the approaches and on the crossing itself to minimise the potential for conflict between users. Cyclists and pedestrians on the approaches may be segregated, and this can continue right up to the kerb line but segregation is usually terminated before the waiting areas (see TALs 10/93 and 4/98).

4.9.5 Toucan crossings work best when the flow of either group of users wishing to cross is not too great. As flows increase, these crossings may experience operational difficulties. If so, pedestrian and cycle flows may be better served by parallel crossings, or entirely separate ones.

Parallel Crossing

4.9.6 A segregated pedestrian/cycle crossing is called a parallel crossing. Parallel crossings may be used in high pedestrian/cycle flow locations where the movements of pedestrians and cyclists are likely to conflict with each other.

4.9.7 If a dedicated cycle crossing totally separated from pedestrians is installed, there will be a cycle-only stage in the signal sequence. The cycle phase may be called by push buttons, loop detectors, microwave detectors, or a combination of these.

Toucan crossing



Toucan crossings can benefit pedestrians and cyclists in terms of both journey time and safety at busy junctions where a cycle track crosses a road. (Photo: Adrian Lord)

Urban Traffic Management and Control (UTMC)

4.9.8 UTMC is used to control the flow of traffic within urban areas. It can assist in area safety schemes, and deter drivers from using certain routes by altering the signal timings at junctions. In some cases this may be beneficial to cyclists by giving priority to a cycle route (in conjunction with bus priority for example) or by controlling traffic volumes along links. It may be possible in some circumstances to set up the 'green wave' in a UTMC system for a low design speed to assist pedestrian safety and cyclist progression.

4.10 Redistribution of the carriageway for cyclists

Bus lanes

4.10.1 Cyclists should normally be allowed access to with-flow and contraflow bus lanes and bus-only streets (LTN 1/97, *Keeping Buses Moving*, DETR 1997). The preferred lane width where there is combined use with cyclists is 4.5 m. Where the width is less than 4.0m, a narrow bus layby (1.5m wide) may be necessary to enable cyclists to pass at bus stops. Where with-flow bus lanes are of minimum width, cyclists are still usually safer in the bus lane than in the general traffic lane unless there is a high volume of bus traffic.

4.10.2 Where cyclists use contraflow bus lanes, conflict with other traffic occurs mainly at the beginning and end of the lane. Between junctions, the accident risk tends to be low. If safe junctions are provided for cyclists at the entry and exit points, it may be safer to allow them to use these bus lanes even where they are of minimum width. In assessing the safety issues, it is important to recognise that if a contraflow bus lane is not made available to cyclists, they may have to use a more hazardous alternative route which will almost certainly be less direct.

Widened nearside lanes

4.10.3 These can be beneficial in creating additional space in an all-purpose lane used by cyclists, without some of the disadvantages associated with advisory cycle lanes. The extra space can be introduced at minimal cost as part of routine carriageway re-marking, and is useful where there are relatively high flows of HGVs and buses. An example is the A38 Bristol Road in Birmingham, which has a 4.25m nearside lane and a 3.0m offside lane.

Reduction in number of all-purpose traffic lanes

4.10.4 To ensure cycle facilities are adequate it may be worth considering removal of a general traffic lane. Safety may improve through a reduction in overtaking accidents, and the space released could, for example, make the introduction of pedestrian refuges and right-turning cycle lanes possible.

4.11 Cycle lanes

With-flow cycle lanes

4.11.1 These can be mandatory or advisory (details of the signing and marking are included in LTN 3/04). Mandatory cycle lanes are delineated by a solid white line. Motor vehicles are not permitted in a mandatory cycle lane during its hours of operation, but cyclists are entitled to ride outside the lane. Mandatory lanes require a traffic regulation order to prohibit use of the lane by motor vehicles and to impose parking or waiting restrictions. Cycle lanes should normally be carried across junction mouths, and where the lane is mandatory, a short section of advisory cycle lane is required here to enable motor vehicles to cross it.

Advisory Cycle Lane



Advisory cycle lane and left turn ban with exemption for buses and cycles. (Photo: Adrian Lord)

4.11.2 Advisory cycle lanes are marked with a broken white line and do not require a traffic regulation order. Advisory lanes may be used when a mandatory one would be impractical. They should not be favoured over mandatory lanes simply because they are easier to instal. All cycle lanes should preferably be a minimum of 1.5m wide to ensure that motor vehicles pass cyclists at a safe distance. If an advanced stop line (ASL) is provided at a junction where width is limited, an advisory cycle feeder lane may be used instead of a mandatory one. This permits motor vehicle encroachment into the cycle lane and thus allows an ASL to be provided where the available room would otherwise preclude it.

4.11.3 A cycle lane may be intermittent as a result of the carriageway being too narrow in places. If so, and to help preserve route continuity, each break in the lane can be marked as an advisory cycle route using signs and cycle logos only. 4.11.4 Coloured surfacing may be used in mandatory and advisory lanes and can help to prevent encroachment into the lane by motor vehicles.

Contraflow cycle lanes

4.11.5 Contraflow lanes permit cyclists to travel against the flow of motor traffic in one-way roads and thus avoid circuitous one-way systems. They can be used to similar effect in false one-way roads (i.e. two-way roads which have no-entry signs at one end).

4.11.6 If a street is to be converted to one-way, consideration should always be given to providing a contraflow facility for cyclists at the same time. In addition, it is strongly recommended that existing one-way streets are studied with a view to modifying them to accommodate contraflow cycling where practicable. As with contraflow bus lanes, in assessing the safety issues it is important to recognise that if a one-way street is not made available to cyclists in contraflow, they may have to use a more hazardous alternative which will almost certainly be a less direct route.

Segregated contraflow lane



Segregated contraflow lane (Photo: Adrian Lord)

4.11.7 Contraflow lanes can be physically segregated from the general traffic lanes and are safer than unsegregated ones but they require more space. Otherwise, the lanes may be mandatory or advisory, or the contraflow facility may not even exist as a cycle lane at all. Layouts and signing are included in LTN 3/04. Contra-flows using an advisory cycle lane or no lane at all require special authorisation from the Department for Transport, and the authorisation procedure is included in LTN 3/04 and TAL 6/98.

Other cycle lanes

4.11.8 One example is Torrington Place in Camden. This is an experimental scheme where a physically segregated bi-directional cycle lane has been provided on one side of the carriageway. The lane has priority over side road entrances and is segregated from the rest of the carriageway along link sections by a raised kerb.

4.12 Cycle tracks

4.12.1 Cycle tracks can be beneficial to children and other inexperienced users by separating them from fast moving traffic. They benefit all types of cyclists where there is little scope for safe provision within the carriageway, such as at large multi-lane junctions and roundabouts. They can be designed for cycle use only (although they are often used by pedestrians) or they may be combined with pedestrian footways or footpaths (see LTN 2/04). Where cycle tracks are installed, the trip length should preferably be shorter, and never more than 10% longer than the equivalent on-road route. Cycle tracks intended for utility journeys away from the carriageway (for example through a park or across a common) should normally be lit but if not, an alternative on-road route should be provided for use during darkness. The design of cycle tracks in rural areas should reflect the character of the location and not lead to a sense of urbanisation.

Cycle-only tracks

4.12.2 There may be sufficient room within the highway boundary to provide cycle tracks parallel to the carriageway but such tracks require careful thought because of the problems associated with their crossing side roads and footways. In urban areas a cycle track is normally required to give way at side roads, and for this reason, many experienced cycle commuters will not use the facility. If the cycle track is to have priority over side roads, it must be raised relative to the carriageway surface through the use of a flat-topped road crossing (absolute maximum height 100mm, recommended maximum 75mm) and signed using the appropriate road markings (see LTN 3/04). Care needs to be taken to ensure that these layouts are properly designed so that motor vehicles turning into the side road have adequate opportunity to see cyclists crossing and stop for them. Where cyclists are required to give way, dropped kerbs should be installed fully flush with the road surface.

Cycle tracks adjacent to or shared with a pedestrian route

4.12.3 There may be some circumstances where adjacent or shared use with pedestrians is the most desirable design option available. (Adjacent use means there is some form of segregation between pedestrians and cyclists; shared use is otherwise.) Examples include cycle routes to primary schools, cycle access to vehicle-restricted areas and linear routes designed primarily for leisure walking and cycling. Care needs to be taken to minimise the potential for conflict, particularly at bus stops and where a route is likely to be used by older and/or disabled people. Such routes may be adjacent use or shared use, but especially on utility routes, there should be a presumption in favour of physical segregation unless conditions dictate otherwise. Some forms of tactile paving are available for this application (see *Guidance on the Use of Tactile Paving Surfaces*, DfT 1998). The decision not to segregate cyclists from pedestrians will depend on the volume of flow of either group, and the total width available for the route. In some circumstances, for example where forward visibility is restricted, it may be appropriate to segregate by direction of flow rather than by mode. LTN 2/04 deals with adjacent and shared use, and explains the legal basis for the creation and use of different types of cycle track.

Integrated cycle track within footway



The cycle track and adjacent footway are separated by a level difference. The scheme was created by taking out a service road. (Photo: Adrian Lord)

4.13 Complementary and trip-end facilities for cyclists

Cycle parking

4.13.1 Appropriate long or short stay cycle parking should be sited as close as possible to the final destination (TAL 7/97, *Supply and Demand for Cycle Parking*, DETR 1997). TAL 6/99, *Cycle Parking - Examples of Good Practice* and NCN leaflet *Cycle Parking*, include a variety of good practice solutions for different situations. Cycle lockers are increasingly being used to provide secure long-stay parking at businesses and public transport interchanges. Local authorities should ensure that cycle parking is provided in new developments by including cycle parking standards in planning guidance.

Cycle Locker



Cycle lockers can be used to provide secure long stay parking at stations (Photo DfT)

4.13.2 Poorly sited cycle parking or lack of formal parking can create hazards for blind or partially sighted people. Some parking stands now incorporate tapping rails and these are preferred (tapping rails not only assist blind people using sticks but they help prevent guide dogs walking through the stands). The facilities should not interfere with visibility splays and should avoid pedestrian desire lines. Good locations for cycle parking are build-outs created by removing car parking spaces, and these can sometimes be combined with informal pedestrian crossing points. Good examples include Kensington High St where cycle parking is provided on the central reserve (see below), and Notting Hill Gate and Brompton Road (see 4.2), which have cycle parking stands on build-outs next to car parking bays.

Cycle parking in central reserve



Cycle parking in central reserve, High Street, Kensington. (Photo: DfT)

14.3.3 Cycle parking in rural and historic areas may be constructed from cast iron or other suitable materials, using designs that fit in with the surrounding street furniture. Designs should be convenient and secure without being visually obtrusive or over-engineered.

Cycle Parking contained within build outs



Cycle parking bay protected by build outs. (Photo: Alex Sully, English Regions Cycling Development Team)

Signing

4.13.4 Care should be taken to ensure that route signing is easy to follow and legally correct, and that key destinations are included especially where the route of the cycle track and/or pedestrian footpath differs from the route used by motor traffic. Signing needs particular emphasis where shared-use ends and pedestrian-only routes begin. Signing may be supplemented by road marking such as the cycle symbol on advisory routes (see LTN 3/04).

Sign posts



This traditional style sign, in a semi-rural environment, includes information about its location to help with route finding and features a slotted pole design to prevent the signs from being turned by vandals. (Photo: Steve Essex, Manchester City Council)

Route maps and information

4.13.5 In addition to signing, pedestrians and cyclists can benefit from the provision of on-street plans and information, not just at public transport interchanges, public buildings, and key destinations, but also at intersections with main routes. In rural areas, interpretation boards can be used to illustrate routes, connections to public transport and features of interest. Copies of the maps should also be available from information centres and downloadable from the Council's website. Some authorities have incorporated information panels for route maps etc into the design of clusters of cycle parking stands.

Bike Guide Publication - Southampton County Council



Photo: Southampton CC

4.13.6 The provision of information can often be tied in to health promotion, school and workplace travel plan initiatives. Information about routes, local cycle shops, local cycling groups and contact details for relevant organisations are usually included. Mapping should be of sufficient quality such that a person unfamiliar with the area would be able to follow routes without reference to additional maps.

4.14 Temporary measures for pedestrians and cyclists

Cyclists and pedestrians at road works

4.14.1 It is important to ensure that the safety and convenience of pedestrians and cyclists is not compromised by road works. This topic is covered more fully for pedestrians in *Guidelines for Providing for Journeys on Foot*, IHT 2000 and for cyclists in TAL 15/99, *Cyclists at Road Works*, DETR 1999. Where road works limit the carriageway to a single lane, a minimum lane width of 4.0m is desirable to enable cars to pass cyclists safely, and a minimum width of 4.25m is necessary for HGVs to pass safely. Advice about street works on footpaths is given in *Inclusive Mobility*, DfT 2002.

5. Key References and Useful Addresses

5.1 General

5.1.1 Some of the key texts giving advice on good practice, and preferred design solutions and dimensions are listed below. Many can be accessed from DfT website (www.dft.gov.uk) or from the National Cycling Strategy website (www.nationalcyclingstrategy.org.uk). A national website for walking is to be developed in the near future. Regularly updated cycling, walking and traffic calming bibliographies are available from the DfT, which detail publications by the DfT and many other organisations.

5.2 Walking

5.2.1 *On the Move by Foot: a Discussion Paper*, DfT 2003. Sets out ideas for encouraging more walking through planning, design and encouragement measures.

5.2.2 *Guidelines for Providing for Journeys on Foot*, IHT 2000. Main principles and references for good practice in catering for pedestrians.

5.2.3 *Walking: Making it Happen*, London Walking Forum 2000. Contains many examples of good practice in applying policies, plans and programmes to promote and facilitate walking.

5.2.4 *Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*, DfT 2002. Also available from the DfT web site ²₃

5.2.5 *Guidance on the Use of Tactile Paving Surfaces*, DETR 1998. Also available from the DfT web site ³₃

5.2.6 *DIY Community Street Audits*, Living Streets 2002. A self-help guide for communities to identify opportunities for improving local conditions for people on foot.

5.2.7 *The Assessment of Pedestrian Crossings*, LTN 1/95, DoT 1995 and LTN 2/95 *The Design of Pedestrian Crossings*, DoT 1995.

5.3 Cycling

5.3.1 LTN 3/04, *Signs and Markings for Cycle Routes* includes the range of prescribed signs available and their correct usage.

5.3.2 *Cycle Friendly Infrastructure*, IHT 1996. Main principles and references for all aspects of providing for journeys by bike, including trip-end facilities.

5.3.3 *London Cycle Network Design Manual*, LCN 1998. Contains guidance on how to implement routes for cyclists in typical urban situations where optimal conditions are difficult to achieve.

5.3.4 *National Cycle Network: Guidelines for Planning and Design*, Sustrans 1997. Design guidance intended to cater for novice, child and less-experienced cyclists requiring higher levels of separation from motor traffic.

5.4 Walking and cycling

5.4.1 LTN 2/04, *Adjacent and Shared Use Facilities for Pedestrians and Cyclists*, DfT 2004. Sets out the design criteria for implementing a shared-use scheme.

5.4.2 TAL 1/87, *Measures to Control Traffic for the Benefit of Residents, Pedestrians and Cyclists* is a brief review of traffic calming techniques.

5.4.3 Forthcoming LTN, *Traffic Calming*, DfT. This document will contain the latest guidance on traffic calming principles and techniques, including the application of traffic calming measures along main roads.

5.4.4 *By Design - Urban design in the planning system: towards better practice*, DETR 2000. This guide by the Commission for Architecture and the Built Environment (CABE) aims to promote higher standards in urban design and acts as a companion to PPG1 *General Policy and Principles*, which sets the policy for urban design.

5.4.5 *Design Bulletin 32* and companion volume *Places, Streets and Movement*, DETR 1998. The primary design guidance for residential areas although now in need of revision. Includes footway and cycle track widths, kerb radii and sightlines as well as more general guidance about layout and design.

5.4.6 *Better Places to Live*, ODPM 2001. This guide is a companion to PPG3 (*Housing*), DETR 2000. It aims to improve the quality of design in residential areas and provides advice on how to create a good movement framework for residential areas. *Better streets, Better places: Delivering Sustainable Residential Environments*, DfT 2003, examines progress towards meeting the requirements of PPG3.

5.4.7 *Going to Town - Improving Town Centre Access*, ODPM/National Retail Planning Forum 2002, is a companion guide to PPG6: *Town Centres and Retail Developments*, DETR 1996, and sets out good practice for design of town centres.

5.4.8 *Best Practice to Promote Walking and Cycling*, (ADONIS Project Report 3). Report for EU from Danish Roads Directorate 1998. Includes examples of innovative solutions from a number of European countries.

5.4.9 *Transport in the Urban Environment*, IHT 1997. Wide-ranging document providing an overview of the main traffic management techniques applicable to urban transport, including catering for pedestrians and cyclists. Useful as an initial source of information about issues such as parking management, vehicle restrictions and other measures that may indirectly improve conditions for pedestrians and cyclists.

5.4.10 *Cycling: the way ahead for towns and cities*, European Commission, DG XI 1999. Includes several successful examples of how cycling provision and promotional strategies have been undertaken in European towns and cities, and comparisons of cycle ownership and use.

5.4.11 *Roads in the Countryside*, Countryside Agency 1995, looks at the general design of roads within rural areas.

5.4.12 *Quiet Roads: Taming Country Lanes*, Countryside Agency, 1998 looks specifically at the issue of providing rural roads that are attractive and safe for pedestrians, cyclists and equestrians as well as for motor traffic.

5.4.13 *Public Rights of Way*, Circular 2/93, DoE 1993, gives detailed advice about the topic. Further detail on the latest developments is available from the DEFRA and Countryside Agency web sites.

5.5 Transport, health and environment

5.5.1 *Cycling Towards Health and Safety*, British Medical Association 1992. Identifies the much greater health benefits of cycling compared with the risks posed by traffic danger.

5.5.2 *Active Transport*, Health Education Authority 1999. Gives an overview of issues and case studies of initiatives to promote walking and cycling.

5.5.3 *Making T.H.E. Links*, Health Education Authority 1999. A guide for local authorities and healthcare providers on integrating sustainable transport, health and environmental policies.

5.5.4 *Our Healthier Nation*, Department of Health 1999. Government policy statement on health.

5.5.5 *National Air Quality Strategy*, DETR 2000. Government Strategy to reduce air pollution from transport and other sources.

5.5.6 *Making Travel Plans Work: Lessons from UK Case Studies*, DfT 2003. Case studies of successful workplace strategies to reduce car use and encourage walking, cycling and other modes.

5.5.7 *Planning out Crime*, Circular 5/94, DoE 1994. Gives advice on crime reduction aspects of designing roads, footpaths and open public space.

5.5.8 *Making the Connections - Transport and Social Exclusion*, Social Exclusion Unit, ODPM 2003. Looks at the crucial role of transport in providing access to education, employment, health care and other services.

5.6 Road safety

5.6.1 *Tomorrow's Roads: Safer for Everyone*, DETR 2000 sets out the Government Policy on road safety and targets for reducing the number of casualties.

5.6.2 *New Directions in Speed Management: a Review of Policy*, DETR 2000 specifically deals with Government policy on motor vehicle speeds and their role in road safety and transport planning.

5.7 Useful addresses

5.7.1

DfT Free Literature
P O Box 236
Wetherby

West Yorkshire
LS23 7NB

Tel: 0870 1226 236
Minicom 0870 1226 405
Fax: 0870 1226 237
Email: dft@twoten.press.net

5.7.2

DfT Traffic Advisory Leaflets
Charging & Local Transport Division
Zone 3/19, Great Minster House
76 Marsham Street
London
SW1P 4DR

Tel 020 7944 2478

5.7.3

DfT Mobility and Inclusion Unit
(advice on accessible pedestrian environments and installation of tactile paving).

Zone 1/18, Great Minster House
76 Marsham Street
London
SW1P 4DR

Tel 020 7944 6100
Minicom 020 7944 3277
Email: miu@dft.gov.uk

5.7.4

Highways Agency Publications Officer
Heron House
49/53 Goldington Road
Bedford
MK40 3LL

5.7.5

Countryside Agency
John Dower House
Crescent Place
Cheltenham,
Gloucestershire
GL50 3RA

Email: transport@countryside.gov.uk

5.7.6

Sustrans Head Office
35 King Street
Bristol BS1 4DZ

Tel: 0117 926 8893
Fax: 0117 929 4173

² *Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure:*
<http://www.dft.gov.uk/transportforyou/access/tipws/inclusivemobility>

³ *Guidance on the Use of Tactile Paving Surfaces:*
<http://www.dft.gov.uk/transportforyou/access/tipws/guidanceontheuseoftactilepav6167>

Annex A

Figure 1: Walking Infrastructure Design Process



Figure 2: Cycling Infrastructure Design Process



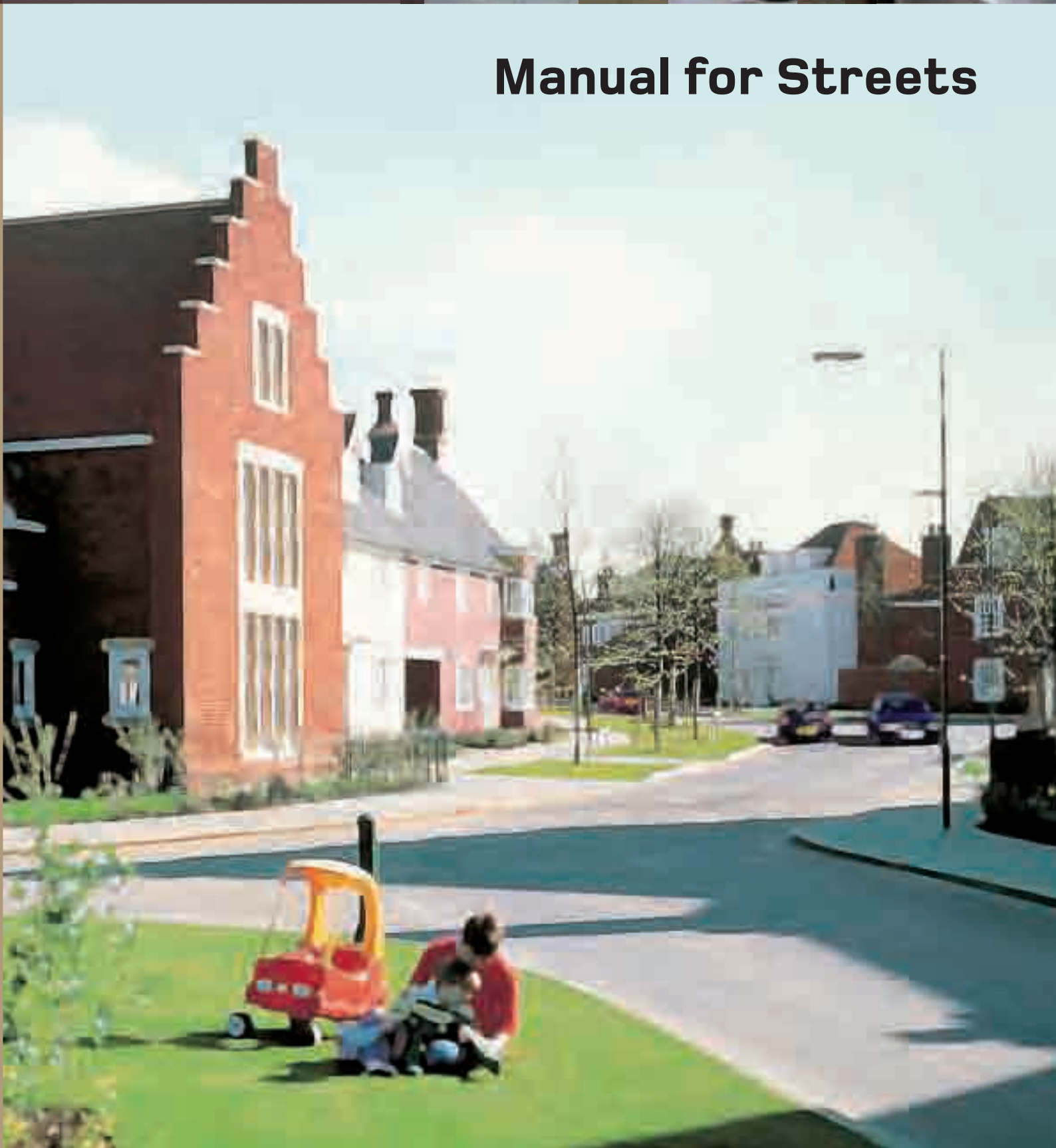
J. Extract from Manual for Streets



Department for
Transport



Manual for Streets





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Manual for Streets



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C



Detailed design issues

6

Street users' needs



Chapter aims

- Promote inclusive design.
- Set out the various requirements of street users.
- Summarise the requirements for various types of motor vehicle.

6.1 Introduction

6.1.1 Street design should be inclusive. Inclusive design means providing for all people regardless of age or ability. There is a general duty for public authorities to promote equality under the Disability Discrimination Act 2005.¹ There is also a specific obligation for those who design, manage and maintain buildings and public spaces to ensure that disabled people play a full part in benefiting from, and shaping, an inclusive built environment.

6.1.2 Poor design can exacerbate the problems of disabled people – good design can minimise them. Consultation with representatives of various user-groups, in particular disabled people, is important for informing the design of streets. Local access officers can also assist here.

6.1.3 Designers should refer to *Inclusive Mobility*,² *The Principles of Inclusive Design and Guidance on the Use of Tactile Paving Surfaces* (1999)⁴ in order to ensure that their designs are inclusive.

6.1.4 If any aspect of a street unavoidably prevents its use by particular user groups, it is important that a suitable alternative is provided. For example, a safe cycling route to school may be inappropriate for experienced cyclist commuters, while a cycle route for commuters in the same transport corridor may be unsafe for use by children. Providing one as an alternative to the other overcomes these problems and ensures that the overall design is inclusive.

6.1.5 This approach is useful as it allows for the provision of a specialised facility where there is considerable demand for it without disadvantaging user groups unable to benefit from it.

6.2 Requirements for pedestrians and cyclists

6.2.1 When designing for pedestrians or cyclists, some requirements are common to both:

- routes should form a coherent network linking trip origins and key destinations, and they should be at a scale appropriate to the users;
- in general, networks should allow people to go where they want, unimpeded by street furniture, footway parking and other obstructions or barriers;
- infrastructure must not only be safe but also be perceived to be safe – this applies to both traffic safety and crime; and
- aesthetics, noise reduction and integration with surrounding areas are important – the environment should be attractive, interesting and free from graffiti and litter, etc.

6.3 Pedestrians

6.3.1 The propensity to walk is influenced not only by distance, but also by the quality of the walking experience. A 20-minute walk alongside a busy highway can seem endless, yet in a rich and stimulating street, such as in a town centre, it can pass without noticing. Residential areas can offer a pleasant walking experience if good quality landscaping, gardens or interesting architecture are present. Sightlines and visibility towards destinations or intermediate points are important for pedestrian way-finding and personal security, and they can help people with cognitive impairment.

6.3.2 Pedestrians may be walking with purpose or engaging in other activities such as play, socialising, shopping or just sitting. For the purposes of this manual, pedestrians include wheelchair users and people pushing wheeled equipment such as prams.

6.3.3 As pedestrians include people of all ages, sizes and abilities, the design of streets needs to satisfy a wide range of requirements. A street design which accommodates the needs of children and disabled people is likely to suit most, if not all, user types.

6.3.4 Not all disability relates to difficulties with mobility. People with sensory or cognitive impairment are often less obviously disabled,

1 Disability Discrimination Act 2005. London: TSO.
2 Department for Transport (2002) *Inclusive Mobility A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*. London: Department for Transport.
3 CABI (2006) *The Principles of Inclusive Design (They include you)*. London: CABI.
4 DETR (1999) *Guidance on the Use of Tactile Paving Surfaces*. London: TSO.



Figure 6.1 West End of London 1884 – the block dimensions are of a scale that encourages walking.

so it is important to ensure that their needs are not overlooked. Legible design, i.e. design which makes it easier for people to work out where they are and where they are going, is especially helpful to disabled people. Not only does it minimise the length of journeys by avoiding wrong turns, for some it may make journeys possible to accomplish in the first place.

6.3.5 The layout of our towns and cities has historically suited pedestrian movement (Fig. 6.1).

6.3.6 Walkable neighbourhoods should be on an appropriate scale, as advised in Chapter 4. Pedestrian routes need to be direct and match desire lines as closely as possible. Permeable networks help minimise walking distances.

6.3.7 Pedestrian networks need to connect with one another. Where these networks are separated by heavily-trafficked roads, appropriate surface level crossings should be provided where practicable. Footbridges and subways should be avoided unless local topography or other conditions make them necessary. The level changes and increased

distances involved are inconvenient, and they can be difficult for disabled people to use. Subways, in particular, can also raise concerns over personal security – if they are unavoidable, designers should aim to make them as short as possible, wide and well lit.

6.3.8 The specific conditions in a street will determine what form of crossing is most relevant. All crossings should be provided with tactile paving. Further advice on the assessment and design of pedestrian crossings is contained in Local Transport Notes 1/95⁵ and 2/95⁶ and the *Puffin Good Practice Guide*.⁷

6.3.9 Surface level crossings can be of a number of types, as outlined below:

- Uncontrolled crossings – these can be created by dropping kerbs at intervals along a link. As with other types of crossing, these should be matched to the pedestrian desire lines. If the crossing pattern is fairly random and there is an appreciable amount of pedestrian activity, a minimum frequency of 100 m is recommended.⁸ Dropped kerbs should

5 Department for Transport (1995) *The Assessment of Pedestrian Crossings*. Local Transport Note 1/95. London: TSO.

6 Department for Transport (1995) *The Design of Pedestrian Crossings*. Local Transport Note 2/95. London: TSO.

7 County Surveyors' Society/Department for Transport (2006) *Puffin Good Practice Guide* available to download from www.dft.gov.uk or www.cssnet.org.uk.

8 Department for Transport (2005) *Inclusive Mobility A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*. London: Department for Transport.

be marked with appropriate tactile paving and aligned with those on the other side of the carriageway.

- Informal crossings – these can be created through careful use of paving materials and street furniture to indicate a crossing place which encourages slow-moving traffic to give way to pedestrians (Fig. 6.2).
- Pedestrian refuges and kerb build-outs – these can be used separately or in combination. They effectively narrow the carriageway and so reduce the crossing distance. However, they can create pinch-points for cyclists if the remaining gap is still wide enough for motor vehicles to squeeze past them.
- Zebra crossings – of the formal crossing types, these involve the minimum delay for pedestrians when used in the right situation.
- Signalised crossings – there are four types: Pelican, Puffin, Toucan and equestrian crossings. The Pelican crossing was the first to be introduced. Puffin crossings, which

have nearside pedestrian signals and a variable crossing time, are replacing Pelican crossings. They use pedestrian detectors to match the length of the crossing period to the time pedestrians take to cross. Toucan and equestrian crossings operate in a similar manner to Puffin crossings except that cyclists can also use Toucan crossings, while equestrian crossings have a separate crossing for horse riders. Signalised crossings are preferred by blind or partially-sighted people.

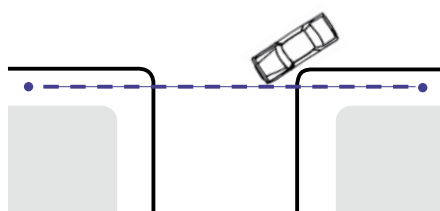
6.3.10 Obstructions on the footway should be minimised. Street furniture is typically sited on footways and can be a hazard for blind or partially-sighted people.

6.3.11 Where it is necessary to break a road link in order to discourage through traffic, it is recommended that connectivity for pedestrians is maintained through the break unless there are compelling reasons to prevent it.

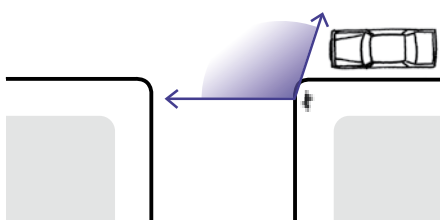


Figure 6.2 Informal crossing, Colchester – although the chains and a lack of tactile paving are hazardous to blind or partially-sighted people.

Small radius (eg. 1 metre)

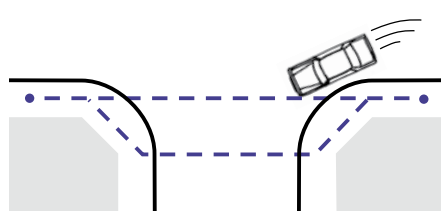


- Pedestrian desire line (---) is maintained.
- Vehicles turn slowly (10 mph – 15 mph).

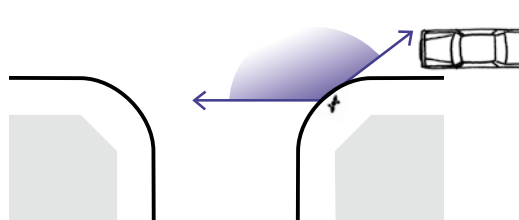


- Pedestrian does not have to look further behind to check for turning vehicles.
- Pedestrian can easily establish priority because vehicles turn slowly.

Large radius (eg. 7 metres)



- Pedestrian desire line deflected.
- Detour required to minimise crossing distance.
- Vehicles turn faster (20 mph – 30 mph).



- Pedestrian must look further behind to check for fast turning vehicles.
- Pedestrian cannot normally establish priority against fast turning vehicles.

Devon County Council

Figure 6.3 The effects of corner radii on pedestrians.

6.3.12 Pedestrian desire lines should be kept as straight as possible at side-road junctions unless site-specific reasons preclude it. Small corner radii minimise the need for pedestrians to deviate from their desire line (Fig. 6.3). Dropped kerbs with the appropriate tactile paving should be provided at all side-road junctions where the carriageway and footway are at different levels. They should not be placed on curved sections of kerbing because this makes it difficult for blind or partially-sighted people to orientate themselves before crossing.

6.3.13 With small corner radii, large vehicles may need to use the full carriageway width to turn. Swept-path analysis can be used to determine the minimum dimensions required. The footway may need to be strengthened locally in order to allow for larger vehicles occasionally overrunning the corner.

6.3.14 Larger radii can be used without interrupting the pedestrian desire line if the footway is built out at the corners. If larger radii

encourage drivers to make the turn more quickly, speeds will need to be controlled in some way, such as through using a speed table at the junction.

6.3.15 The kerbed separation of footway and carriageway can offer protection to pedestrians, channel surface water, and assist blind or partially-sighted people in finding their way around, but kerbs can also present barriers to some pedestrians. Kerbs also tend to confer an implicit priority to vehicles on the carriageway. At junctions and other locations, such as school or community building entrances, there are benefits in considering bringing the carriageway up flush with the footway to allow people to cross on one level (Fig. 6.4). This can be achieved by:

- raising the carriageway to footway level across the mouths of side roads; and
- providing a full raised speed-table at 'T' junctions and crossroads.



Andrew Cameron, WSP

Figure 6.4 Raised crossover, but located away from the desire line for pedestrians and therefore ignored – the crossover should be nearer the junction with, in this case, a steeper ramp for vehicles entering the side street.



Stuart Reid, TRL

Figure 6.6 Uninviting pedestrian link – narrow, not well overlooked, unlit and deserted.



Tim Pharoah, Llewellyn Davies Yeang

Figure 6.5 Inviting pedestrian link.



Andrew Cameron, WSP

Figure 6.7 Overlooked shared route for pedestrians and vehicles, Poundbury, Dorset.

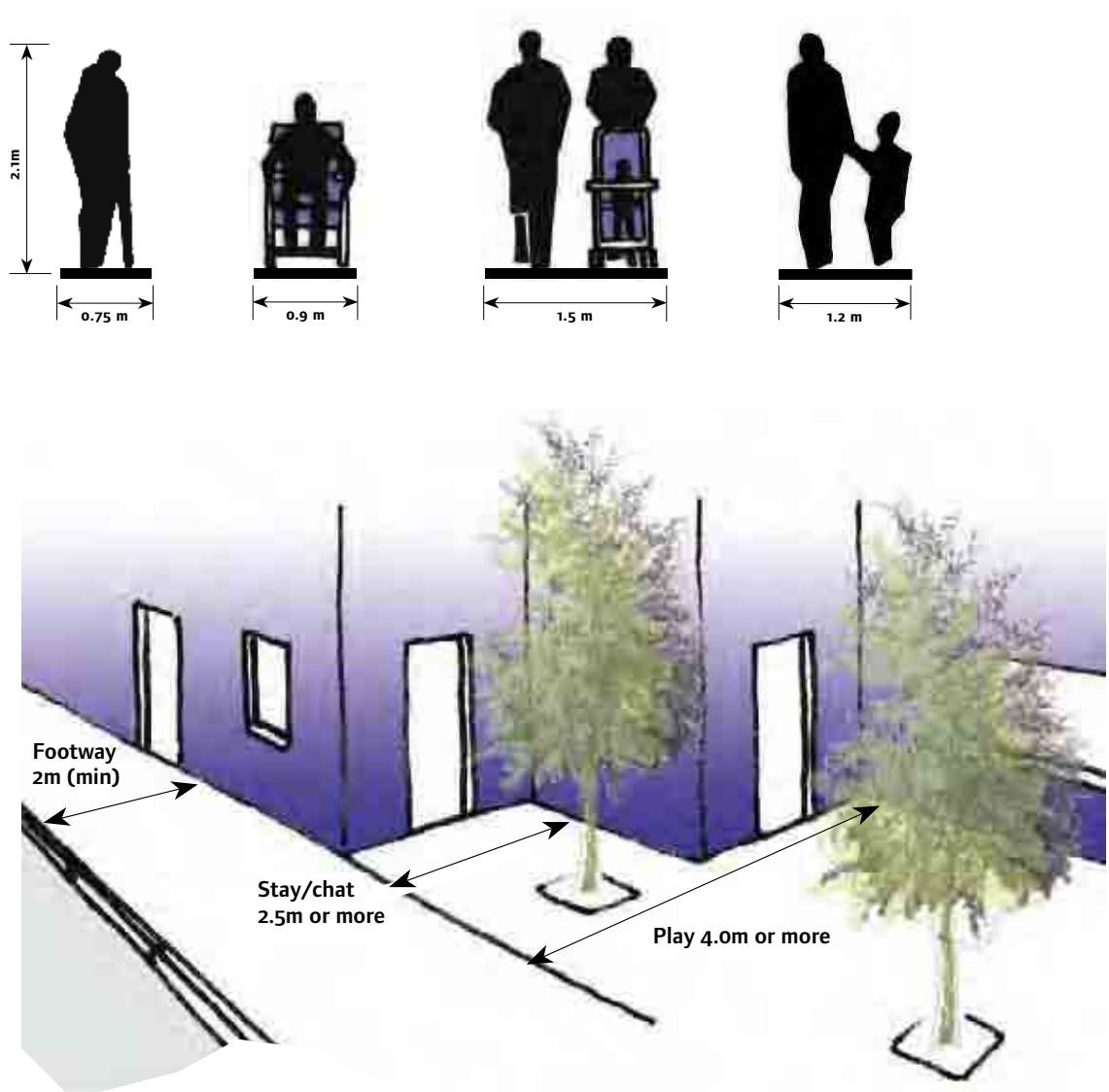
6.3.16 The carriageway is usually raised using short ramps which can have a speed-reducing effect, but if the street is on a bus route, for example, a more gradual change in height may be more appropriate (Fig. 6.4). It is important that any such shared surface arrangements are designed for blind or partially-sighted people because conventional kerbs are commonly used to aid their navigation. Tactile paving is required at crossing points regardless of whether kerbs are dropped or the carriageway is raised to footway level. Other tactile information may be required to compensate for kerb removal elsewhere.

6.3.17 Pedestrians can be intimidated by traffic and can be particularly vulnerable to the fear of crime or anti-social behaviour. In order to encourage and facilitate walking, pedestrians need to feel safe (Figs 6.5 and 6.6).

6.3.18 Pedestrians generally feel safe from crime where:

- their routes are overlooked by buildings with habitable rooms (Fig. 6.7);
- other people are using the street;
- there is no evidence of anti-social activity (e.g. litter, graffiti, vandalised street furniture);
- they cannot be surprised (e.g. at blind corners);
- they cannot be trapped (e.g. people can feel nervous in places with few entry and exit points, such as subway networks); and
- there is good lighting.

6.3.19 Streets with high traffic speeds can make pedestrians feel unsafe. Designers should seek to control vehicle speeds to below 20 mph in residential areas so that pedestrians activity is not displaced. Methods of vehicle speed control are discussed in Chapter 7.



Devon County Council

Figure 6.8 The footway and pedestrian areas provide for a range of functions which can include browsing, pausing, socialising and play.

6.3.20 *Inclusive Mobility* gives guidance on design measures for use where there are steep slopes or drops at the rear of footways.

6.3.21 Places for pedestrians may need to serve a variety of purposes, including movement in groups, children's play and other activities (Fig. 6.8).

6.3.22 There is no maximum width for footways. In lightly used streets (such as those with a purely residential function), the minimum unobstructed width for pedestrians should generally be 2 m. Additional width should be considered between the footway and a heavily used carriageway, or adjacent to gathering places, such as schools and shops. Further guidance on minimum footway widths is given in *Inclusive Mobility*.

6.3.23 Footway widths can be varied between different streets to take account of pedestrian volumes and composition. Streets where people walk in groups or near schools or shops, for example, need wider footways. In areas of high pedestrian flow, the quality of the walking experience can deteriorate unless sufficient width is provided. The quality of service goes down as pedestrian flow density increases. Pedestrian congestion through insufficient capacity should be avoided. It is inconvenient and may encourage people to step into the carriageway (Fig. 6.9).

6.3.24 Porch roofs, awnings, garage doors, bay windows, balconies or other building elements should not oversail footways at a height of less than 2.6 m.

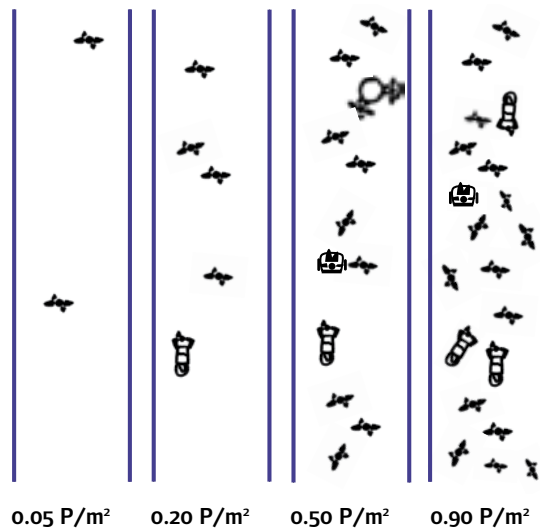


Figure 6.9 Diagram showing different densities of use in terms of pedestrians per square metre. Derived from *Vorrang für Fussgänger*⁹.



Figure 6.10 Poorly maintained tree obstructing the footway.

6.3.25 Trees to be sited within or close to footways should be carefully selected so that their spread does not reduce pedestrian space below minimum dimensions for width and headroom (Fig. 6.10).

6.3.26 Low overhanging trees, overgrown shrubs and advertising boards can be particularly hazardous for blind or partially-sighted people. Tapering obstructions, where the clearance under a structure reduces because the structure slopes

down (common under footbridge ramps), or the pedestrian surface ramps up, should be avoided or fenced off.

6.3.27 Designers should attempt to keep pedestrian (and cycle) routes as near to level as possible along their length and width, within the constraints of the site. Longitudinal gradients should ideally be no more than 5%, although topography or other circumstances may make this difficult to achieve (Fig. 6.11).



Figure 6.11 In some instances it may be possible to keep footways level when the carriageway is on a gradient, although this example deflects pedestrians wanting to cross the side road significantly from their desire lines.

⁹ Wissenschaft & Verkehr (1993) *Vorrang für Fussgänger*. Verkehrsclub Österreich.

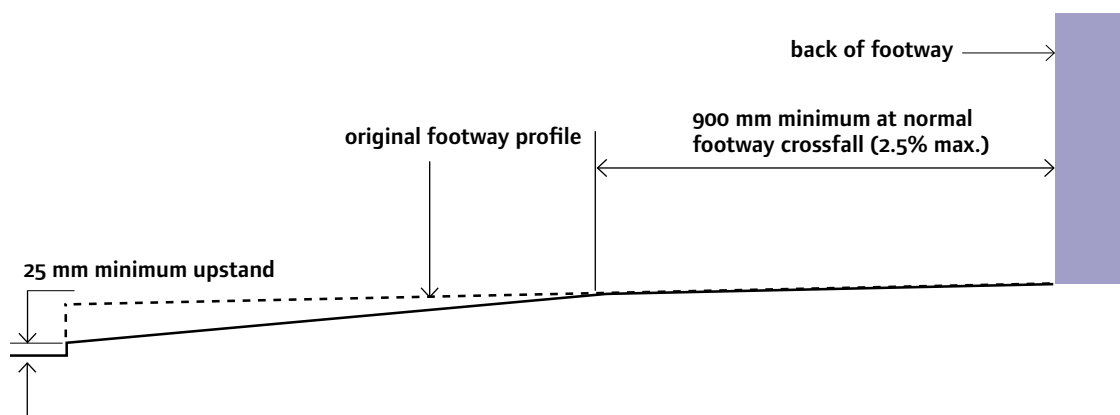


Figure 6.12 Typical vehicle crossover.

6.3.28 Off-street parking often requires motorists to cross footways. Crossovers to private driveways are commonly constructed by ramping up from the carriageway over the whole width of the footway, simply because this is easier to construct. This is poor practice and creates inconvenient cross-falls for pedestrians. Excessive cross-fall causes problems for people pushing prams and can be particularly difficult to negotiate for people with a mobility impairment, including wheelchair users.

6.3.29 Where it is necessary to provide vehicle crossovers, the normal footway cross-fall should be maintained as far as practicable from the back of the footway (900 mm minimum) (Fig. 6.12).

6.3.30 Vehicle crossovers are not suitable as pedestrian crossing points. Blind or partially-sighted people need to be able to distinguish between them and places where it is safe to

cross. Vehicle crossovers should therefore have a minimum upstand of 25 mm at the carriageway edge. Where there is a need for a pedestrian crossing point, it should be constructed separately, with tactile paving and kerbs dropped flush with the carriageway.

6.3.31 Surfaces used by pedestrians need to be smooth and free from trip hazards. Irregular surfaces, such as cobbles, are a barrier to some pedestrians and are unlikely to be appropriate for residential areas.

6.3.32 Designs need to ensure that pedestrian areas are properly drained and are neither washed by runoff nor subject to standing water (Fig 6.13).

6.3.33 Seating on key pedestrian routes should be considered every 100 m to provide rest points and to encourage street activity. Seating should ideally be located where there is good natural surveillance.

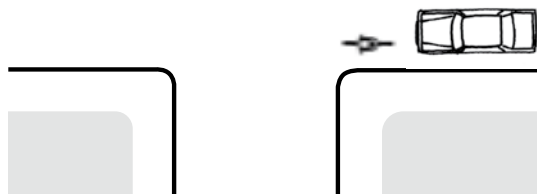


Figure 6.13 Poor drainage at a pedestrian crossing place causes discomfort and inconvenience.



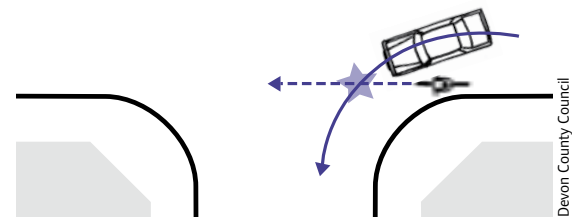
Figure 6.14 On-street cycling in Ipswich.

Small radius (eg. 1 metre)



- Cycle and car speeds compatible.

Large radius (eg. 7 metres)



- Danger from fast turning vehicles cutting across cyclists.

Figure 6.15 The effect of corner radii on cyclists near turning vehicles.

6.4 Cyclists

6.4.1 Cyclists should generally be accommodated on the carriageway. In areas with low traffic volumes and speeds, there should not be any need for dedicated cycle lanes on the street (Fig. 6.14).

6.4.2 Cycle access should always be considered on links between street networks which are not available to motor traffic. If an existing street is closed off, it should generally remain open to pedestrians and cyclists.

6.4.3 Cyclists prefer direct, barrier-free routes with smooth surfaces. Routes should avoid the need for cyclists to dismount.

6.2.4 Cyclists are more likely to choose routes that enable them to keep moving. Routes that take cyclists away from their desire lines and require them to concede priority to side-road traffic are less likely to be used. Anecdotal evidence suggests that cyclists using cycle tracks running adjacent and parallel to a main road are particularly vulnerable when they cross the mouths of side roads and that, overall, these routes can be more hazardous to cyclists than the equivalent on-road route.

6.4.5 Cyclists are particularly sensitive to traffic conditions. High speeds or high volumes of traffic tend to discourage cycling. If traffic conditions are inappropriate for on-street cycling, the factors contributing to them need to be addressed, if practicable, to make on-street cycling satisfactory. This is described in more detail in Chapter 7.

6.4.6 The design of junctions affects the way motorists interact with cyclists. It is recommended that junctions are designed to promote slow motor-vehicle speeds. This may include short corner radii as well as vertical deflections (Fig. 6.15).

6.4.7 Where cycle-specific facilities, such as cycle tracks, are provided, their geometry and visibility should be in accordance with the appropriate design speed. The design speed for a cycle track would normally be 30 km/h (20 mph), but reduced as necessary to as low as 10 km/h (6 mph) for short distances where cyclists would expect to slow down, such as on the approach to a subway. Blind corners are a hazard and should be avoided.

6.4.8 Cyclists should be catered for on the road if at all practicable. If cycle lanes are installed, measures should be taken to prevent them from being blocked by parked vehicles. If cycle tracks are provided, they should be physically segregated from footways/footpaths if there is sufficient width available. However, there is generally little point in segregating a combined width of about 3.3 m or less. The fear of being struck by cyclists is a significant concern for many disabled people. Access officers and consultation groups should be involved in the decision-making process.

6.4.9 Cycle tracks are more suited to leisure routes over relatively open spaces. In a built-up area, they should be well overlooked. The decision to light them depends on the circumstances of the site – lighting may not always be appropriate.

6.4.10 Like pedestrians, cyclists can be vulnerable to personal security concerns. Streets which meet the criteria described for pedestrians are likely to be acceptable to cyclists.

6.4.11 The headroom over routes used by cyclists should normally be 2.7 m (minimum 2.4 m). The maximum gradients should generally be no more than 3%, or 5% maximum over a distance of 100 m or less, and 7% maximum over a distance of 30 m or less. However, topography may dictate the gradients, particularly if the route is in the carriageway.

6.4.12 As a general rule, the geometry, including longitudinal profile, and surfaces employed on carriageways create an acceptable running surface for cyclists. The exception to this rule is the use of granite setts, or similar. These provide an unpleasant cycling experience due to the unevenness of the surface. They can prove to be particularly hazardous in the wet and when cyclists are turning, especially when giving hand signals at the same time. The conditions for cyclists on such surfaces can be improved if the line they usually follow is locally paved using larger slabs to provide a smoother ride.

6.5 Public transport

6.5.1 This section concentrates on bus-based public transport as this is the most likely mode to be used for serving residential areas. *Inclusive Mobility* gives detailed guidance on accessible bus stop layout and design, signing, lighting, and design of accessible bus (and rail) stations and interchanges.

Public transport vehicles

6.5.2 Purpose-built buses, from 'hoppers' to double-deckers, vary in length and height, but width is relatively fixed (Fig. 6.16).

6.5.3 Streets currently or likely to be used by public transport should be identified in the design process, working in partnership with public transport operators.

6.5.4 Bus routes and stops should form key elements of the walkable neighbourhood. Designers and local authorities should try to ensure that development densities will be high enough to support a good level of service without long-term subsidy.

6.5.5 In order to design for long-term viability, the following should be considered:

- streets serving bus routes should be reasonably straight. Straight routes also help passenger demand through reduced journey times and better visibility. Straight streets may, however, lead to excessive speeds. Where it is necessary to introduce traffic-calming features, designers should consider their potential effects on buses and bus passengers; and
- layouts designed with strong connections to the local highway network, and which avoid long one-way loops or long distances without passenger catchments, are likely to be more viable.

6.5.6 Bus priority measures may be appropriate within developments to give more direct routing or to assist buses in avoiding streets where delays could occur.

6.5.7 Using a residential street as a bus route need not require restrictions on direct vehicular access to housing. Detailed requirements for streets designated as bus routes can be determined in consultation with local public transport operators. Streets on bus routes should not generally be less than 6.0 m wide (although this could be reduced on short sections with good inter-visibility between opposing flows). The presence and arrangement of on-street parking, and the manner of its provision, will affect width requirements.

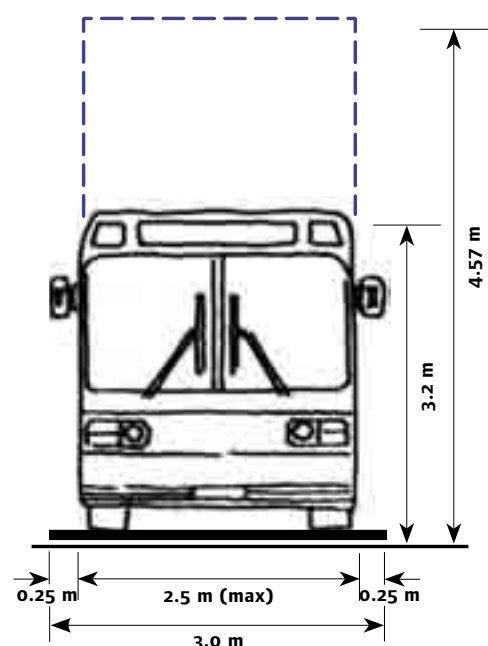


Figure 6.16 Typical bus dimensions



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Figure 6.17 The bus lay-by facilitates the free movement of other vehicles, but it is inconvenient for pedestrians.

6.5.8 Swept-path analysis can be used to determine the ability of streets to accommodate large vehicles. Bus routes in residential areas are likely to require a more generous swept path to allow efficient operation. While it would be acceptable for the occasional lorry to have to negotiate a particular junction with care, buses need to be able to do so with relative ease. The level of provision required for the movement of buses should consider the frequency and the likelihood of two buses travelling in opposite directions meeting each other on a route.

Bus stops

6.5.9 It is essential to consider the siting of public transport stops and related pedestrian desire lines at an early stage of design. Close co-operation is required between public transport operators, the local authorities and the developer.

6.5.10 First and foremost, the siting of bus stops should be based on trying to ensure they can be easily accessed on foot. Their precise location will depend on other issues, such as the need to avoid noise nuisance, visibility requirements, and the convenience of pedestrians and cyclists. Routes to bus stops must be accessible by disabled people. For example, the bus lay-by in Fig. 6.17 deflects

pedestrians walking along the street from their desire line and the insufficient footway width at the bus stop hinders free movement.

6.5.11 Bus stops should be placed near junctions so that they can be accessed by more than one route on foot, or near specific passenger destinations (schools, shops, etc.) but not so close as to cause problems at the junction. On streets with low movement function (see Chapter 2), setting back bus stops from junctions to maximise traffic capacity should be avoided.

6.5.12 Bus stops should be high-quality places that are safe and comfortable to use. Consideration should be given to providing cycle parking at bus stops with significant catchment areas. Cycle parking should be designed and located so as not to create a hazard, or impede access for, disabled people.

6.5.13 Footways at bus stops should be wide enough for waiting passengers while still allowing for pedestrian movement along the footway. This may require local widening at the stop.

6.5.14 Buses can help to control the speed of traffic at peak times by preventing cars from overtaking. This is also helpful for the safety of passengers crossing after leaving the bus.

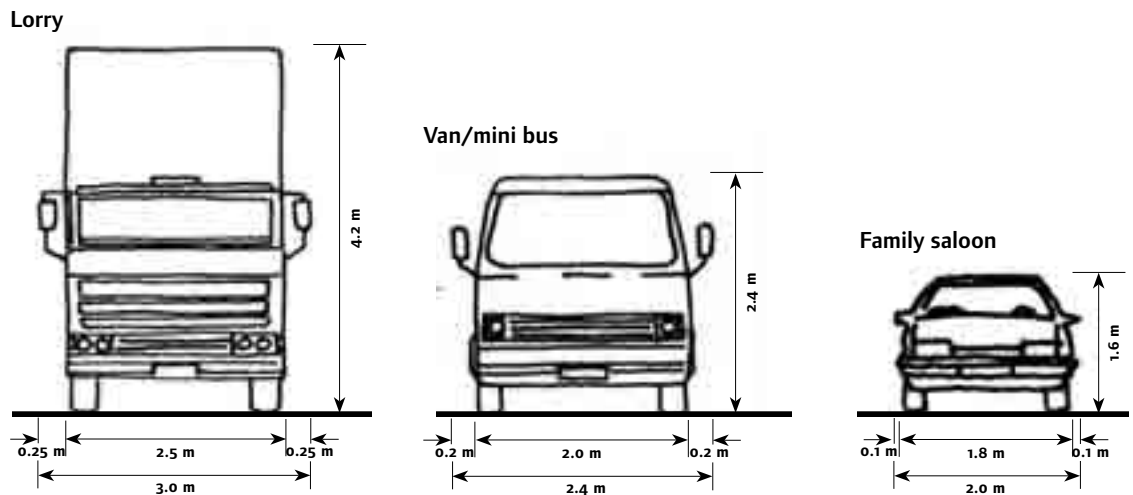


Figure 6.18 Private and commercial motor-vehicles – typical dimensions.

6.6 Private and commercial motor vehicles

6.6.1 Streets need to be designed to accommodate a range of vehicles from private cars, with frequent access requirements, to larger vehicles such as delivery vans and lorries, needing less frequent access (Fig. 6.18). Geometric design which satisfies the access needs of emergency service and waste collection vehicles will also cover the needs of private cars. However, meeting the needs of drivers in residential streets should not be to the detriment of pedestrians, cyclists and public transport users. The aim should be to achieve a harmonious mix of user types.

6.6.2 In a residential environment, flow is unlikely to be high enough to determine street widths, and the extent of parking provision (see Chapter 8) will depend on what is appropriate for the site.

6.6.3 In some locations, a development may be based on car-free principles. For example, there are options for creating developments relatively free of cars by providing remotely sited parking (e.g. Greenwich Millennium Village, see Fig. 6.19) or by creating a wholly car-free development. Such approaches can have a significant effect on the design of residential streets and the way in which they are subsequently used.



Figure 6.19 Greenwich Millennium Village. Cars can be parked on the street for a short time, after which they must be moved to a multi-storey car park.

6.7 Emergency vehicles

6.7.1 The requirements for emergency vehicles are generally dictated by the fire service requirements. Providing access for large fire appliances (including the need to be able to work around them where appropriate) will cater for police vehicles and ambulances.

6.7.2 The Building Regulation requirement B5 (2000)¹⁰ concerns 'Access and Facilities for the Fire Service'. Section 17, 'Vehicle Access', includes the following advice on access from the highway:

- there should be a minimum carriageway width of 3.7 m between kerbs;
- there should be vehicle access for a pump appliance within 45 m of single family houses;
- there should be vehicle access for a pump appliance within 45 m of every dwelling entrance for flats/maisonettes;
- a vehicle access route may be a road or other route; and
- fire service vehicles should not have to reverse more than 20 m.

6.7.3 The Association of Chief Fire Officers has expanded upon and clarified these requirements as follows:

- a 3.7 m carriageway (kerb to kerb) is required for *operating space at the scene of a fire*. Simply to reach a fire, the access route could be reduced to 2.75 m over short distances, provided the pump appliance can get to within 45 m of dwelling entrances;
- if an authority or developer wishes to reduce the running carriageway width to below 3.7 m, they should consult the local Fire Safety Officer;
- the length of cul-de-sacs or the number of dwellings have been used by local authorities as criteria for limiting the size of a development served by a single access route. Authorities have often argued that the larger the site, the more likely it is that a single access could be blocked for whatever reason. The fire services adopt a less numbers-driven approach and consider each application based on a risk assessment for the site, and response time requirements. Since the introduction of the Fire and Rescue Services Act 2004,¹¹ all regions have had to produce an Integrated Management Plan

setting out response time targets (*Wales: Risk Reduction Plans*¹²). These targets depend on the time required to get fire appliances to a particular area, together with the ease of movement within it. It is therefore possible that a layout acceptable to the Fire and Rescue Service (FRS) in one area, might be objected to in a more remote location;

- parked cars can have a significant influence on response times. Developments should have adequate provision for parking to reduce its impact on response times; and
- residential sprinkler systems are highly regarded by the FRS and their presence allows a longer response time to be used.

A site layout which has been rejected on the grounds of accessibility for fire appliances may become acceptable if its buildings are equipped with these systems.

6.8 Service vehicles

6.8.1 The design of local roads should accommodate service vehicles without allowing their requirements to dominate the layout. On streets with low traffic flows and speeds, it may be assumed that they will be able to use the full width of the carriageway to manoeuvre. Larger vehicles which are only expected to use a street infrequently, such as pantechnicons, need not be fully accommodated – designers could assume that they will have to reverse or undertake multi-point turns to turn around for the relatively small number of times they will require access.

6.8.2 Well-connected street networks have significant advantages for service vehicles. A shorter route can be used to cover a given area, and reversing may be avoided altogether. They also minimise land-take by avoiding the need for wasteful turning areas at the ends of cul-de-sacs.

6.8.3 However, some sites cannot facilitate such ease of movement (e.g. linear sites and those with difficult topography), and use cul-de-sacs to make the best use of the land available. For cul-de-sacs longer than 20 m, a turning area should be provided to cater for vehicles that will regularly need to enter the street. Advice on the design of turning areas is given in Chapter 7.

¹⁰ Statutory Instrument 2000 No. 2531, The Building Regulations 2000. London: TSO. Part II, paragraph B5: Access and facilities for the fire service.

¹¹ Fire and Rescue Services Act 2004. London: TSO.

¹² Risk Reduction Plans required by the Welsh Assembly. See Welsh Assembly Government (2005) *Fire and Rescue National Framework for Wales*. Cardiff: NAFW.

Waste collection vehicles

6.8.4 The need to provide suitable opportunities for the storage and collection of waste is a major consideration in the design of buildings, site layouts and individual streets. Storage may be complicated by the need to provide separate facilities for refuse and the various categories of recyclable waste. Quality of place will be significantly affected by the type of waste collection and management systems used, because they in turn determine the sort of vehicles that will need to gain access.

6.8.5 Policy for local and regional waste planning bodies is set out in *Planning Policy Statement 10: Planning for Sustainable Waste Management* (PPS10)¹³ and its companion guide. PPS10 refers to design and layout in new development being able to help secure opportunities for sustainable waste management. Planning authorities should ensure that new developments make sufficient provision for waste management and promote designs and layouts that secure the integration of waste management facilities without adverse impact on the street scene (*Wales*: Refer to Chapter 12 of PPW¹⁴ and TAN 21: Waste¹⁵).

6.8.6 The operation of waste collection services should be an integral part of street design and achieved in ways that do not compromise quality of place. Waste disposal and collection authorities and their contractors should take into account the geometry of streets across their area and the importance of securing quality of place when designing collection systems and deciding which vehicles are applicable. While it is always possible to design new streets to take the largest vehicle that could be manufactured, this would conflict with the desire to create quality places. It is neither necessary nor desirable to design new streets to accommodate larger waste collection vehicles than can be used within existing streets in the area.

6.8.7 Waste collection vehicles fitted with rear-mounted compaction units (Fig 6.20) are about the largest vehicles that might require regular access to residential areas. BS 5906: 2005¹⁶ notes that the largest waste vehicles currently in use are around 11.6 m long, with

a turning circle of 20.3 m. It recommends a minimum street width of 5 m, but smaller widths are acceptable where on-street parking is discouraged. Swept-path analysis can be used to assess layouts for accessibility. Where achieving these standards would undermine quality of place, alternative vehicle sizes and/or collection methods should be considered.

6.8.8 Reversing causes a disproportionately large number of moving vehicle accidents in the waste/recycling industry. Injuries to collection workers or members of the public by moving collection vehicles are invariably severe or fatal. BS 5906: 2005 recommends a maximum reversing distance of 12 m. Longer distances can be considered, but any reversing routes should be straight and free from obstacles or visual obstructions.

6.8.9 Schedule 1, Part H of the Building Regulations (2000)¹⁷ define locations for the storage and collection of waste. The collection point can be on-street (but see Section 6.8.11), or may be at another location defined by the waste authority. Key points in the Approved Document to Part H are:

- residents should not be required to carry waste more than 30 m (excluding any vertical distance) to the storage point;
- waste collection vehicles should be able to get to within 25 m of the storage point (note, BS 5906: 2005¹⁸ recommends shorter distances) and the gradient between the two should not exceed 1:12. There should be a maximum of three steps for waste



Figure 6.20 Large waste collection truck in a residential street.

¹³ ODPM (2005) *Planning Policy Statement 10: Planning for Sustainable Waste Management*. London: TSO.

¹⁴ Welsh Assembly Government (2002). *Planning Policy Wales*. Cardiff: NAFW. Chapter 12, Infrastructure and Services.

¹⁵ Welsh Assembly Government (2001) *Technical Advice Note 21: Waste*. Cardiff: NAFW.

¹⁶ British Standards Institute (BSI) (2005) *BS 5906: 2005 Waste Management in Buildings – Code of Practice*. London: BSI.

¹⁷ Statutory Instrument 2000 No. 2531, *The Building Regulations 2000*. London: TSO.

¹⁸ BSI (2005) *BS 5906: 2005 Waste Management in Buildings – Code of Practice*. London: BSI.



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Figure 6.21 Refuse disposal point discharging into underground collection facility.

containers up to 250 litres, and none when larger containers are used (the Health and Safety Executive recommends that, ideally, there should be no steps to negotiate); and

- the collection point should be reasonably accessible for vehicles typically used by the waste collection authority.

6.8.10 Based on these parameters, it may not be necessary for a waste vehicle to enter a cul-de-sac less than around 55 m in length, although this will involve residents and waste collection operatives moving waste the maximum recommended distances, which is not desirable.

6.8.11 BS 5906: 2005 provides guidance and recommendations on good practice. The standard advises on dealing with typical weekly waste and recommends that the distance over which containers are transported by collectors should not normally exceed 15 m for two-wheeled containers, and 10 m for four-wheeled containers.

6.8.12 It is essential that liaison between the designers, the waste, highways, planning and building control authorities, and access officers, takes place at an early stage. Agreement is required

on the way waste is to be managed and in particular:

- methods for storing, segregating and collecting waste;
- the amount of waste storage required, based on collection frequency, and the volume and nature of the waste generated by the development; and
- the size of anticipated collection vehicles.

6.8.13 The design of new developments should not require waste bins to be left on the footway as they reduce its effective width. Waste bins on the footway pose a hazard for blind or partially-sighted people and may prevent wheelchair and pushchair users from getting past.

Recycling

6.8.14 The most common types of provision for recycling (often used in combination) are:

- 'bring' facilities, such as bottle and paper banks, where residents leave material for recycling; and
- kerbside collection, where householders separate recyclable material for collection at the kerbside.

6.8.15 'Bring' facilities need to be in accessible locations, such as close to community buildings, but not where noise from bottle banks, etc., can disturb residents. There needs to be enough room for the movement and operation of collection vehicles.

6.8.16 Underground waste containers may be worth considering. All that is visible to the user is a 'litter bin' or other type of disposal point (Fig. 6.21). This collects in underground containers which are emptied by specially equipped vehicles. There were some 175 such systems in use in the UK in 2006.

6.8.17 Kerbside collection systems generally require householders to store more than one type of waste container. This needs to be considered in the design of buildings or external storage facilities.

6.8.18 Designers should ensure that containers can be left out for collection without blocking the footway or presenting hazards to users.

7

Street geometry



Chapter aims

- Advise how the requirements of different users can be accommodated in street design.
- Summarise research which shows that increased visibility encourages higher vehicle speeds.
- Describe how street space can be allocated based on pedestrian need, using swept path analysis to ensure that minimum access requirements for vehicles are met.
- Describe the rationale behind using shorter vehicle stopping distances to determine visibility requirements on links and at junctions.
- Recommend that the design of streets should determine vehicle speed.
- Recommend a maximum design speed of 20 mph for residential streets.

7.1 Introduction

7.1.1 Several issues need to be considered in order to satisfy the various user requirements detailed in Chapter 6, namely:

- street widths and components;
- junctions;
- features for controlling vehicle speeds;
- forward visibility on links; and
- visibility splays at junctions.

7.2 Street dimensions

7.2.1 The design of new streets or the improvement of existing ones should take into account the functions of the street, and the type, density and character of the development.

7.2.2 Carriageway widths should be appropriate for the particular context and uses of the street. Key factors to take into account include:

- the volume of vehicular traffic and pedestrian activity;
- the traffic composition;
- the demarcation, if any, between carriageway and footway (e.g. kerb, street furniture or trees and planting);
- whether parking is to take place in the carriageway and, if so, its distribution, arrangement, the frequency of occupation, and the likely level of parking enforcement (if any);
- the design speed (recommended to be 20 mph or less in residential areas);
- the curvature of the street (bends require greater width to accommodate the swept path of larger vehicles); and
- any intention to include one-way streets, or short stretches of single lane working in two-way streets.

7.2.3 In lightly-trafficked streets, carriageways may be narrowed over short lengths to a single lane as a traffic-calming feature. In such single lane working sections of



Figure 7.1 Illustrates what various carriageway widths can accommodate. They are not necessarily recommendations.

street, to prevent parking, the width between constraining vertical features such as bollards should be no more than 3.5 m. In particular circumstances this may be reduced to a minimum value of 2.75 m, which will still allow for occasional large vehicles (Fig. 7.1). However, widths between 2.75 m and 3.25 m should be avoided in most cases, since they could result in drivers trying to squeeze past cyclists. The local Fire Safety Officer should be consulted where a carriageway width of less than 3.7 m is proposed (see paragraph 6.6.3)

7.2.4 Each street in the network is allocated a particular street character type, depending on where it sits within the place/movement hierarchy (see Chapter 2) and the requirements of its users (see Chapter 6). Individual streets can then be designed in detail using the relevant typical arrangement as a starting point. For example, one street might have a fairly high movement status combined with a medium place status, whilst another might have very little movement status but a high place status. The typical arrangement for each street character type can then be drawn up. This may be best

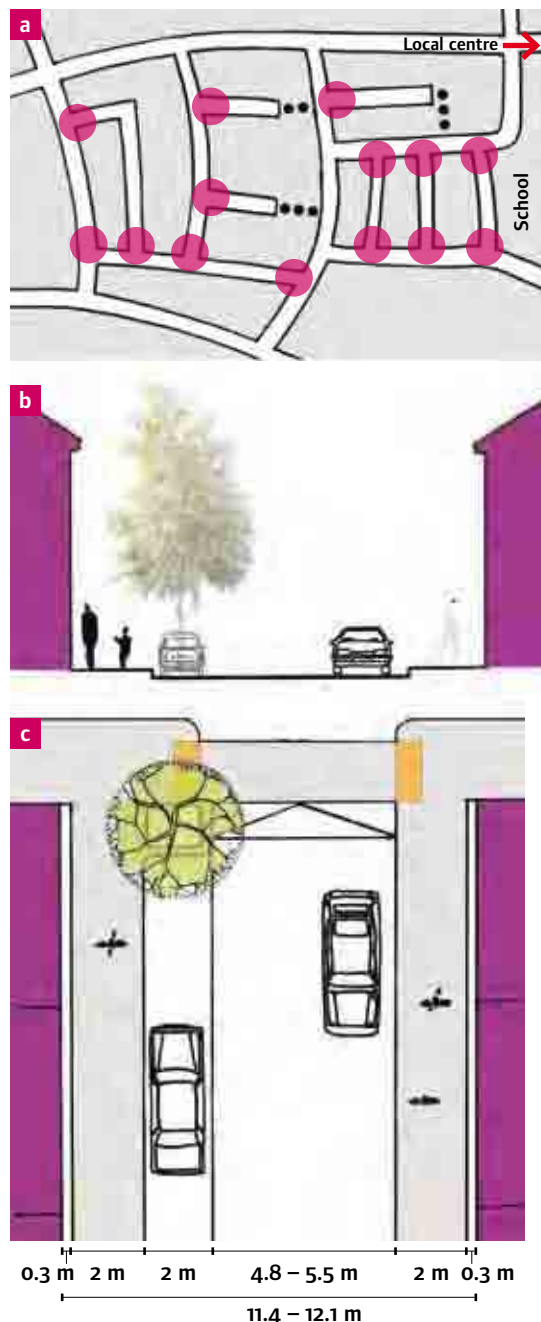


Figure 7.2 Typical representation of a street character type. This example shows the detail for minor side street junctions. Key plan (a) shows the locations, (b) is a cross-section and (c) the plan.



Figure 7.3 On-street parking and shallow gradient junction table suitable for accommodating buses.

Newhall demonstrates that adherence to masterplan principles can be achieved through the use of design codes (Fig. 7.3) that are attached to land sales and achieved by covenants.

A list of key dimensions was applied:

- Frontage to frontage – min 10.5 m;
- Carriageway width – min 4.8 m, max 8.8 m;
- Footway width – min 1.5 m;
- Front gardens – min 1.5 m, max 3 m;
- Reservation for services – 1 m; and
- Design speed – 20 mph.

The design is based on pedestrian priority and vehicle speeds of less than 20 mph controlled through the street design.

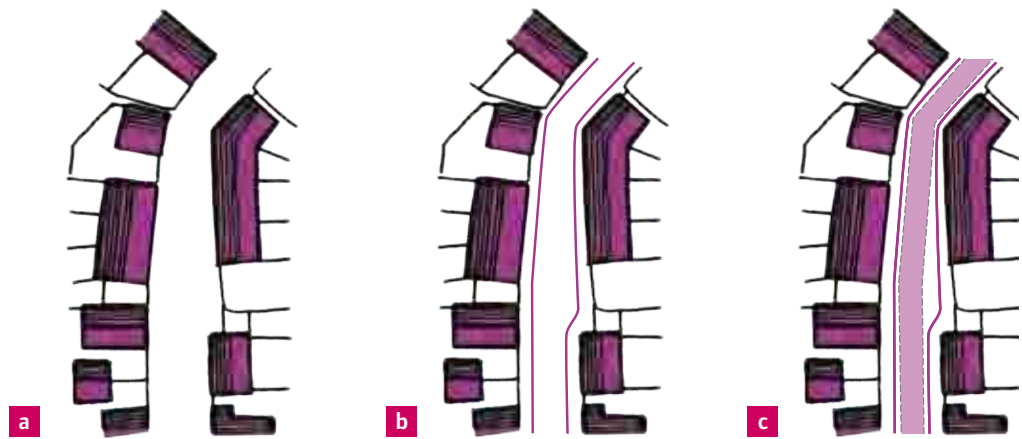


Figure 7.4 Left to right: (a) the buildings and urban edge of a street help to form the place; (b) the kerb line can be used to reinforce this; and (c) the remaining carriageway space is tracked for movement and for the provision of places where people may park their vehicles.

represented using a plan and cross-section as illustrated in Figure 7.2.

7.2.5 These street types can be defined in a design code, as demonstrated at Newhall, Harlow (see Newhall, Harlow box).

Swept path analysis

7.2.6 Swept path analysis, or tracking, is used to determine the space required for various vehicles and is a key tool for designing carriageways for vehicular movement within the overall layout of the street. The potential layouts of buildings and spaces do not have to be dictated by carriageway alignment – they should generally be considered first, with the carriageway alignment being designed to fit within the remaining space (Fig. 7.4).

7.2.7 The use of computer-aided design (CAD) tracking models and similar techniques often proves to be beneficial in determining how the street will operate and how vehicles will move within it. Layouts designed using this approach enable buildings to be laid out to suit the character of the street, with footways and kerbs helping to define and emphasise spaces. Designers have the freedom to vary the space between kerbs or buildings. The kerb line does not need to follow the line of vehicle tracking if careful attention is given to the combination of sightlines, parking and pedestrian movements.

Shared surface streets and squares

7.2.8 In traditional street layouts, footways and carriageways are separated by a kerb. In a street with a shared surface, this demarcation is absent and pedestrians and vehicles share the same surface. Shared surface schemes work best in relatively calm traffic environments. The key aims are to:

- encourage low vehicle speeds;
- create an environment in which pedestrians can walk, or stop and chat, without feeling intimidated by motor traffic;
- make it easier for people to move around; and
- promote social interaction.

7.2.9 In the absence of a formal carriageway, the intention is that motorists entering the area will tend to drive more cautiously and negotiate the right of way with pedestrians on a more conciliatory level (Fig. 7.5).

7.2.10 However, shared surfaces can cause problems for some disabled people. People with cognitive difficulties may find the environment difficult to interpret. In addition, the absence of a conventional kerb poses problems for blind or partially-sighted people, who often rely on this feature to find their way around. It is therefore important that shared surface schemes include an alternative means for visually-impaired people to navigate by.



Bob White, Kent County Council

Figure 7.5 A shared surface in a residential area

7.2.11 Research published by the Guide Dogs for the Blind Association in September 2006¹ illustrated the problems that shared surfaces cause for blind or partially-sighted and other disabled people. Further research to be carried out by the Guide Dogs for the Blind Association will consider how the requirements of disabled people can be met, with a view to producing design guidance in due course.

7.2.12 Consultation with the community and users, particularly with disability groups and access officers, is essential when any shared surface scheme is developed. Early indications are that, in many instances, a protected space, with appropriate physical demarcation, will need to be provided, so that those pedestrians who may be unable or unwilling to negotiate priority with vehicles can use the street safely and comfortably.

7.2.13 When designing shared surface schemes, careful attention to detail is required to avoid other problems, such as:

- undifferentiated surfaces leading to poor parking behaviour;
- vulnerable road users feeling threatened by having no space protected from vehicles; and
- the positioning and quantity of planting, street furniture and other features creating visual clutter.

7.2.14 Subject to making suitable provision for disabled people, shared surface streets are likely to work well:

- in short lengths, or where they form cul-de-sacs (Fig. 7.6);
- where the volume of motor traffic is below 100 vehicles per hour (vph) (peak) (see box); and
- where parking is controlled or it takes place in designated areas.



Andrew Cameron, WSP



Duchy of Cornwall and Leon Krier

Figure 7.6 (a) and (b) A shared-surface square in Poundbury, Dorset.

¹ The Guide Dogs for the Blind Association (2006) *Shared Surface Street Design Research Project. The Issues: Report of Focus Groups*. Reading: The Guide Dogs for the Blind Association



Tim Pharoah, Llewelyn Davies Yeang

Figure 7.7 A shared surface scheme. Beaulieu Park, Chelmsford.

7.2.15 Shared surface streets are often constructed from pavements rather than asphalt, which helps emphasise their difference from conventional streets. Research for MfS has shown that block paving reduces traffic speeds by between 2.5 and 4.5 mph, compared with speeds on asphalt surfaces (Fig. 7.7).

Home Zones

7.2.16 Home Zones are residential areas designed with streets to be places for people, instead of just for motor traffic. By creating a high-quality street environment, Home Zones strike a better balance between the needs of the local community and drivers (Fig. 7.8). Involving the local community is the key to a successful scheme. Good and effective consultation with all sectors of the community, including young people, can help ensure that the design of individual Home Zones meets the needs of the local residents.



Franz Otto Novotny, Northmoor Urban Art Project

Figure 7.8 Children playing in a Home Zone, Northmoor, Manchester. However, this type of bollard would cause problems for disabled people.

7.2.17 Home Zones often include shared surfaces as part of the scheme design and in doing so they too can create difficulties for disabled people. Research commissioned by the Disabled Persons Transport Advisory Committee (DPTAC) on the implications of Home Zones for disabled people, due to be published in 2007, will demonstrate those concerns. Design guidance relating to this research is expected to be published in due course.

7.2.18 Home Zones are encouraged in both the planning and transport policies for new developments and existing streets. They are distinguished from other streets by having signed entry and exit points, which indicate the special nature of the street.

7.2.19 Local traffic authorities in England and Wales were given the powers to designate roads as Home Zones in section 268 of the Transport Act 2000.² The legal procedure for creating a

Research on shared space streets

A study of public transport in London Borough Pedestrian Priority Areas (PPAs) undertaken by TRL for the Bus Priority Team at Transport for London concluded that there is a self-limiting factor on pedestrians sharing space with motorists, of around 100 vph. Above this, pedestrians treat the general path taken by motor vehicles as a 'road' to be crossed rather than as a space to occupy. The speed

of vehicles also had a strong influence on how pedestrians used the shared area. Although this research project concentrated on PPAs, it is reasonable to assume that these factors are relevant to other shared space schemes.

The relationship between visibility, highway width and driver speed identified on links was also found to apply at junctions. A full description of the research findings is available in *Manual for Streets: redefining residential street design*.³

2 I York, A Bradbury, S Reid, T Ewings and R Paradise (2007) *The Manual for Streets: redefining residential street design*. TRL Report No. 661. Crowthorne: TRL.
3 Transport Act 2000. London: TSO.




































Nodal form	T	Y	Cross / staggered	Multi armed	Square	Circus	Crescent
Regular							
							
							
							
Irregular							

Fig. 7.9 Illustrative junction layouts.

Home Zone in England is set out in the Quiet Lanes and Home Zones (England) Regulations 2006⁴ and guidance is provided in Department for Transport Circular 02/2006.⁵ Procedure regulations are yet to be made in Wales, but traffic authorities may still designate roads as Home Zones.

7.2.20 Developers sometimes implement 'Home Zone style' schemes without formal designation. However, it is preferable for the proper steps to be followed to involve the community in deciding how the street will be used.

7.2.21 In existing streets, it is essential that the design of the Home Zone involves significant participation by local residents and local access groups. In new-build situations, a partnership between the developer and the relevant authorities will enable prospective residents to be made aware of the proposed designation of the street as a Home Zone. This will pave the way for the formal consultation procedure once the street becomes public highway.

7.2.22 Further guidance on the design of Home Zones is given in *Home Zones: Challenging the Future of Our Streets*,⁶ the Institute of Highway Incorporated Engineers' (IHIE) *Home Zone Design Guidelines*⁷ and on the website www.homezones.org.uk.

7.3 Junctions

7.3.1 Junctions that are commonly used in residential areas include:

- crossroads and staggered junctions;
- T and Y junctions; and
- roundabouts.

Figure 7.9 illustrates a broader range of junction geometries to show how these basic types can be developed to create distinctive places. Mini-roundabouts and shared surface squares can be incorporated within some of the depicted arrangements.

7.3.2 Junctions are generally places of high accessibility and good natural surveillance. They are therefore ideal places for locating public buildings, shops and public transport stops, etc. Junctions are places of interaction among street users. Their design is therefore critical to achieving a proper balance between their place and movement functions.

7.3.3 The basic junction forms should be determined at the masterplanning stage. At the street design stage, they will have to be considered in more detail in order to determine how they are going to work in practice. Masterplanning and detailed design will cover issues such as traffic priority arrangements, the need, or otherwise, for signs, markings and kerbs, and how property and building lines are related.

4 Statutory Instrument 2006 No. 2082, the Quiet Lanes and Home Zones (England) Regulations 2006. London: TSO.

5 Department for Transport (2006) *Circular 02/2006 – The Quiet Lanes and Home Zones (England) Regulations*. London: TSO.

6 Department for Transport (2005) *Home Zones: Challenging the future of our streets*. London: Department for Transport.

7 IHIE (2002) *Home Zones Design Guidelines*. London: IHIE.

7.3.4 The resulting spaces and townscape should ideally be represented in three dimensions – see box.

7.3.5 Often, the key to a well-designed junction is the way in which buildings are placed around it and how they enclose the space in which the junction sits. Building placement should therefore be decided upon first, with the junction then designed to suit the available space.

7.3.6 Junction design should facilitate direct pedestrian desire lines, and this will often mean using small corner radii. The use of swept path analysis will ensure that the junctions are negotiable by vehicles (Fig. 7.11).



Una McCaughrin, Llewelyn Davies Yang

Figure 7.11 Quadrant kerbstones used instead of large radii at junctions reduce the dominance of the carriageway. This is reinforced by the placement and form of the adjacent buildings and the absence of road markings. However, note the lack of dropped kerbs and tactile paving.

Drawing in three dimensions

Presenting design layouts in three dimensions is an important way of looking at aspects of engineering and urban design together (Fig. 7.10). It enables street furniture, lighting, utility equipment and landscaping to be clearly shown. Three-dimensional layouts are also useful in consultation with the public.

Street cross-sections and plans should be developed initially. Perspective or axonometric drawings can then be produced to add clarity and to assist designers in visualising and refining their ideas. Such three-dimensional representation is fairly easy to achieve both by hand and using CAD software. For more complex schemes, a computer-generated 'walk-through' presentation can be used to demonstrate how the proposal will work in practice. It is also a powerful tool for resolving design issues.

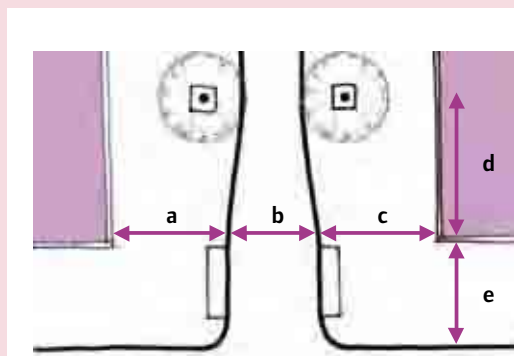
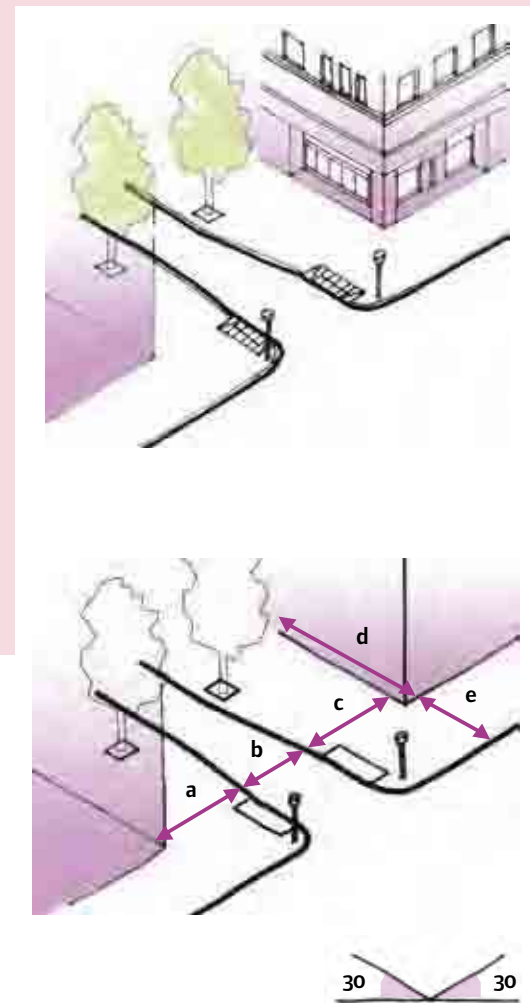


Figure 7.10 Example of three-dimensional presentations.



Colin J Davis

7.3.7 Junctions can be marked to indicate which arms have priority, but on quieter streets it may be acceptable to leave them unmarked. A lack of marked priority may encourage motorists to slow down to negotiate their way through, making the junction more comfortable for use by pedestrians. However, this approach requires careful consideration (see Chapter 9).

7.3.8 Crossroads are convenient for pedestrians, as they minimise diversion from desire lines when crossing the street. They also make it easier to create permeable and legible street networks.

7.3.9 Permeable layouts can also be achieved using T and Y junctions. Y junctions can increase flexibility in layout design.

7.3.10 Staggered junctions can reduce vehicle conflict compared with crossroads, but may reduce directness for pedestrians. If it is necessary to maintain a view point or vista, and if there is sufficient room between buildings, staggered junctions can be provided within continuous building lines. (Fig. 7.12).

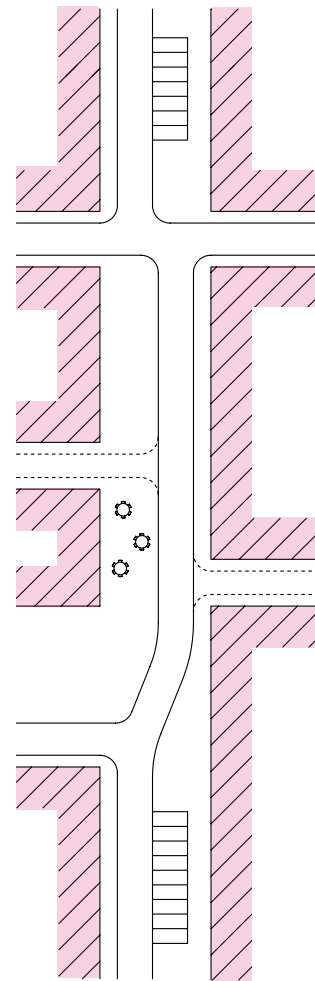


Figure 7.12 – Using staggered junctions to maintain a view point or vista.

Case study

Hulme, Manchester: speed tables



Tim Pharoah, Llewelyn Davies Yeang

Figure 7.13 Raised tables at junction in Hulme. The table has been raised almost to kerb height.

A distinctive feature of the Hulme development is the adherence to a linear grid form. Raised tables at junctions reduce speeds and facilitate pedestrian movement (Fig. 7.13).

7.3.11 Where designers are concerned about potential user conflict, they may consider placing the junction on a speed table (see Hulme, Manchester box). Another option might be to close one of the arms to motor traffic (while leaving it open for pedestrians and cyclists).

7.3.12 Conventional roundabouts are not generally appropriate for residential developments. Their capacity advantages are not usually relevant, they can have a negative impact on vulnerable road users, and they often do little for the street scene.

7.3.13 Larger roundabouts are inconvenient for pedestrians because they are deflected from their desire lines, and people waiting to cross one of the arms may not be able to anticipate easily the movement of motor vehicles on the roundabout, or entering or leaving it.



Peter O'Brien, Llewelyn Davies Yeang

Figure 7.14 This street avoids the use of vertical traffic-calming features, but the irregular alignment is unsightly and unlikely to have much speed-reducing effect, because of the width of the carriageway. It also results in irregular grassed areas that create a maintenance burden while contributing little to street quality.

7.3.14 Roundabouts can be hazardous for cyclists. Drivers entering at relatively high speed may not notice cyclists on the circulatory carriageway, and cyclists travelling past an arm are vulnerable to being hit by vehicles entering or leaving the junction.

7.3.15 Mini-roundabouts may be more suitable in residential areas, as they cause less deviation for pedestrians and are easier for cyclists to use. In addition, they do not occupy as much land. Practitioners should refer to *Mini-roundabouts: Good Practice Guidelines*.⁸

7.3.16 Continental-style roundabouts are also suitable for consideration. They sit between conventional roundabouts and mini-roundabouts in terms of land take. They retain a conventional central island, but differ in other respects – there is minimal flare at entry and exit, and they have a single-lane circulatory carriageway. In addition, the circulatory carriageway has negative camber, so water drains away from the centre, which simplifies drainage arrangements. Their geometry is effective in reducing entry, circulatory and exit speeds.⁹ They are safer for cyclists because of the reduced speeds, together with the fact that drivers cannot overtake on the circulatory carriageway. Their use is described in *Traffic Advisory Leaflet 9/97*.¹⁰

Spacing of junctions

7.3.17 The spacing of junctions should be determined by the type and size of urban blocks appropriate for the development. Block size should be based on the need for permeability, and generally tends to become smaller as density and pedestrian activity increases.

7.3.18 Smaller blocks create the need for more frequent junctions. This improves permeability for pedestrians and cyclists, and the impact of motor traffic is dispersed over a wider area. Research in the preparation of MfS¹¹ demonstrated that more frequent (and hence less busy) junctions need not lead to higher numbers of accidents.

7.3.19 Junctions do not always need to cater for all types of traffic. Some of the arms of a junction may be limited to pedestrian and cycle movement only.

7.4 Achieving appropriate traffic speeds

7.4.1 Conflict among various user groups can be minimised or avoided by reducing the speed and flow of motor vehicles. Ideally, designers should aim to create streets that control vehicle speeds naturally rather than having to rely on unsympathetic traffic-calming measures (Fig. 7.14). In general, providing a separate pedestrian and/or cycle route away from motor traffic should only be considered as a last resort (see the hierarchy of provision in Chapter 4).

⁸ Department for Transport and County Surveyors' Society (CSS) (2006) *Mini-roundabouts: Good Practice Guidance*. London: CSS.

⁹ Davies D.G. Taylor, MC, Ryley, TJ, Halliday, M. (1997) *Cyclists at Roundabouts – the Effects of 'Continental' Design on Predicted Safety and Capacity*. TRL Report No. 285. Crowthorne: TRL.

¹⁰ DETR (1997) *Traffic Advisory Leaflet 9/97 – Cyclists at Roundabouts: Continental Design Geometry*. London: DETR.

¹¹ I York, A Bradbury, S Reid, T Ewings and R Paradise (2007) *The Manual for Streets: redefining residential street design*. TRL Report no. 661. Crowthorne: TRL.



Andrew Cameron, WSP

Figure 7.15 Trees planted in the highway at Newhall, Harlow, help to reduce vehicle speeds.

7.4.2 For residential streets, a maximum design speed of 20 mph should normally be an objective. The severity of injuries and the likelihood of death resulting from a collision at 20 mph are considerably less than can be expected at 30 mph. In addition, vehicle noise and the intimidation of pedestrians and cyclists are likely to be significantly lower.

7.4.3 Evidence from traffic-calming schemes suggests that speed-controlling features are required at intervals of no more than 70 m in order to achieve speeds of 20 mph or less.¹² Straight and uninterrupted links should therefore be limited to around 70 m to help ensure that the arrangement has a natural traffic-calming effect.

7.4.4 A continuous link can be broken up by introducing features along it to slow traffic. The range of traffic-calming measures available act in different ways, with varying degrees of effectiveness:

- *Physical features* – involving vertical or horizontal deflection – can be very effective in reducing speed. It is preferable to use other means of controlling speeds, if practicable, but there will be situations where physical features represent the optimum solution. Additional sources of advice on traffic calming can be found in Traffic Advisory Leaflet 2/05.¹³
- *Changes in priority* – at roundabouts and other junctions. This can be used to disrupt flow and therefore bring overall speeds down.

- *Street dimensions* – can have a significant influence on speeds. Keeping lengths of street between junctions short is particularly effective. Street width also has an effect on speed (see box).
- *Reduced visibility* – research carried out in preparation of MfS found that reductions in forward visibility are associated with reduced driving speeds (see box).
- *Psychology and perception* – street features and human activity can have an influence on the speed at which people choose to drive. Research¹⁴ suggests that features likely to be effective include the following:
 - edge markings that visually narrow the road – speed reduction is likely to be greatest where the edging is textured to appear unsuitable for driving on;
 - the close proximity of buildings to the road;
 - reduced carriageway width;
 - obstructions in the carriageway (Fig. 7.15);
 - features associated with potential activity in, or close to, the carriageway, such as pedestrian refuges;
 - on-street parking, particularly when the vehicles are parked in echelon formation or perpendicular to the carriageway;
 - the types of land use associated with greater numbers of people, for example shops; and
 - pedestrian activity.

¹² DETR (1999) *Traffic Advisory Leaflet 9/99* – 20mph speed limits and zones. London: DETR.

¹³ Department for Transport (2005) *Traffic Advisory Leaflet 2/05 - Traffic calming Bibliography*. London: Department for Transport.

¹⁴ J Kennedy, R Gorell, L Crinson, A Wheeler, M Elliott (2005) *'Psychological' traffic calming* TRL Report No. 641. Crowthorne: TRL.

Influence of geometry on speed

Research carried out in the preparation of MfS considered the influence of geometry on vehicle speed and casualties in 20 residential and mixed-use areas in the UK. Two highway geometric factors stand out as influencing driving speed, all other things being equal.

They are:

- forward visibility; and
- carriageway width.

Improved visibility and/or increased carriageway width were found to correlate with increased vehicle speeds. Increased width for a given visibility, or vice versa, were found to increase speed. These data are summarised in Fig. 7.16.

The relationship between visibility, highway width and driver speed identified on links was also found to apply at junctions. A full description of the research findings is available in TRL Report 661.¹⁵

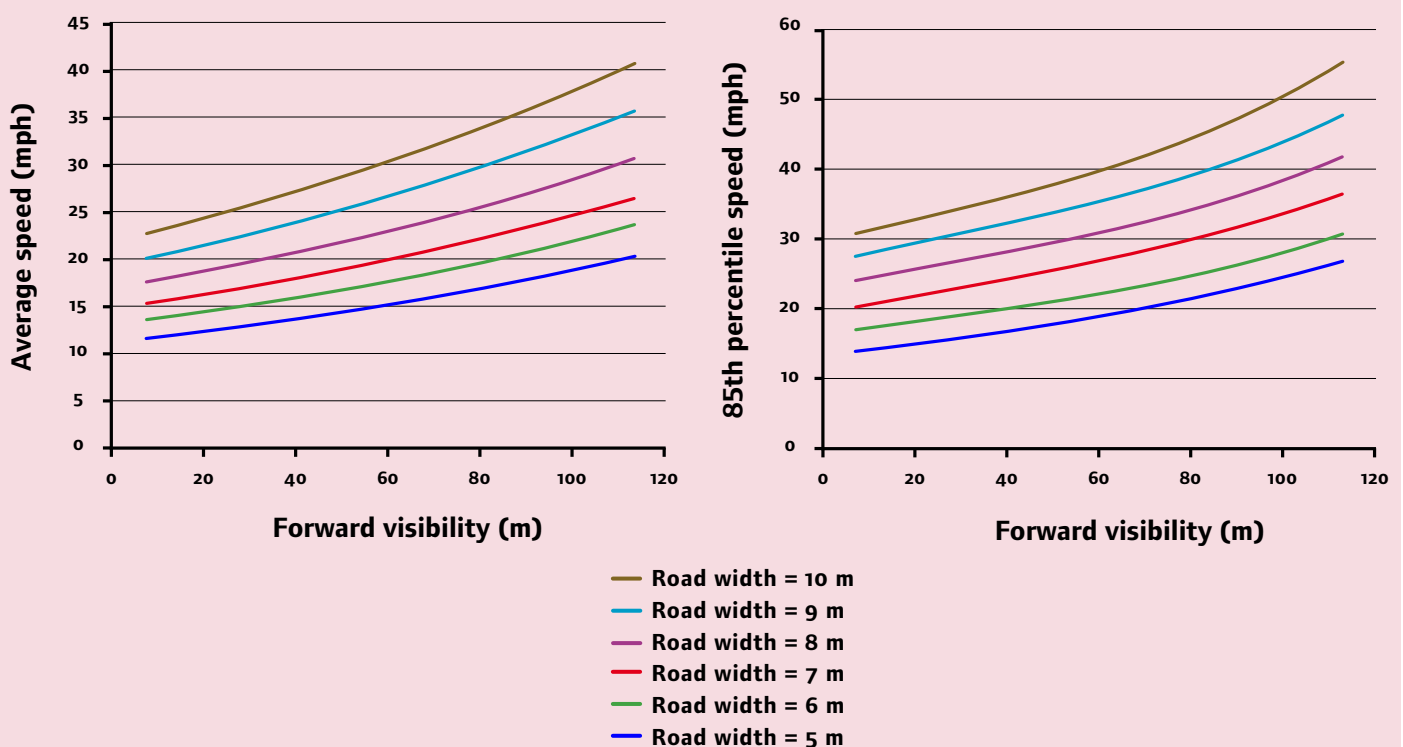


Figure 7.16 Correlation between visibility and carriageway width and vehicle speeds (a) average speeds and (b) 85th percentile speeds. These graphs can be used to give an indication of the speed at which traffic will travel for a given carriageway width/forward visibility combination.

7.4.5 Speed limits for residential areas are normally 30 mph, but 20 mph limits are becoming more common. If the road is lit, a 30 mph limit is signed only where it begins – repeater signs are not used here. All other speed limits have to be signed where they start and be accompanied by repeater signs.

¹⁵ I York, A Bradbury, S Reid, T Ewings and R Paradise (2007) *The Manual for Streets: Redefining Residential Street Design*. TRL Report No. 661. Crowthorne: TRL.

7.4.6 A street with a 20 mph limit is not the same as a 20 mph zone. To create a 20 mph zone, it is a legal requirement that traffic-calming measures are installed to ensure that low speeds are maintained throughout. In such cases, the limit is signed only on entering the zone, and no repeater signs are necessary.

7.4.7 Any speed limits below 30 mph, other than 20 mph limits or 20 mph zones, require individual consent from the Secretary of State for Transport. Designers should note that such approval is unlikely to be given.

7.4.8 A speed limit is not an indication of the appropriate speed to drive at. It is the responsibility of drivers to travel within the speed limit at a speed suited to the conditions. However, for new streets, or where existing streets are being modified, and the design speed is below the speed limit, it will be necessary to include measures that reduce traffic speeds accordingly.

7.4.9 Difficulties may be encountered where a new development connects to an existing road. If the junction geometry cannot be made to conform to the requirements for prevailing traffic speeds, the installation of traffic-calming measures on the approach will allow the use of a lower design speed to be used for the new junction.

7.5 Stopping sight distance

7.5.1 This section provides guidance on stopping sight distances (SSDs) for streets where 85th percentile speeds are up to 60 km/h. At speeds above this, the recommended SSDs in the *Design Manual for Roads and Bridges*¹⁶ may be more appropriate.

7.5.2 The stopping sight distance (SSD) is the distance within which drivers need to be able to see ahead and stop from a given speed. It is calculated from the speed of the vehicle, the time required for a driver to identify a hazard and then begin to brake (the perception–reaction time), and the vehicle’s rate of deceleration. For new streets, the design speed is set by the designer. For existing streets, the 85th percentile wet-weather speed is used.

7.5.3 The basic formula for calculating SSD (in metres) is:

$$SSD = vt + v^2/2d$$

where:

v = speed (m/s)

t = driver perception–reaction time (seconds)

d = deceleration (m/s²)

7.5.4 The desirable minimum SSDs used in the *Design Manual for Roads and Bridges* are based on a driver perception–reaction time of 2 seconds and a deceleration rate of 2.45 m/s² (equivalent to 0.25g where g is acceleration due to gravity (9.81 m/s²)). *Design Bulletin 32*¹⁷ adopted these values.

7.5.5 Drivers are normally able to stop much more quickly than this in response to an emergency. The stopping distances given in the Highway Code assume a driver reaction time of 0.67 seconds, and a deceleration rate of 6.57 m/s².

7.5.6 While it is not appropriate to design street geometry based on braking in an emergency, there is scope for using lower SSDs than those used in *Design Bulletin 32*. This is based upon the following:

- a review of practice in other countries has shown that *Design Bulletin 32* values are much more conservative than those used elsewhere;¹⁸
- research which shows that the 90th percentile reaction time for drivers confronted with a side-road hazard in a driving simulator is 0.9 seconds (see TRL Report 332¹⁹);
- carriageway surfaces are normally able to develop a skidding resistance of at least 0.45g in wet weather conditions. Deceleration rates of 0.25g (the previously assumed value) are more typically associated with snow-covered roads; and
- of the sites studied in the preparation of this manual, no relationship was found between SSDs and casualties, regardless of whether the sites complied with *Design Bulletin 32* or not.

¹⁶ Highways Agency (1992) *Design Manual for Roads and Bridges* London: TSO.

¹⁷ Department of the Environment/Department of Transport (1977; 2nd edn 1992) *Design Bulletin 32, Residential Roads and Footpaths – Layout Considerations*. London: HMSO.

¹⁸ D.W. Harwood, D.B. Fambro, B. Fishburn, H. Joubert, R. Lamm and B. Psarianos. (1995) *International Sight Distance Design Practices, International Symposium on Highway Geometric Design Practices*, Boston, Massachusetts Conference Proceedings. Washington USA: Transportation Research Board.

¹⁹ Maycock G, Brocklebank P. and Hall, R. (1998) *Road Layout Design Standards and Driver Behaviour*. TRL Report No. 332. Crowthorne: TRL

Table 7.1 Derived SSDs for streets (figures rounded).

Speed	Kilometres per hour	16	20	24	25	30	32	40	45	48	50	60
	Miles per hour	10	12	15	16	19	20	25	28	30	31	37
SSD (metres)		9	12	15	16	20	22	31	36	40	43	56
SSD adjusted for bonnet length. See 7.6.4		11	14	17	18	23	25	33	39	43	45	59
Additional features will be needed to achieve low speeds												

7.5.7 The SSD values used in MfS are based on a perception–reaction time of 1.5 seconds and a deceleration rate of 0.45g (4.41 m/s²). Table 7.1 uses these values to show the effect of speed on SSD.

7.5.8 Below around 20 m, shorter SSDs themselves will not achieve low vehicle speeds: speed-reducing features will be needed. For higher speed roads, i.e. with an 85th percentile speed over 60 km/h, it may be appropriate to use longer SSDs, as set out in the *Design Manual for Roads and Bridges*.

7.5.9 Gradients affect stopping distances. The deceleration rate of 0.45g used to calculate the figures in Table 7.1 is for a level road. A 10% gradient will increase (or decrease) the rate by around 0.1g.

7.6 Visibility requirements

7.6.1 Visibility should be checked at junctions and along the street. Visibility is measured horizontally and vertically.

7.6.2 Using plan views of proposed layouts, checks for visibility in the horizontal plane ensure that views are not obscured by vertical obstructions.

7.6.3 Checking visibility in the vertical plane is then carried out to ensure that views in the horizontal plane are not compromised by obstructions such as the crest of a hill, or a bridge at a dip in the road ahead. It also takes into account the variation in driver eye height and the height range of obstructions. Eye height is assumed to range from 1.05 m (for car drivers) to 2 m (for lorry drivers). Drivers need to be able to see obstructions 2 m high down to a point 600 mm above the carriageway. The latter dimension is used to ensure small children can be seen (Fig. 7.17).

7.6.4 The SSD figure relates to the position of the driver. However, the distance between the driver and the front of the vehicle is typically up to 2.4 m, which is a significant proportion of shorter stopping distances. It is therefore recommended that an allowance is made by adding 2.4 m to the SSD.

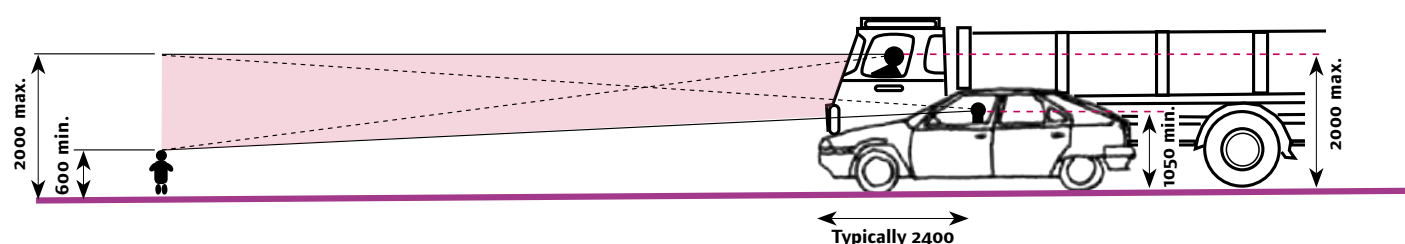


Figure 7.17 Vertical visibility envelope.

7.7 Visibility splays at junctions

7.7.1 The visibility splay at a junction ensures there is adequate inter-visibility between vehicles on the major and minor arms (Fig. 7.18).

7.7.2 The distance back along the minor arm from which visibility is measured is known as the X distance. It is generally measured back from the 'give way' line (or an imaginary 'give way' line if no such markings are provided). This distance is normally measured along the centreline of the minor arm for simplicity, but in some circumstances (for example where there is a wide splitter island on the minor arm) it will be more appropriate to measure it from the actual position of the driver.

7.7.3 The Y distance represents the distance that a driver who is about to exit from the minor arm can see to his left and right along the main alignment. For simplicity it is measured along the nearside kerb line of the main arm, although vehicles will normally be travelling a distance from the kerb line. The measurement is taken from the point where this line intersects the centreline of the minor arm (unless, as above, there is a splitter island in the minor arm).

7.7.4 When the main alignment is curved and the minor arm joins on the outside of a bend, another check is necessary to make sure that an approaching vehicle on the main arm is visible over the whole of the Y distance. This is done by drawing an additional sight line which meets the kerb line at a tangent.

7.7.5 Some circumstances make it unlikely that vehicles approaching from the left on the main arm will cross the centreline of the main arm – opposing flows may be physically

segregated at that point, for example. If so, the visibility splay to the left can be measured to the centreline of the main arm.

X distance

7.7.6 An X distance of 2.4 m should normally be used in most built-up situations, as this represents a reasonable maximum distance between the front of the car and the driver's eye.

7.7.7 A minimum figure of 2 m may be considered in some very lightly-trafficked and slow-speed situations, but using this value will mean that the front of some vehicles will protrude slightly into the running carriageway of the major arm. The ability of drivers and cyclists to see this overhang from a reasonable distance, and to manoeuvre around it without undue difficulty, should be considered.

7.7.8 Using an X distance in excess of 2.4 m is not generally required in built-up areas.

7.7.9 Longer X distances enable drivers to look for gaps as they approach the junction. This increases junction capacity for the minor arm, and so may be justified in some circumstances, but it also increases the possibility that drivers on the minor approach will fail to take account of other road users, particularly pedestrians and cyclists. Longer X distances may also result in more shunt accidents on the minor arm. TRL Report No. 184²⁰ found that accident risk increased with greater minor-road sight distance.

Y distance

7.7.10 The Y distance should be based on values for SSD (Table 7.1).

20 Summersgill I., Kennedy, J. and Baynes, D. (1996) *Accidents at Three-arm Priority Junctions on Urban Single-carriageway Roads* TRL Report no. 184. Crowthorne: TRL.

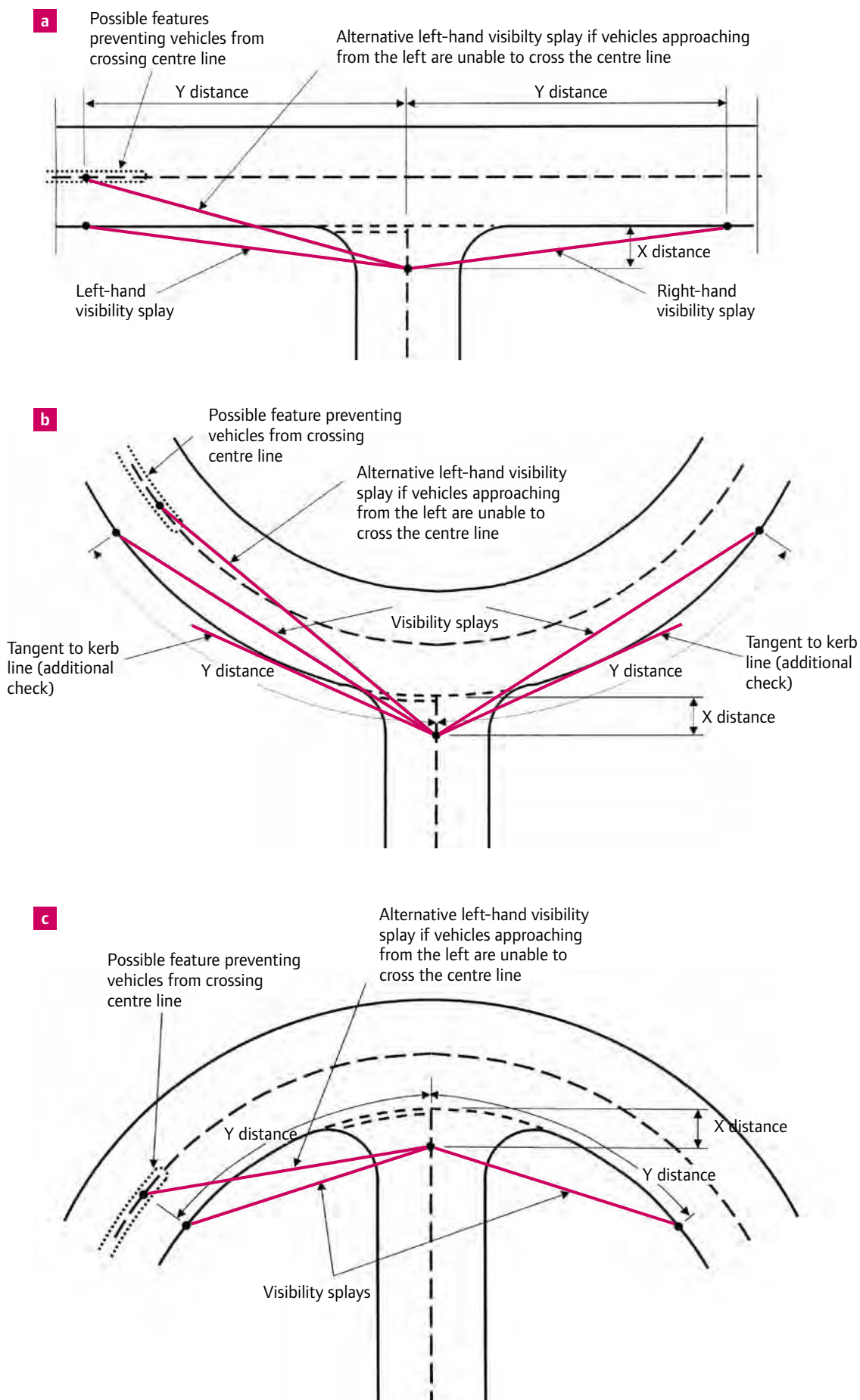


Figure 7.18 Measurement of junction visibility splays (a) on a straight road, (b) and (c) on bends.

7.8 Forward visibility

7.8.1 Forward visibility is the distance a driver needs to see ahead to stop safely for obstructions in the road. The minimum forward visibility required is equal to the minimum SSD. It is checked by measuring between points on a curve along the centreline of the inner traffic lane (see Fig. 7.19).

7.8.2 There will be situations where it is desirable to reduce forward visibility to control traffic speed – the Influence of geometry on speed box describes how forward visibility influences speed. An example is shown in Fig 7.20.

Visibility along the street edge

7.8.3 Vehicle exits at the back edge of the footway mean that emerging drivers will have to take account of people on the footway. The absence of wide visibility splays at private driveways will encourage drivers to emerge more cautiously. Consideration should be given to whether this will be appropriate, taking into account the following:

- the frequency of vehicle movements;
- the amount of pedestrian activity; and
- the width of the footway.

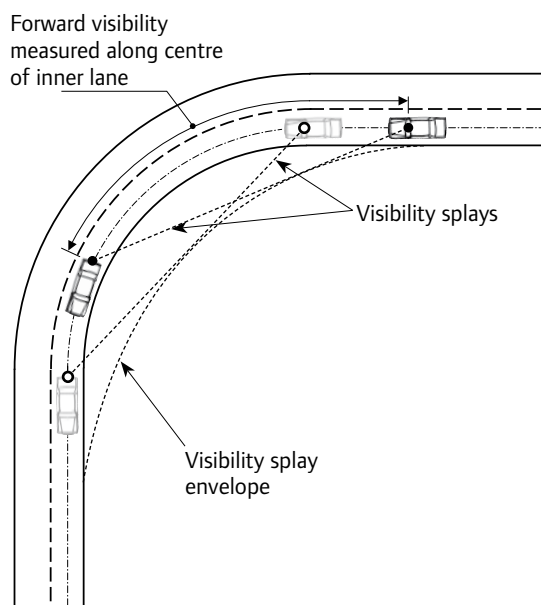


Figure 7.19 Measurement of forward visibility.



Figure 7.20 Limiting forward visibility helps keep speeds down in Poundbury, Dorset.

7.8.4 When it is judged that footway visibility splays are to be provided, consideration should be given to the best means of achieving this in a manner sympathetic to the visual appearance of the street (Fig. 7.21). This may include:

- the use of boundary railings rather than walls (Fig. 7.22); and
- the omission of boundary walls or fences at the exit location.

Obstacles to visibility

7.8.5 Parking in visibility splays in built-up areas is quite common, yet it does not appear to create significant problems in practice. Ideally, defined parking bays should be provided outside the visibility splay. However, in some circumstances, where speeds are low, some encroachment may be acceptable.

7.8.6 The impact of other obstacles, such as street trees and street lighting columns, should be assessed in terms of their impact on the overall envelope of visibility. In general, occasional obstacles to visibility that are not large enough to fully obscure a whole vehicle or a pedestrian, including a child or wheelchair user, will not have a significant impact on road safety.



Tim Pharaoh, Llewelyn Davies Yeang

Figure 7.21 Beaulieu Park, Chelmsford – low vegetation provides subtle provision of visibility at private driveway.



Tim Pharaoh, Llewelyn Davies Yeang

Figure 7.22 Beaulieu Park, Chelmsford: the visibility splays are provided by railings rather than boundary walls, although the railings could have followed the property boundary.

7.9 Frontage access

7.9.1 One of the key differences between streets and roads is that streets normally provide direct access to buildings and public spaces. This helps to generate activity and a positive relationship between the street and its surroundings. Providing direct access to buildings is also efficient in land-use terms.

7.9.2 The provision of frontage vehicle access onto a street should be considered from the viewpoint of the people passing along the street, as well as those requiring access (Fig. 7.23).

Factors to consider include:

- the speed and volume of traffic on the street;
- the possibility of the vehicles turning around within the property – where this is possible, then vehicles can exit travelling forward;
- the presence of gathered accesses – a single access point can serve a number of properties or a communal parking area, for example. This may be acceptable where a series of individual accesses would not be; and

- the distance between the property boundary and the carriageway – to provide adequate visibility for the emerging driver.

7.9.3 In the past, a relatively low limit on traffic flow (300 vehicles per peak hour or some 3,000 vehicles per day) has generally been used when deciding whether direct access was appropriate. This is equivalent to the traffic generated by around 400 houses. Above this level, many local-authority residential road guidelines required the provision of a ‘local distributor road’.



Andrew Cameron, WSP

Figure 7.23 Frontage access for individual dwellings onto a main street into Dorchester.

7.9.4 Such roads are often very unsuccessful in terms of placemaking and providing for pedestrians and cyclists. In many cases, buildings turn their backs onto local distributors, creating dead frontages and sterile environments. Separate service roads are another possible design response, but these are wasteful of land and reduce visual enclosure and quality.

7.9.5 It is recommended that the limit for providing direct access on roads with a 30 mph speed restriction is raised to at least 10,000 vehicles per day (see box).

Traffic flow and road safety for streets with direct frontage access

The relationship between traffic flow and road safety for streets with direct frontage access was researched for MfS. Data on recorded accidents and traffic flow for a total of 20 sites were obtained. All of the sites were similar in terms of land use (continuous houses with driveways), speed limit (30 mph) and geometry (single-carriageway roads with limited side-road junctions). Traffic flows at the sites varied from some 600 vehicles per day to some 23,000 vehicles per day, with an average traffic flow of some 4,000 vehicles per day.

It was found that very few accidents occurred involving vehicles turning into and out of driveways, even on heavily-trafficked roads.

Links with direct frontage access can be designed for significantly higher traffic flows than have been used in the past, and there is good evidence to raise this figure to 10,000 vehicles per day. It could be increased further, and it is suggested that local authorities review their standards with reference to their own traffic flows and personal injury accident records. The research indicated that a link carrying this volume of traffic, with characteristics similar to those studied, would experience around one driveway-related accident every five years per kilometre. Fewer accidents would be expected on links where the speed of traffic is limited to 20 mph or less, which should be the aim in residential areas.

7.10 Turning areas

7.10.1 Connected street networks will generally eliminate the need for drivers to make three-point turns.

7.10.2 Where it is necessary to provide for three-point turns (e.g. in a cul-de-sac), a tracking assessment should be made to indicate the types of vehicles that may be making this manoeuvre and how they can be accommodated. The turning space provided should relate to its environment, not specifically to vehicle movement (see Fig. 7.24), as this can result in a space with no use other than for turning vehicles. To be effective and usable, the turning head must be kept clear of parked vehicles. Therefore it is essential that adequate parking is provided for residents in suitable locations.

7.10.3 Routing for waste vehicles should be determined at the concept masterplan or scheme design stage (see paragraph 6.8.4). Wherever possible, routing should be configured so that the refuse collection can be made without the need for the vehicle having to reverse, as turning heads may be obstructed by parked vehicles and reversing refuse vehicles create a risk to other street users.

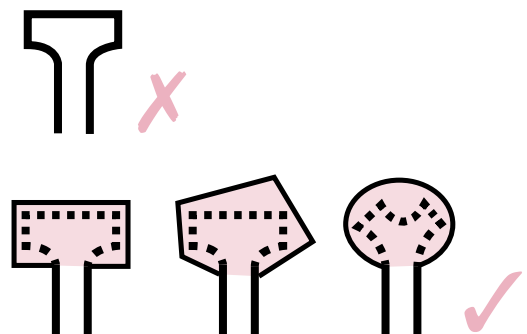


Figure 7.24 Different turning spaces and usable turning heads.

7.11 Overrun areas

7.11.1 Overrun areas are used at bends and junctions (including roundabouts). They are areas of carriageway with a surface texture and/or appearance intended to deter overrunning by cars and other light vehicles. Their purpose is to allow the passage of large vehicles, such as buses and refuse vehicles, while maintaining 'tight' carriageway dimensions that deter smaller vehicles from speeding.

7.11.2 Overrun areas should generally be avoided in residential and mixed-use streets. They can:

- be visually intrusive;
- interfere with pedestrian desire lines (Fig. 7.25); and
- pose a hazard for cyclists.

However, they can help to overcome problems with access for larger vehicles and so may represent the best solution.



Figure 7.25 The overrun area at this junction is hazardous for pedestrians and/or requires them to divert from their desire line. Notice also the unsightly placing of inspection covers. The layout is particularly hazardous for blind and partially-sighted pedestrians.

K. Extract from Manual For Streets 2

Manual for Streets 2



Wider Application of the Principles

Published by the Chartered Institution of Highways & Transportation

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Ministerial Foreword



Streets and roads make up around three-quarters of all public space – their design, appearance, and the way they function have a huge impact on the quality of people's lives. The Department for Transport is committed to high quality design in the public realm and our technical advice is evidence of that commitment.

In 2007 the Department published the Manual for Streets, replacing guidance which had been in use for 30 years. It completely changed the approach to the design and provision of residential and other streets. It enjoys an excellent standing and its success has generated a desire among professionals for technical advice to cover other streets and roads along similar lines.

Manual for Streets 2 – Wider Application of the Principles is the result – a product of highly collaborative working between the Department for Transport and industry. It is an excellent demonstration of what can be achieved when Government works in partnership with others.

I congratulate the Chartered Institution of Highways and Transportation and the team which made publication of Manual for Streets 2 possible and I commend the document to all those involved in designing the public realm. The challenge now is for them to embrace the advice and extend the advantages of good design to streets and roads outside residential areas.

A handwritten signature in black ink that reads "Norman Baker". The signature is written in a cursive, flowing style.

NORMAN BAKER
Parliamentary Under Secretary of State
for Transport

Presidential Foreword



By Geoff Allister
CIHT President 2010-2011

In 2007 the Department for Transport published the Manual for Streets, a landmark document that is changing the face of our residential streets. The Manual for Streets (MfS1) did not set out new policy, it reinforced a philosophy that had been growing since the late 1990s to return our residential streets to the community by engineering them to create a greater sense of place, provide an environment that is accessible and safe for all, and one that improves the quality of life.

The Chartered Institution of Highways and Transportation's new guidelines builds on the advice contained in MfS1, exploring in greater detail how and where its key principles can be applied to busier streets and roads in both urban and rural locations up to, but not including, trunk roads. Manual for Streets 2 – Wider Application of the Principles will help to fill the perceived gap in design advice between MfS and the design standards for trunk roads set out in the Design Manual for Roads and Bridges.

Manual for Streets 2 is the result of a partnership between practitioners and policy makers from highway engineers and urban designers to transport planners. The quality of the advice it contains is a true testament to the knowledge and expertise of all those who have contributed to its preparation. I thank them all, particularly the members of the steering group and the editorial team for the considerable time and effort they have contributed to this project.

I would also like to thank the sponsors the Department for Transport, the Association of Directors of Environment, Economy, Planning and Transport, the Commission for Architecture and the Built Environment and the Homes and Communities Agency who have made these guidelines possible.

On behalf of the Institution, I am pleased to commend Manual for Streets 2 – Wider Application of the Principles to all those who are involved in the planning, construction and improvement of our streets and roads. I am sure it will make a significant contribution to professional practice and, over time, to our communities and the places where people live, work and play.

Geoff Allister
President 2010-2011

A handwritten signature in black ink, appearing to read 'G W Allister', written in a cursive style.

Partnering Organisations Preface

Streets play a fundamental part in community life which is why CABI has been a long term supporter of the development of Manual for Streets. Our experience tells us that creative design can deliver more vibrant and inclusive streets. Happily we're not alone in this view. Policy makers, practitioners, and community members also identify well designed, civilising streets as critical to issues such as community cohesion, economic vitality, well-being and health. The key challenge in delivering these wider benefits is the ability to strike a more effective balance between the movement, meeting and exchange functions of our street network. Manual for Streets 2 will play an important role in supporting this agenda.



Richard Simmons
Chief Executive, CABI

ADEPT enthusiastically supports this important piece of work which will be an essential reference in the future. Local authorities are increasingly aware of the fundamental nature of well designed and maintained streets to the economic, social, educational and environmental well-being of local citizens and communities; and the harmful consequences of neglecting the places where we live and work.



George Batten
President of ADEPT

Status and Application

Manual for Streets 2: Wider Application of the Principles (MfS2) forms a companion guide to Manual for Streets (MfS1). Whilst MfS1 focuses on lightly-trafficked residential streets it also states that, *‘a street is defined as a highway that has important public realm functions beyond the movement of traffic.... Most highways in built up areas can therefore be considered as streets.’* MfS1 also stated that, *‘many of its key principles may be applicable to other types of streets, for example high streets and lightly trafficked lanes in rural areas’.*

MfS2 builds on the guidance contained in MfS1, exploring in greater detail how and where its key principles can be applied to busier streets and non-trunk roads, thus helping to fill the perceived gap in design guidance between MfS1 and the Design Manual for Roads and Bridges (DMRB).

DMRB is the design standard for Trunk Roads and Motorways in England, Scotland, Wales and Northern Ireland. The strict application of DMRB to non-trunk routes is rarely appropriate for highway design in built up areas, regardless of traffic volume.

MfS2 provides advice and does not set out any new policy or legal requirements.

The following definitions apply throughout this document:

MfS1 refers to Manual for Streets (2007).

MfS2 refers to this document.

MfS refers to both documents.

Section A

Context and Process



1_ Principles

1.1_ Introduction

1.1.1 MfS2 has been prepared for the Chartered Institution of Highways and Transportation (CIHT) by a multidisciplinary team of consultants. The document is endorsed by the Department for Transport (DfT), the Homes and Community Agency (HCA), the Welsh Assembly Government (WAG), Commission for Architecture and the Built Environment (CABE), the Association of Directors of Environment, Economy, Planning and Transport (ADEPT) and English Heritage. All of these organisations contributed to its development.

1.1.2 This new document does not supersede MfS1; rather it explains how the principles of MfS1 can be applied more widely. It draws on a number of sources including:

- The Department for Transport's 'Mixed Priority Route' research study¹;
- Interim findings from the ongoing Department for Transport research into Shared Space²;
- Case Studies, including detailed research by CABE; and
- Further research into the relationship between junction visibility and collisions.

1.2_ MfS Principles

1.2.1 MfS1 changed the way we approach the design, construction, adoption and maintenance of urban streets. The principal changes to practice, as set out below, also form the basis of this document which considers the wider highway network.

- **Applying a user hierarchy** to the design process with pedestrians at the top. This means considering the needs of pedestrians first when designing, building, retrofitting, maintaining and improving streets.
- **Emphasising a collaborative approach** to the delivery of streets. Many busy streets and rural highways require a 'non-standard' approach to respond to context and this can be achieved by working as a multidisciplinary team and by looking at and researching other similar places that work well. It is important to include all skill sets required to meet scheme objectives. Many of these are included in MfS1, paragraph 1.2.1.
- **Recognising the importance of the community function** of streets as spaces for social interaction. Streets should integrate not segregate communities and neighbourhoods.
- **Promoting an inclusive environment** that recognises the needs of people of all ages and abilities. Designs must recognise the importance of way-finding and legibility, especially with regards to the sensory and cognitive perceptions of children, older people and disabled people.
- **Reflecting and supporting pedestrian and cyclist desire lines** in networks and detailed designs.



Both of these streets have about the same amount of carriageway space and carry around the same volume of vehicular traffic. The cross section and arrangement of buildings mean that the one in the upper photo segregates two communities whilst the one in the lower photo is at the centre of the community and offers retail and commercial opportunities.

- **Developing masterplans and preparing design codes** for larger scale developments, and using design and access statements for all scales of development.
- **Establishing a clear vision and setting objectives for schemes**, which respond to the more complex and competing requirements in mixed use contexts.
- **A locally appropriate balance should be struck between the needs of different user groups.** Traffic capacity will not always be the primary consideration in designing streets and networks.
- **Creating networks of streets that provide permeability and connectivity** to main destinations and choice of routes.
- **Moving away from hierarchies of standard road types** based on traffic flows and/or the number of buildings served.
- **Developing street character types** on a location-specific basis requiring a balance to be struck between place and movement in many of the busier streets.
- **Encouraging innovation** with a flexible approach to street layouts and the use of locally distinctive, durable and maintainable materials.
- **Using quality audit processes** that demonstrate how designs will meet objectives for the locality.
- **Designing to keep vehicle speed at or below 20mph** in streets and places with significant pedestrian

movement unless there are overriding reasons for accepting higher speeds.

- **Using the minimum of highway design features** necessary to make the streets work properly. The starting point for any well designed street is to begin with nothing and then add only what is necessary in practice.

1.3_Scope of MfS

1.3.1 The following key areas of advice, derived from principles contained in MfS, can be applied based on speed limits, subject to a more detailed assessment of local context, as shown below in **Table 1.1**.

1.3.2 It is clear from **Table 1.1** that most MfS advice can be applied to a highway regardless of speed limit. **It is therefore**

streets with on-street parking and direct frontage access to 2/3 lane dual carriageways. Furthermore, local context varies not only from street to street but also along the length of a street.

(See **Figure 1.1**.)

1.3.6 Where a single carriageway street with on-street parking and direct frontage access is subject to a 40mph speed limit, its place characteristics are more of a residential street or high street, with higher traffic flows, and may result in actual speeds below the limit. It is only where actual speeds are above 40mph for significant periods of the day that DMRB parameters for SSD are recommended. Where speeds are lower, MfS parameters are recommended. Where there may be some doubt as to which guidance to adopt, actual speed measurements should be undertaken

Speed Limit	20mph	30mph	40mph	50+mph
User Hierarchy	●	●	●	●
Team Working	●	●	●	●
Community Function	●	●	●	●
Inclusive Design	●	●	●	●
Ped/Cycle Support	●	●	●	●
Master Plans/Design Codes	●	●	●	●
Stopping Sight Distance	●	●	●	●
Frontage Access	●	●	●	●
Minimise Signs and Street Furniture	●	●	●	●
Quality Audits	●	●	●	●
Connectivity/Permeability	●	●	●	●

Table 1.1 Application of key areas of MfS advice

Note: ● yes ● subject to local context

recommended that as a starting point for any scheme affecting non-trunk roads, designers should start with MfS.

1.3.3 Where designers do refer to DMRB for detailed technical guidance on specific aspects, for example on strategic inter-urban non-trunk roads, it is recommended that they bear in mind the key principles of MfS, and apply DMRB in a way that respects local context. It is further recommended that DMRB or other standards and guidance is only used where the guidance contained in MfS is not sufficient or where particular evidence leads a designer to conclude that MfS is not applicable.

1.3.4 The application of MfS advice to all 30mph speed limits as a starting point is in keeping with MfS1.

1.3.5 Much of the research behind MfS1 for stopping sight distance (SSD) is limited to locations with traffic speeds of less than 40mph and there is some concern that driver behaviour may change above this level as the character of the highway changes. However, 40mph speed limits in built-up areas cover a wide range of contexts, from simple urban

to determine which is most appropriate. (See **Chapter 10** for SSD guidance.)

1.3.7 Similarly, in rural areas many parts of the highway network are subject to the national speed limit but have traffic speeds significantly below 60mph. (See **Figure 1.2**) Again in these situations where speeds are lower than 40mph, MfS SSD parameters are recommended.

1.3.8 Direct frontage access is common in all urban areas, including where 40mph speed limits apply, without evidence to suggest that this practice is unsafe. This is confirmed in TD41/95³ (Annex 2 paragraph A2.10) which states that *'in the urban situation there is no direct relationship between access provision and collision occurrence'*. However, this is not true of rural roads (A2.5) where the research identified a *'statistically significant relationship for collisions on rural single carriageways with traffic flow, link length and farm accesses. On rural dual carriageways, the significant relationship extended to laybys, residential accesses and other types of access including petrol filling stations'* (See **Chapter 9** for further advice on direct frontage access.)

1.3.9 This approach demonstrates that the key MfS principles can be applied widely to improve the quality of highways and their application is not limited to low speed or lightly trafficked routes.

1.3.10 Any new design has to take account of local context, however adopting speed limits as a proxy to identify which elements of MfS apply provides a reasonable way forward. It is clear from **Table 1.1** that for a particular context, even though some aspects of MfS may not apply, there are still many principles which affect design quality that do.

Single Lane,
Frontage Access,
On-Street Parking



Wide Single Lane,
Frontage Access,
On-Street Parking



2/3 Lane Dual
Carriageway. No
frontage access.
No stopping.



Figure 1.1 Typical Range of Urban 40mph Speed Limits



Figure 1.2 National speed limits apply in rural lanes but actual speeds can be much lower

1.4_ The Benefits of Better Streets

1.4.1 It is important to take into account multiple objectives when developing transport strategies and schemes, and not simply congestion reduction. These other priorities include economic regeneration, climate change, casualty reduction, reducing air and noise pollution, minimising the impact of transport on the natural environment, heritage and landscaping, and encouraging more sustainable and healthy patterns of travel behaviour.

1.4.2 Making appropriate provision for road-based public transport, cycling and walking can help to encourage modal shift from the private car, and so contribute to the sustainability and health agendas. Enhancing street environments through a high quality public realm incorporating local materials and historic street features, removal of clutter and pedestrian barriers, use of shared space where appropriate and enhanced street lighting can help to stimulate local economic activity, reduce street crime and encourage a sense of local community; this in turn encourages more local, shorter distance travel on foot or by cycle. This will be particularly important in conservation areas, national parks, World Heritage sites and other environmentally sensitive areas.

1.4.3 Local Transport Note 3/08, 'Mixed Priority Routes: Practitioners' Guide'¹, refers to ten schemes which were among the least safe of urban roads which were transformed into safer, friendlier, more attractive and inclusive streets as discussed in the box out below.

The ten MPR schemes:

- 1 Walworth Road, London
- 2 Wandsworth Road, London
- 3 Prince of Wales Road, Norwich
- 4 Newland Avenue, Hull
- 5 Nantwich Road, Crewe
- 6 Renshaw Street/ Berry Street, Liverpool
- 7 Wilmslow Road, Rusholme, Manchester
- 8 St Peter's Street/ Chequer Street, St Albans
- 9 The Parade/ Victoria Terrace, Leamington Spa
- 10 Cowley Road, Oxford

Mixed Priority Routes (MPR) demonstration project

Mixed Priority Routes are streets that carry high levels of traffic and also have:

- A mix of residential use and commercial frontages;
- A mix of road users, i.e. shoppers, cyclists, bus passengers, schoolchildren;
- A mix of parking and deliveries.

They are not just transport routes. Although dealing with transport and safety is a key element, other concerns associated with the local economy and local communities may also generate an interest in improving the area with economic regeneration and environmental improvements.

There are many benefits to be gained from enhancing the high street environment with an integrated approach. The investment is likely to contribute towards assisting the delivery of a range of local authority corporate objectives and targets including:

- Accessibility planning;
- Casualty reduction;
- Economic regeneration;
- Public service agreement;
- Quality of life; and
- Sustainability.

Outcomes

Early results across a number of different indicators show that all of the MPR demonstration schemes have been successful in meeting their stated objectives:

- Safety: all schemes have achieved a substantial casualty reduction of between 24% and 60%;
- Environment: noise and air quality measurements have shown improvements;
- Accessibility: pedestrian and cycling activity has increased, and children and mobility impaired users generally feel more confident; and
- Economy: improvements in the quality of streetscape have led to a reduction in vacant premises and a more vibrant local economy.



Prince of Wales Road, Norwich



Newland Avenue, Hull

1.4.4 These schemes have clearly demonstrated a range of benefits beyond just road safety. These include increased economic vitality due to additional visitors to local shops and services and increased investment in regeneration, through improvements in facilities and the environment.

1.4.5 Research into mixed-use high streets carried out by University of Westminster⁴ has shown that they are well used and well liked by local people and encourage sustainable and inclusive patterns of living. Resolving the challenges of balancing the movement and place functions will result in these streets becoming the cornerstone of sustainable communities.

1.4.6 Both sets of research complement the studies carried out by CABI which found a clear link between street quality and property values - see Example below.

1.4.7 Green infrastructure, which provides a network of living green spaces, is important to the design of urban communities. Trees are one of the most visible components of green infrastructure and highway engineers and transport planners are well placed to help deliver this element of the natural environment. In the last few years a growing body of research has made it clear that trees bring a wide range of benefits both to the urban environment, individual people and to society as a whole. Further guidance on how to plan and design for street trees is given in **Chapter 12**.

1.4.8 A number of case studies that demonstrate the value of improving the public realm can be found in Section C.

CABI: Paved with Gold: the Real Value of Good Street Design (2007)⁵

Streets are public assets and, in common with other public realm features, assessing their value is a difficult undertaking. Broadly speaking streets are too often viewed in purely technical terms by the people designing and managing them on the one hand and their more aesthetic qualities by people funding economic redevelopment work on the other.

The truth lies somewhere in between - that streets which resolve competing demands and create places that people enjoy using can deliver in transport economic and social terms. CABI's research, 'Paved with Gold: the Real Value of Good Street Design' (2007), was designed as a demonstration project to show how to measure the impact of street design improvements on market prices as revealed through retail rents and residential prices.

London High Street case studies, outside the centre to avoid tourist effects, were identified in order to make them as comparable as possible. Streets with large shopping centres were excluded as their presence would skew results. A range of types of area and quality of streets was identified.

This work identified for the first time a direct causal link between street quality and market prices, which discounted all other factors. It established that prices are not totally explained by factors such as prosperity of the neighbourhood or public transport accessibility alone; a significant proportion of these prices are explained solely by the quality of the street.



Section B

Detailed Design Issues



Section B of MfS2 provides guidance on geometric and other parameters for new and improved highways. Although numerical values are given in this section, designers are encouraged to take a flexible approach to its interpretation and application, thinking through for themselves the likely outcome of any course of action based on experience and local circumstances.

This section is divided into chapters by area of the highway (carriageway, footway etc) and by design elements (junctions, street furniture etc).

However, in preparing schemes, designers should consider the layout in totality, including the relationship of the highway to its surroundings, both in urban and rural areas.

The highway should not be seen in isolation or simply as a piece of infrastructure. The best highway designs respect their surroundings - the buildings, open space and pedestrian/cycle routes that pass through an area.

5_ Pedestrian Needs and Footways

5.1_ Pedestrian Needs

5.1.1 Advice on meeting pedestrians' needs, including the geometric design of footpaths and footways is given in Chapter 6 of MfS1, and that advice applies to all highways that fall within the scope of this document. Further guidance on planning and designing for pedestrians is given in the DfT's 'Inclusive Mobility'³⁵ and the IHT document 'Guidelines for Providing for Journeys on Foot'³⁶, further guidance in Wales is contained in Technical Advice Note 18 Transport³⁷.

5.1.2 Encouraging walking has many benefits, including reductions in vehicle emissions and traffic collisions, and improvements in personal health.

5.1.3 In summary, MfS1 advises that

- The propensity to walk is influenced not only by distance, but also by the quality of the walking experience.
- Good sightlines and visibility towards destinations and intermediate points are important for way-finding and personal security.
- Pedestrian routes need to be direct and match desire lines as closely as possible, including across junctions, unless site-specific reasons preclude it.
- Pedestrian networks need to be connected. Where routes are separated by heavily-trafficked routes, appropriate surface-level crossings should be provided where practicable.
- Pedestrians should generally be accommodated on multifunctional streets rather than on routes segregated from motor traffic. In situations where it is appropriate to provide traffic-free routes they should be short, well-overlooked and relatively wide.
- Obstructions on the footway should be minimised. Street furniture on footways can be a hazard for vulnerable people.
- There is no maximum width for footways; widths should take account of pedestrian volumes and composition.

5.1.4 These principles are important throughout urban areas, and are not confined to lightly-trafficked situations. Indeed, meeting pedestrians' needs where traffic volumes are higher is vital if this most sustainable mode of transport is to be encouraged.

5.1.5 This chapter provides key advice on the provision and design of footways; **Chapter 9** deals with crossings and pedestrians' needs at junctions, and **Chapter 12** covers street furniture, including guardrail.

5.2_ Footway Provision

5.2.1 There are many examples of routes in urban areas that were built without footways where pedestrians still do walk, despite the lack of any formal provision. Many of these routes were built as modern ring roads/relief roads

of the type discussed in **Chapter 2**, which do not perform well in place terms. Moreover, drivers tend to react to the absence of pedestrians by travelling faster, to the detriment of road safety.



Modern urban highways without footways

5.2.2 Where pedestrians are likely to be present in significant numbers footways should normally be provided along both sides of highways, particularly in urban areas. However, streets without conventional footways may be appropriate where traffic speeds are low and the area operates on 'shared space' principles such as in town or village centres (see **Chapter 2**).

5.2.3 In town centres and other places where there are high numbers of pedestrians, footways should be of sufficient width to cater for peak demand without causing crowding and the risk that people will be pushed into the carriageway. In some cases, this will mean that space needs to be taken from the carriageway in order to create a better balanced street. It may be possible to achieve this without causing a significant reduction in vehicular capacity by reducing the width of traffic lanes, as set out in **Chapter 8**. It may also be possible to remove lanes without affecting capacity or safety e.g. lightly-used turning lanes.

5.2.4 Additional footway capacity can also be gained by removing and/or rationalising street furniture, including guardrail - see **Chapter 12**.

5.2.5 Evidence from the Newland Avenue Mixed Priority Routes (MPR) project (see Example) indicates that providing more generous and better quality facilities for pedestrians can lead to large increases in walking.

The gradient of pedestrian routes should ideally be no more than 5%, although topography or other circumstances may make this difficult to achieve. However, as a general rule, 8% should generally be considered as a maximum, which is the limit for most wheelchair users, as advised in Inclusive Mobility³⁵.

The Newland Avenue MPR Project created much more space for pedestrians by narrowing the carriageway to between 6 and 6.5m and removing guardrail. See LTN 3/08¹ for further information.

At a pinch point under a narrow railway bridge, the footway was widened from 1.1m to 1.6m, and the flow of pedestrians increased by around 1,700 per day, an increase of 59%.



Footways widened significantly by narrowing carriageway



A marginal widening of footway led to a large increase in pedestrian flow.

6_ Cycle Facilities

6.1_ Introduction

6.1.1 Advice on meeting cyclists' needs is given in Chapter 6 of MfS1, and that advice applies to all highways that fall within the scope of this document.

6.1.2 As with walking, encouraging cycling has many benefits, including reductions in vehicle emissions and traffic collisions, and improvements in personal health.

6.1.3 In summary, MfS1 advises that

- Cyclists should be accommodated on the carriageway.
- Cyclists prefer direct, barrier-free routes that avoid the need for cyclists to dismount. Routes that take cyclists away from their desire lines and require them to concede priority to side-road traffic are less likely to be used.
- Off-carriageway cycle tracks that bring cyclists into conflict with side road traffic can be more hazardous than routes that stay on the main carriageway.
- Cyclists are sensitive to traffic conditions; high speeds or high volumes of traffic tend to discourage cycling. If traffic conditions are inappropriate for on-street cycling, they should be addressed to make on-street cycling satisfactory.
- Junctions should be designed to accommodate cyclists' needs. Over-generous corner radii that lead to high traffic speed should be avoided.

6.1.4 This chapter provides key advice on the provision and design of cycle facilities; **Chapter 9** deals with crossings and cyclists' needs at junctions.

6.2_ Cycle Lanes, Cycle Tracks and Markings

6.2.1 Detailed guidance on the design of specific facilities for cyclists is given in Local Transport Note 2/08³⁸, 'Cycle Infrastructure Design' and its advice should be taken into account when highway schemes are being developed.

6.2.2 Generally the preferred design approach - to enable and encourage increased levels of cycling - is to create conditions on the carriageway so that cyclists are content to use it, particularly in urban areas. This may require reductions in the volume and/or speed of traffic and the reallocation of space away from traffic. Reductions in vehicular lane widths may make it possible to achieve this without causing a significant reduction in vehicular capacity, as set out in **Chapter 8**. However the choice of lane width should carefully consider the ability of motor vehicles to pass cyclists, if necessary. Narrow traffic lanes will help to reduce traffic speed, which will in turn reduce the need for motor vehicles to pass cyclists.

6.2.3 Guidance on when to provide cycle lanes and cycle tracks is given in Table 1.3 of LTN 2/08³⁸, depending on the volume, composition and speed of traffic. A high percentage of larger vehicles, including buses, will increase the desirability of cycle lanes (or alternatively combined bus/cycle lanes).

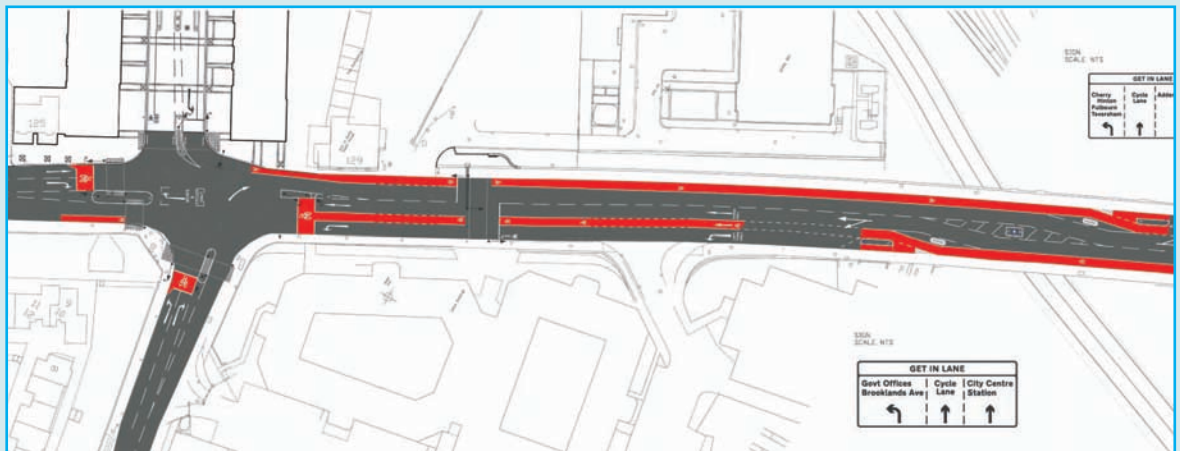
6.2.4 Well-designed cycle lanes can benefit cyclists, but poorly designed lanes can make conditions worse for them. All cycle lanes should be of sufficient width as there is evidence that vehicles are driven closer to cyclists when there is a cycle lane³⁹. Cycle lanes are more beneficial in the uphill direction as the speed differential between cyclists and vehicles tends to be larger, while cyclists may wander a little as their speed is reduced. A single uphill cycle lane of the recommended width is far preferable to sub-standard cycle lanes in both directions.



Generous cycle lanes, Scunthorpe. Note absence of central white line

6.2.5 Cycle lanes should be 2 metres wide on busy roads, or where traffic is travelling in excess of 40mph. A minimum width of 1.5m may be generally acceptable on roads with a 30mph limit. Cycle lanes less than 1.2m width are only recommended at lead-in lanes to advanced stop lines where there is insufficient width for wider lanes. Cyclists will also benefit from bus lanes, when provided. Where cycle lanes pass parking and loading bays sufficient margin should be provided to allow for doors being opened.

6.2.6 In some cases, providing the recommended width of cycle lanes will mean that space needs to be taken from the carriageway. It may be possible to achieve this without causing a significant reduction in vehicular capacity by reducing the width of traffic lanes, as set out in **Chapter 8**. In Cambridge, a scheme is being installed on a busy radial route that reduces the number of traffic lanes to provide wide cycle lanes (See Example overleaf).



Hills Road Bridge is one of the busiest routes in Cambridge. Formerly a four lane dual carriageway, it caters for over 4,000 cyclists everyday, which often results in conflict for both cyclists and drivers. New 2.1m wide cycle lanes are being installed on Hills Road Bridge, which will allow cyclists to proceed straight ahead safely with motor traffic as the lane moves to the right at the top of the bridge. Cyclists turning left will be provided with a by-pass lane.

6.2.7 Many authorities have chosen to use blue, red, green or another coloured surfacing for cycle lanes, and this can make them more conspicuous, which is useful at critical locations such as where a cycle lane crosses a junction. However, coloured surfaces can be visually intrusive, particularly if used excessively, and may not always be justified.

6.2.8 Hybrid lanes are wide cycle lanes with some form of physical demarcation, such as a cobbled strip, between the cycle lane and the carriageway. They offer a greater feeling of protection which is important to less confident cyclists. They are commonplace in the Netherlands and in other countries but are presently rare in the UK.



Hybrid cycle lane, Netherlands

6.2.9 Using the cycle symbol (diagram 1057), in conjunction with appropriate upright signs but without marking a cycle lane is a way of making drivers more aware of the likelihood of encountering cyclists and confirming to cyclists that they are on a designated route. Placing the symbol away from the kerb also encourages cyclists to take up a safer position in the carriageway and reduces the likelihood of drivers passing too close and forcing them towards the kerb. However, the cycle symbol and associated signs do have a visual impact and add to street furniture and authorities should therefore use this approach selectively.

6.2.10 Off-carriageway cycle tracks can have advantages, but will generally need to be shared with pedestrians, who may see them as a reduction in provision. They will therefore be the least desired option, particularly in urban areas. More information on the design of shared use schemes is available in Local Transport Note 2/86 'Shared Use by Cyclists and Pedestrians'⁴⁰. This Local Transport Note is in the process of being updated and a replacement document is expected to be published by DfT in 2011.

6.2.11 Shared use footway/cycle tracks can be segregated into pedestrian/cycle areas using a raised white line or other measure, but these can be omitted on unsegregated routes, reducing street clutter.

6.3_ Cycle Parking

6.3.1 Convenient cycle parking should be provided at key destinations - for example in local high streets - to support journeys by bike. This may be on the footway but there should be a clear route for pedestrians. As indicated in **Chapter 8**, cycle parking can also be provided along central reservations.

6.3.2 Public transport accessibility can also be greatly increased by providing good quality cycle parking at key bus and tram stops and at railway stations. Cyclists travel around three times the speed of pedestrians and so the cycle catchment of a stop is around ten times the pedestrian catchment.



Secure, covered cycle parking - Newland Avenue MPR scheme

8_ Carriageways

8.1_ Introduction

8.1.1 The design of carriageways between junctions in urban and rural areas is often based on TD9/93⁴⁴, 'Highway Link Design', part of DMRB, but that document has been prepared for Trunk Roads and may not always be appropriate in other circumstances. As noted in **Chapter 1** it is recommended that designers bear in mind the key principles of MfS when applying DMRB.

8.1.2 This chapter provides designers with advice on how carriageway widths, alignments and cross-sectional details can be designed in a way that better respects local context and the needs of users other than motor traffic.

8.2_ Design Speed

8.2.1 The geometric design of carriageways is generally based on the notion of a design speed, which in the past has tended to be fixed along a route, or a substantial section of a route.

8.2.2 Design speeds in urban areas (or rural routes subject to a local speed limit) have tended to be based on the advice contained in DMRB TD 9/93⁴⁴, which determines design speed from the existing or proposed local speed limit, but with some allowance for vehicles travelling at higher speeds. In urban areas subject to a 30mph limit, a design speed of 60kph (37mph) has often been used.

8.2.3 It is now considered inappropriate in areas subject to a limit of 30mph, to adopt a design speed of more than 30 mph unless existing speeds are significantly above this level.

8.2.4 This is justified by the finding from the research contained in MfS1 that drivers tend to adopt higher speeds in response to more generous highway geometry and that, in recent years, the proportion of vehicles that exceed the speed limit in free flow conditions has been dropping; in 2008 it was below 50%, down from 69% in 1998. Average free flow speeds were 30mph in 30mph limits; and 36mph in 40mph limits⁴⁵.

8.2.5 In rural areas not subject to a local speed limit, TD9/93 can be taken as a starting point for new routes, which relates design speed to the:

- Alignment Constraint, based on the bendiness of the route (degrees per kilometre) and on single carriageways, the harmonic mean visibility; and the
- Layout Constraint, which measures the degree of constraint imparted by the road cross section, verge width, and frequency of junctions and accesses.

8.2.6 The finding in MfS1 that the context through which drivers pass does have an effect on their chosen speed is thus explicit in TD9/93⁴⁴, which notes in Para 1.2 that 'Speeds vary accordingly to the impression of constraint that the road alignment and layout impart to the driver'.

8.2.7 Whilst an appropriate design speed can be determined from the guidance above, designers should also consider the potential for reducing design speed locally, where it is appropriate that traffic should travel more slowly.

8.2.8 Such situations could include where a major route is passing through the centre of a small town or village, or where there is a site of significant ecological value within the corridor of a highway improvement and where a reduction in design speed would allow a scheme of lower impact to be designed.

8.2.9 In urban areas, highway space is shared between motor traffic, pedestrians, cyclists and public transport, and keeping speeds low has been demonstrated to have significant safety benefits. MfS1 and DMRB confirm that designing for higher speeds will create an environment where drivers tend to travel faster. Instead, speeds should be designed down to an appropriate level.

8.2.10 Speed limits of 20mph are now becoming commonplace. Some authorities, such as Portsmouth, have adopted a policy of setting signed-only 20mph limits across most residential areas, which have succeeded in reducing speeds and improving safety.

8.2.11 Advice on setting local speed limits is provided by DfT and the devolved administrations. In 2009, DfT consulted on a change to Circular 1/2006⁴⁶ aimed at encouraging highway authorities, over time, to introduce 20mph zones or limits into:

- streets which are primarily residential in nature; and
- town or city streets where pedestrian and cyclist movements are high, such as around schools, shops, markets, playgrounds and other areas where these are not part of any major through route.

8.2.12 The Welsh Assembly Government published guidance on the setting of speed limits in 2009⁴⁷ which supports the use of 20mph speed limits and zones at appropriate locations, including town centres, residential areas and in the vicinity of schools.

8.2.13 However, even where a 20mph limit is not appropriate, authorities may still choose to set the design speed for a section of a route to below 30mph. Measures that will help to keep speeds low, particularly in urban areas, are set out in section 7.4.4 of MfS1, and include:

- Physical features
- Changes in priority
- Street dimensions, including width
- Reduced forward visibility
- Psychology and perception - the following features may be effective:
 - Visual narrowing;
 - Close proximity of buildings;
 - Reduced carriageway width;
 - Obstructions in the carriageway
 - Pedestrian refuges and other features associated with activity;
 - On-street parking;
 - Land uses associated with large numbers of people (e.g. shops); and
 - Pedestrian activity.

8.2.14 Guidance on the design of physical traffic calming measures is given in the IHT publication 'Traffic Calming Techniques' (2005)⁴⁸.

8.3 Horizontal Alignment

8.3.1 Parameters for horizontal curves are related to local design speed and radius and are dependent on the limit of sideways force in the bend that can be tolerated by the vehicle without skidding or overturning.

8.3.2 Desirable minimum horizontal curves set out in TD9/93⁴⁴ seek to limit the sideways force to very low levels, commensurate with high speed inter-urban roads, and therefore result in generous curve radii.

8.3.3 The adoption of gentle minimum curve radii for new highways in urban areas can result in alignments that are inappropriate to the surrounding urban grain, sometimes requiring the acquisition and demolition of existing buildings and creating awkward plots of remaining land. This could be avoided if sharper curves were used. The Sky Blue Way example in **Chapter 2** shows the damage that can result when new highways are designed with generous curvature and widths.

8.3.4 Tighter radii can be adopted; TD9/93⁴⁴ para 3.4 advises that horizontal curves of four steps below desirable minimum radii can be used, "*inter alia*", for design speeds of 60kph and below. The relative sharpness of curves is established by the formula v^2/R , where v =design speed (kph) and R = radius (m).

8.3.5 Horizontal curves of four steps below desirable minimum (TF9/93⁴⁴ para 0.7) have a v^2/R value of 56, and therefore the minimum horizontal curves corresponding to this criterion are as follows:

Design Speed, kph	Curve Radius, m 4 steps below TD 9/93 Desirable Min
30	16
40	28
48	41
50	44
60	64

Table 8.1 - Minimum Recommended Curve Radii

8.3.6 Superelevation in urban areas should be kept to a minimum, since it is often difficult to achieve due to the frequency of accesses and junctions and other constraints. Excessive superelevation can also adversely affect the relationship between the carriageway and frontage buildings and footways. When it is provided, a maximum superelevation in urban areas of 5% is recommended (TD9/93⁴⁴ para 3.2).

8.3.7 Where it is desirable to provide a horizontal curve below the values recommended in **Table 8.1** above, the preferred solution will often be to reduce the speed of traffic locally, rather than provide steep superelevation, which will tend to encourage higher speeds.

8.3.8 The presence of a sharp bend will itself lead to lower speeds. Research by TRL⁴⁹ showed the following reductions in speed at bends (v = Approach Speed (kph), R = Bend radius).

v^2/R	Percentage Speed Reduction Due to Bend	
	From 50%ile speed	From 85%ile speed
20	3.5	5
28	5	7
40	7	10
56	10	14
80	14	20

Table 8.2: Percentage Speed Reduction at Bends

8.4 Carriageway Gradients

8.4.1 A maximum longitudinal carriageway gradient of 6% is desirable (TD9/93⁴⁴ para 4.1), although a gradient of 5% is desirable where there are significant numbers of pedestrians walking along the route.

8.4.2 In hilly areas steeper gradients will frequently be required, but a gradient of 8% should be regarded as a practical maximum unless there are particular local difficulties. This is also the maximum gradient that a manual wheelchair user can negotiate (see guidance on footway gradients in **Chapter 5**).

8.5_ Vertical Curvature

8.5.1 Minimum length requirements for vertical curves are normally assessed based on two criteria - the comfort of vehicle occupants and the need to maintain forward visibility.

8.5.2 For design speeds of 50kph and below, where it can be expected that drivers will reduce speed in response to changes of alignment, forward visibility to achieve minimum Stopping Sight Distance (SSD) should be used as the basis of design, but as with forward visibility around horizontal curves, there will be locations where it is appropriate to restrict forward visibility in order to help reduce traffic speeds.

8.5.3 For design speeds of 50kph and above, designers should follow the guidance contained in TD 9/93⁴⁴.

8.6_ Carriageway and Lane Widths

8.6.1 UK practice has generally adopted a standard lane width of 3.65m (12 feet) but this should not be taken as a preferred value in all circumstances. This can be an unsatisfactory lane width for cyclists, as there is insufficient room for drivers to pass them comfortably.

8.6.2 Narrower lanes will be appropriate in many circumstances, particularly in built up areas, resulting in carriageways that are easier for pedestrians to cross and encouraging low traffic speeds without causing a significant loss of traffic capacity. The needs of cyclists will need to be expressly considered however, as discussed below.

8.6.3 Lane widths should be determined based on the following local consideration:

- the volume and composition of vehicular traffic;
- pedestrian and cyclists' needs;
- the demarcation, if any, between carriageway and footway (e.g. kerb, street furniture or trees and planting);
- whether parking is to take place in the carriageway and, if so, its distribution, arrangement, the turnover of spaces, and the likely level of parking enforcement (if any);
- the design speed;
- the curvature of the street (bends require greater width to accommodate the swept path of larger vehicles); and
- any intention to include one-way streets, or short stretches of single lane working in two-way streets.

8.6.4 MfS1 Figures 6.18 and 7.1 provide information on the width requirements of different types of vehicle, and these can be taken as a guide to minimum lane widths. These can be applied to links between and at junctions.

8.6.5 Thus for example, at a traffic signal stop line, where HGVs and buses make up only a small proportion of traffic flow, 2 - 2.5m wide lanes would be sufficient for most vehicles, and would reduce overall carriageway width requirements, making it much easier for pedestrians to cross the carriageway. Lanes wider than 3m are not necessary in most urban areas carrying mixed traffic.

8.6.6 Carriageway and lane widths do not have to be constant. Varying the width through non-parallel kerb lines or other physical limits can create interest, provide informal parking opportunities at widenings and traffic speed reduction at narrowings. The needs of cyclists at narrowings should be considered in detail.

8.6.7 The needs of cyclists using the carriageway should be expressly considered when lane widths are being determined. Cyclists should wherever possible be accommodated on carriageway without special provision, based on the recommendations of LTN 2/08, 'Cycle Infrastructure Design'³⁸.

8.6.8 The ideal minimum widths required for vehicles to overtake cyclists in comfort given in LTN 2/08³⁸ are:

- Car passing at 20mph - 3.8m
- Car passing at 30mph - 4.3m
- Bus/HGV passing at 20mph - 4.6m
- Bus/HGV passing at 30mph - 5.05m

8.6.9 These are not necessarily lane widths, however. If traffic flows are generally light enough for vehicles to pass cyclists fairly readily by moving at least partly into the opposite lane then the overall carriageway width will be available. Lane widths of 3m or less will make it less likely that drivers will try to squeeze past cyclists without pulling around them.

8.6.10 Providing a central median that can be overrun is one way of allowing motor vehicles to pass cyclists comfortably without using excessively wide lanes - see Broad Street, Birmingham and Leamington Spa examples overleaf.

8.6.11 If traffic speeds are higher and motor vehicles are not able to move into the opposite lane to pass cyclists with comfort, then cycle lanes may be justified so that excessive lane widths are not provided, which would otherwise encourage higher speeds. Where there is more than one lane in either direction, some authorities have divided the carriageway into unequal lanes, giving more space on the nearside lane to assist cyclists.

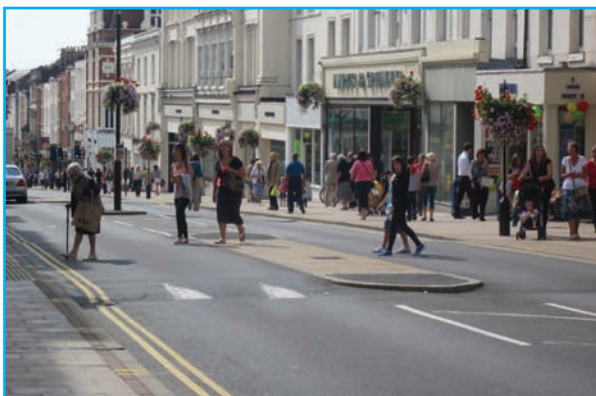
8.6.12 Lane and carriageway widening requirements for horizontal curves should be assessed using tracking software. The criteria to be adopted should be based on traffic flows and composition. For example, where HGV and/or bus flows are low, it may not be necessary to design carriageways to cater for two large vehicles meeting at a bend, as long as there is sufficient inter-visibility for one driver to stop and wait. The use of overrun areas can be considered - see MfS1 7.11 for further guidance on their use.

8.7_ Refuges, Medians and Central Reservations

8.7.1 Central medians/reservations and refuges are useful features in urban areas to enable pedestrians and cyclists to cross carriageways in two stages, whether as part of a designated crossing of any type (see **Chapter 9**), on the approach to a junction, or along a highway link. These features can also have a dramatic effect on the character of a highway, and can therefore significantly enhance the sense of place.

8.7.2 The minimum width of central reservations/medians and refuges should be based on the users anticipated³⁵:

- 1.2m - to accommodate pedestrians only, with no street furniture on the median/island
- 1.5m - desirable width to accommodate wheelchair users
- 2.0m - minimum width to accommodate allow wheelchair users to pass one another. This is also the minimum width for cyclists (LTN 2/08 para 10.2.7³⁸).



These simple pedestrian refuges were provided on The Parade, Leamington Spa MPR project. Note the absence of keep left bollards, but also the intrusive road markings.

8.7.3 Narrower medians that can be over-run have also proved useful in some schemes, by giving pedestrians a space to wait in the centre of the carriageway which can also be used by vehicles when they need to pass cyclists or other vehicles. Such medians also allow emergency vehicles to cross over into the opposing lane when necessary.



This informal median on Broad Street, Birmingham has operated successfully for many years

8.7.4 Formal central reservations, provided on dual carriageway links, can be planted or paved depending on local context and requirements, including the need for pedestrians to cross the carriageway and the local landscape character.



Mature trees in central reservation, Bristol Road, Birmingham. Here the central reservation is of little benefit to pedestrians crossing the route, but the width of the reservation and the mature trees are attractive and make up a vital part of the street's character.

8.7.5 In urban areas, central reservations should be left unfenced so that pedestrians can cross at any point, unless there is clear safety case for not doing so.



Upper Parliament Street, Nottingham – Unfenced Central Reservation

8.7.6 If it is of sufficient size, the central reservation can be a place for useful activity. O'Connell Street in Dublin has this form, which is also found at Las Ramblas, Barcelona.

8.7.7 There are few examples of this type of street in the UK, but The Broadway in Letchworth shares some of the characteristics, although the continuous fencing on both sides has reduced the value of the central space as an accessible and active place.



O'Connell Street, Dublin

8.7.8 On Kensington High Street, the central reservation has been used for cycle parking. This is a practical use of the space, which also sends a clear signal to drivers that this is a street that cyclists are encouraged to use.



Cycle parking on central reservation, Kensington High Street. Generous spacing between the cycle racks enables pedestrians to cross between the parked cycles.

8.8_ Kerbs

8.8.1 Historically kerbs were primarily installed to form an edge to the drainage channel and provide a clean walking route in urban areas, but have now come to represent a recognisable divider between the carriageway and the footway. In rural areas they are mainly used to form an edge restraint and drainage feature, but there are many rural roads and streets where there is no kerb and separate footway.

8.8.2 In urban areas, half-batter kerbs with a standard height of 125mm are often used, but lower kerb heights are easier for pedestrians to negotiate, particularly people with impaired mobility, and can help to reduce vehicle dominance by reducing the degree of segregation.

8.8.3 Higher kerbs are appropriate at bus stops to allow level access into vehicles - see **Chapter 7** for further guidance on bus stop design.



Kerb heights of between 75mm and zero (at informal crossings) were used with streetscape improvements in the centre of Nottingham.

8.8.4 Low kerb heights may mean that closer gully spacings are required to avoid rainwater run-off from affecting footways during heavy storms.

8.8.5 Kerbs are often omitted in shared space schemes in order to reduce the separate definition of areas for pedestrians and vehicles and to indicate that the street is meant to be shared equally by all users of the highway. However more subtle delineators such as old granite kerbstones could be used, in a remodelled paving scheme in order to retain historic kerb lines and local character. Further guidance on the use of shared space techniques is given in **Chapter 2**.

8.8.6 'Trief' kerbs are designed to deter vehicles from mounting the kerb where high containment is thought to be necessary, but they are more visually intrusive than normal kerbs, are difficult for pedestrians to cross, and have been known to cause small vehicles to overturn. They should therefore not be used without these adverse effects being considered.

9_ Junctions, Crossings and Accesses

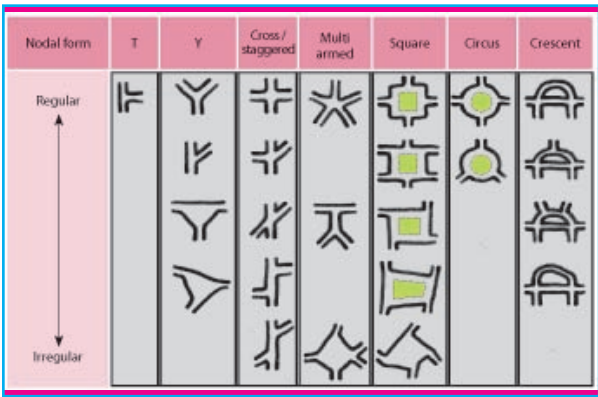
9.1_ Introduction

9.1.1 Junctions are critical places in a number of ways. In traffic terms, they are a potential source of delay and where most collisions tend to occur. They are often seen as a problem in these terms, and highway designers tend to minimise the number of junctions in a network. When junctions are provided or modified, particularly on busier highways, they tend to be designed with the principal aim of accommodating peak hour traffic flows.

9.1.2 In place terms, conversely, junctions can be seen as an opportunity. By definition they are accessible places from several directions, and so tend to be a good location for buildings that attract significant numbers of people, such as shops and public buildings. Junctions are also the most natural way for people to find their way around an area, whether on foot or in a vehicle, and so are a good place for landmark buildings and other distinctive features, such as public art.

9.1.3 It is critical therefore to achieve a good balance of place and movement functions at junctions, particularly in urban areas.

9.1.4 As noted in MfS1 section 7.3, there is considerable flexibility over the form of junctions, which can add to their distinctiveness, so that they function as significant places in their own right.



A wide range of junction layouts is possible

9.1.5 In the past, concerns over capacity and safety have tended to overshadow any concerns about placemaking, and as a result many urban junctions are unattractive and difficult to negotiate, particularly on foot and cycle. Excessive use of guardrailing is a particular problem and further guidance on how to minimise it is given in **Chapter 12**.

9.1.6 Because junctions are a natural focus for all modes of travel, wherever possible they should include convenient and direct crossing facilities for pedestrians, desirably across all arms.

9.1.7 Well-designed crossings are of vital importance to the ability of pedestrians and/or cyclists to move around easily and safely.

9.1.8 Crossings that involve grade separation - subways and bridges - are undesirable and should only be used where essential due to traffic speeds and volumes. Grade separated crossings are much less convenient and therefore less likely to be used, particularly subways which create significant personal security concerns. These types of crossing are much more costly and elevated structures, with their lengthy approach ramps, cause a high degree of visual intrusion.

9.1.9 Where underpasses and bridges are used, they should be as short, wide and direct as possible to improve users' perception of security and make the routes more legible.

9.1.10 The former subway at Maid Marian Way, Nottingham, was unwelcoming and felt dangerous. When the subway was replaced by an at-grade crossing, the number of pedestrians increased significantly (see Case Study **Chapter 14**).

9.1.11 More generally, grade separated junctions and links, particularly in urban areas, are rarely successful in placemaking terms. The carriageways have no connection with their surroundings and are highly inflexible and costly to change. Elevated structures create unwelcoming environments at ground level, both beneath and adjacent to the route.



Nechells Parkway, Birmingham - Despite this pedestrian subway being close by, and the absence of a formal surface crossing, many people choose to walk across the central reservation to reach the bus stops.

9.1.12 The choice of junction and crossing type at a particular location should be made after considering all of its functional requirements - including both movement and place functions - and not just capacity and road safety. Every type of junction has its advantages and disadvantages, and the effect of alternative options should be considered.

9.1.13 A Quality Audit approach (see **Chapter 4**) can be used to assess alternative junction types and layouts, so that the best balance of outcomes is achieved, taking into account the objectives of the scheme.

9.2_ Spacing of Junctions

9.2.1 In the past, guidance on minimum junction spacing has often been based on recommended stopping sight distances (SSD) for 85th percentile speeds. The reductions in SSD compared to previous practice means that junction spacing criteria determined on this basis should be reduced. However, in any event there appears to be little evidence that spacing criteria based on SSD are justified on safety or other grounds.



9.2.2 The need for and provision of junctions on new highways, and additional junctions on existing routes, should be assessed in the round, considering a wide range of factors such as the need for access at particular locations, the impact on the size of development blocks, the potential for interaction between adjacent junctions and the consequent effect on user delay and road safety.

9.3_ Crossings

9.3.1 General advice on the choice of crossing type and their design is given in Local Transport Notes 1/95⁵⁰ and 2/95⁵¹ and in Chapter 6 of MfS1, which is complemented by the further advice in this section. While the focus is on pedestrian crossings the recommendations can also be applied in most instances to crossings designed for cyclists (other than zebra crossings). Crossings should be provided with appropriate tactile paving. The legal requirements for crossings are given in the Crossing Regulations⁵².

9.3.2 Crossings should be located on or close to desire lines so that pedestrians find them convenient and pleasant to use. Placing crossings away from desire lines will reduce their level of use, even when guardrailling or other deterrent features are used.



Stoke Newington - new zebra crossings and new routes through park, linking directly to one another.

9.3.3 The simplest form of uncontrolled or informal crossing involves the provision of dropped or flush kerbs so that mobility-impaired people can cross to and from the carriageway. A refuge in the centre of the carriageway enables pedestrians to negotiate one stream of traffic at a time, which can be of considerable help when flows are high. Combining a refuge with a kerb build out, so that the carriageway is narrowed, will provide additional assistance to pedestrians. Further guidance on the design of refuges is given in **Chapter 8**.

9.3.4 Informal crossings can also indicate clearly to drivers where pedestrians are encouraged - and are therefore likely - to be crossing. Designs can make use of contrasting paving materials, street furniture and changes in carriageway width and level to emphasise pedestrian movement. When done well, in a slow speed traffic environment, they will often encourage drivers to give informal priority to pedestrians.



Shrewsbury High Street – ‘courtesy’ crossings are paved in the same material as the footways and line up with pedestrian routes on either side. See Traffic Advisory Leaflet 8/98¹⁰³.

9.3.5 Informal crossings require no signs or markings and therefore do not add to visual clutter. They can be generous in width (to pedestrians) so that the crossing becomes a strong element within the street scene.

9.3.6 Replacing controlled crossings (ie zebra and signalised) with informal crossings can reduce delays to traffic. In the Newland Avenue MPR scheme all signal-controlled crossings were removed, which resulted in reduced vehicle travel times as well as a reduction in maximum vehicle speed. Road safety and vehicle emissions were also improved significantly - details are given in LTN 3/08¹.

9.3.7 Zebra crossings offer the greatest advantage to pedestrians as they give them priority over all other traffic. In some authorities there has been a move away from providing zebra crossings towards signalised crossings, on the basis that they represent an ‘upgrade’ but this is not necessarily the case. Research carried out in London found that it was not possible to ascribe a safety benefit directly to the conversion of zebra crossings to pelicans⁵³.

9.3.8 Zebra crossings also typically result in lower delays to traffic flow, except when pedestrian flows are heavy. They are more immediately visible to drivers than signalised crossings and can be located closer to junctions, which can help to put crossings on desire lines.



Zebra crossing located close to road junction.

9.3.9 Zebra crossings are generally only used when the speed limit is 30mph or below, as at higher speeds it may be more difficult for pedestrians to establish precedence.

9.3.10 There are four types of stand-alone signalised crossings - Pelican, Puffin, Toucan and Equestrian crossings, which are described in LTN 2/95⁵¹. Traffic signal junctions can also incorporate signalised crossings.

9.3.11 Signalised crossings can cause additional delay compared to zebras and informal crossings, due to the lost time caused by intergreen periods etc. Linking signalised crossings to upstream signalised crossings can bring traffic benefits but this can lead to long delays for pedestrians.

9.3.12 Signalised crossings need to be used when controlled facilities for mounted cyclists and equestrians are required, as these groups are not authorised to use zebra crossings. Older people and people with a visual impairment may express a preference for signalised crossings as they provide greater certainty when crossing.

9.3.13 All types of crossing can be provided on a raised surface, so that pedestrians cross between footways on a level surface. This slows traffic on the approach to the crossing, makes pedestrians more visible and emphasises their presence in the street, making it more likely that drivers will see them and cede priority.



Zebra crossing on raised table.



Simple raised crossing of minor arm, with tight corner radii.

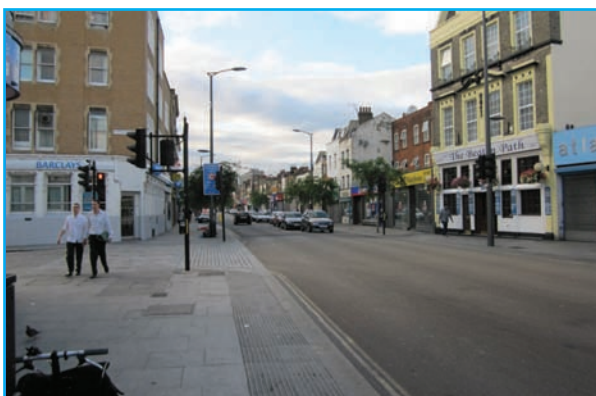


Signalised crossing on extensive raised table, City of London

9.3.15 Zebra crossings can also be used across minor junctions close to the give way line, when it is judged desirable to provide clear pedestrian priority at this point.



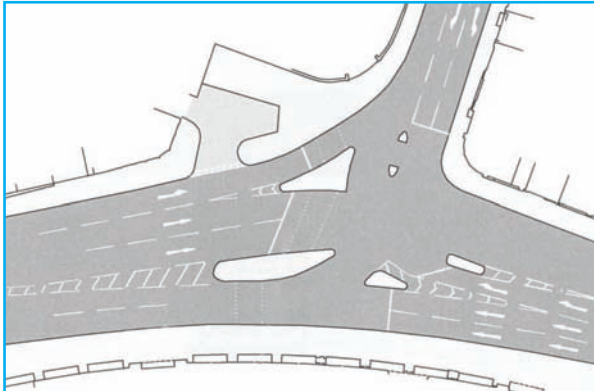
Zebra crossing across minor arm, close to junction, on desire lines.



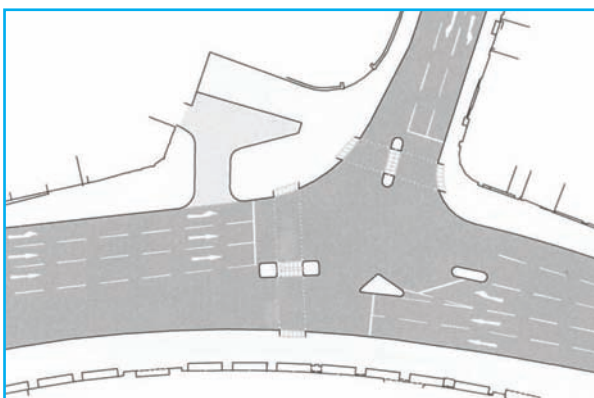
Raised table across side road at signalised crossing – Walworth Road MPR scheme.

9.3.16 Controlled crossings may be divided using central refuges. Straight ahead divided crossings are much more convenient for pedestrians than staggered crossings, which involve additional delay and deviation from the desire line, particularly where the stagger is large.

9.3.14 Raised crossings across the mouth of minor road junctions are very helpful to pedestrians, and provide an element of informal priority at this key conflict point. Tight corner radii help to reduce the speed of turning traffic and help make the crossing movements easier and safer. The Highway Code notes (Rule 170)²² that pedestrians who have started to cross a junction have priority.



Staggered signalised crossing without guardrail



High Street Kensington - replacement of staggered crossing with straight over crossing at signalised junction.

9.3.17 Divided zebra crossings operate as two separate crossings, with pedestrians having to establish priority on each side. The absence of a stagger does not affect the operation of a zebra crossing in terms of pedestrian priority.

9.3.18 Signalised crossings that are divided by a refuge, and which are to operate in traffic terms as two separate crossings, are normally staggered, although there are examples of straight ahead signalised crossings that operate under separate phases (see box out on Maid Marian Way, overleaf).

9.3.19 Pedestrian guardrailing is often used to reinforce staggers, but it is not essential. Some authorities have successfully used upstand kerbs or low walls to define the stagger at signalised crossings, which significantly reduces street clutter.

Maid Marian Way – Two Stage Straight Ahead Crossings

At the junction of Maid Marian Way and Friar Lane, Nottingham, a roundabout with pedestrian subways was replaced by a signal-controlled junction with pedestrian crossings.



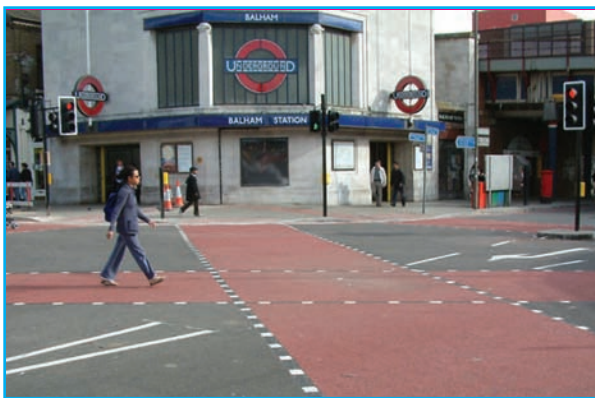
Unwelcoming pedestrian subways were replaced by signal-controlled at-grade crossings.

Maid Marian Way is a busy dual carriageway and both crossings of this route needed to be signalled in two stages. Despite this requirement, straight ahead crossings were used, rather than relying on more conventional staggered layouts. Nearside pedestrian aspects were used, as farside aspects could have led to confusion.

Another non-standard aspect of the design is that one of the crossings is not perpendicular to the traffic flow and stop line, but rather follows the pedestrian desire line.



9.3.20 Pedestrian crossings at traffic signals are typically across each arm of the junction, but when an all-red (to traffic) phase is provided, consideration can be given to providing diagonal crossing facilities. These enable pedestrians to cross to the opposite corner of the junction in one movement instead of two, which is much quicker and more convenient. A high-profile scheme has recently been installed at Oxford Circus in London, but there are long-standing examples elsewhere, such as in Balham, at the junction of Bramford Road and Yarmouth Road in Ipswich, and in Wellingborough at the junction of Croyland Road, Doddington Road and Broadway near a school.



Diagonal crossing, Balham



Diagonal crossing, Oxford Circus

9.4_ Priority and Uncontrolled Junctions

9.4.1 The simplest junctions are where two or more streets meet at a point. These junctions may have marked priority so that there is a major route through the junction, or the junction may have no marked priority and is therefore uncontrolled. Uncontrolled junctions tend to increase driver uncertainty and lead to reduced speeds and are therefore appropriate to low volume and low speed environments, including in urban centres.

9.4.2 Detailed guidance on the design of priority junctions is given in TD42/95⁵⁴ but (as with all sections of DMRB) this is written specifically for trunk roads and, where used in other situations, should not be applied uncritically.

9.4.3 T and Y junctions have the fewest conflicting traffic movements. Where there is a straight or nearly straight through route drivers will tend to regard this as the major movement, and so even without road markings or signs, a natural priority will tend to develop.

9.4.4 Crossroads and multi-armed junctions have much higher numbers of conflicting traffic movements and therefore tend to perform worse in terms of road safety. However, grid-type networks with crossroads junctions are extremely legible and therefore encourage walking and cycling, and it is therefore important to strike the right balance. Well-connected street grids can also disperse traffic flows, which will tend to reduce the level of conflict at any particular point.

9.4.5 Reducing traffic speed will also improve safety, and one way of achieving this at the conflict point is to raise the junction onto a speed table.



Tabled crossroads

9.4.6 Keeping the number of approach lanes to the minimum will make the junction safer and easier to negotiate for pedestrians and cyclists. Research into cycle safety at T-junctions found that higher cycle collision rates are associated with two lane minor road approaches⁵⁵.

9.4.7 TD 42/95⁵⁴ recommends that consideration should be given to providing a right turning lane at priority junctions where the side road flow exceeds 500 vehicles per day, but this advice relates to trunk roads, where there is an emphasis on providing an unimpeded route for through traffic. It is a relatively low flow, and junctions without right turn lanes will often be able to cater for higher levels of turning traffic without resulting in significant congestion.

9.4.8 Right turning lanes make it more difficult for pedestrians to cross major roads and lead to higher traffic speeds and authorities should therefore consider carefully

all of the effects before deciding to provide them. Removing unnecessary right turn lanes can also be considered, and will bring substantial benefits to non-motorised users.

9.4.9 Where right turn lanes are to be provided or retained, refuges should be provided within ghost islands to facilitate pedestrians crossing.

9.4.10 As noted in Sections 6.3 and 6.4 of MfS1, tight corner radii help pedestrians and cyclists to travel across and through junctions by reducing the speed of turning

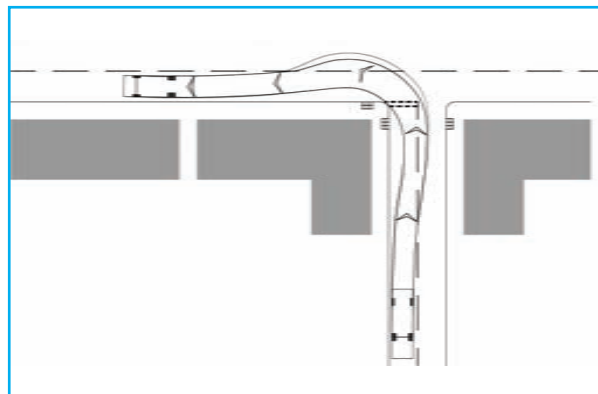


Ghost island junction with pedestrian refuge

vehicles. Advice contained in TD 42/95⁵⁴, that minimum corner radii should be 6m in urban areas, should therefore not be taken as representing best practice when the needs of vulnerable road users are to be prioritised.

9.4.11 Larger vehicles can still negotiate junctions where minimal (1m or less) corner radii are used, depending on the width of the junction arms they are turning to and from. In many cases it will be better to have slightly greater carriageway widths at the junction, rather than generous corner radii, or accept that larger vehicles occasionally cross into the opposing lane. This approach allows the vehicle to take a larger radius than the junction kerb, as shown below. This can be tested by vehicle tracking software rather than relying on fixed standards.

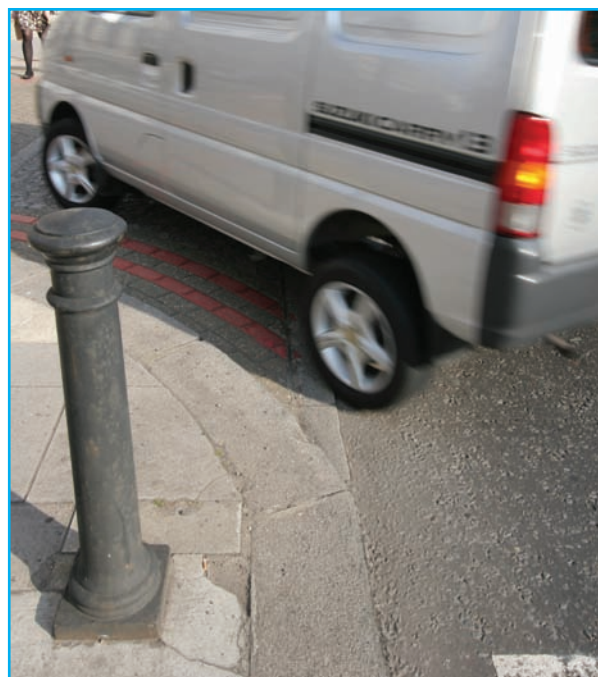
9.4.12 Designers are sometimes reluctant to use tight corner radii on the grounds that vehicles slowing to turn into the minor arm may cause shunt collisions on the



Despite the small corner radius, with sufficient carriageway width (X) a long vehicle can still negotiate a junction.

major road. This may be the case where speeds are high, but in urban areas the overall emphasis of MfS is that speeds should be reduced to appropriate levels of 30mph or below through design and the use of tight corner radii is consistent with this approach.

9.4.13 Moreover, there are junctions on very busy routes where tight corner radii have existed for a considerable time, as shown above.



9.4.14 Footway crossovers can be used instead of more formal priority junctions, which will give further prominence to pedestrians. Footway crossovers are often used successfully at accesses to commercial premises, as illustrated below, demonstrating that they can be used at busy locations.

9.4.15 Footway crossovers should maintain the normal footway cross-fall as far as practicable from the back of the footway (900mm), as recommended in MfS1. Designs



Footway crossover access to commercial premises

which ramp up over the whole width of the footway make it difficult for people with a mobility impairment, including wheelchair users, to negotiate the crossover.

9.4.16 The safety aspects of visibility requirements at priority junctions are dealt with in **Chapter 10**. Junction capacity is also dependent on visibility, however, as the drivers on the minor arm will emerge more cautiously and slowly when visibility is limited. Standard junction capacity tools such as PICADY enable designers to consider the effect of minor road visibility on junction capacity.

9.5_ Squares

9.5.1 Squares are excellent opportunities for creating successful and attractive public spaces, where people will wish to spend time, and are natural sites for commercial and public buildings that add to vitality. Many towns and cities have public squares at their heart, and many designs for urban extensions incorporate public squares as a focal point for the new community.

9.5.2 Although squares are primarily regarded as public spaces, squares with traffic passing through them can also be regarded as a development of priority and/or uncontrolled junctions. Squares offer a good way of enabling complex turning movements to take place across a more dispersed area, rather than at a single point, thus reducing conflict and improving safety. Many squares successfully incorporate car parking within the space.



Poundbury, Dorset. This square, where four routes meet, forms part of a new urban extension. It includes parking and local shops

9.6_ Conventional Roundabouts

9.6.1 Conventional roundabouts are widely used in the UK. Detailed guidance on the design of roundabouts is given in TD16/07⁵⁶ but (as with all sections of DMRB) this is written specifically for trunk roads and, where used in other situations, should not be applied uncritically.

9.6.2 Roundabouts typically have the lowest rate and severity of motor vehicle collisions and cause low levels of traffic delay, and therefore reduced vehicle emissions, in off-peak conditions. They can deliver high levels of traffic capacity and can cater for junctions with more than four approach arms, although there is some evidence that this can lead to a reduction in road safety.

9.6.3 On the other hand, roundabouts generally have a poor collision record for cyclists and can be a significant barrier to pedestrian movement. Many roundabout designs make only minimal provision for pedestrians, requiring them to cross wide entry and exit arms. Where formal crossings are installed, whether as zebra or signal-controlled crossings, they are often placed well away from desire lines. Some designers have created subways beneath roundabouts in an attempt to give pedestrians more direct crossing routes, but as the Maid Marian Way Case Study shows, this has rarely been successful (**Chapter 14**).

9.6.4 Providing adequate deflection is important in reducing speed for motor vehicles, and normal practice is for the geometry to force vehicles to turn through a curve of less than 100m in radius. This is less important in urban areas with a speed limit of 30mph or below where speed can be limited by other means. Designs that use means other than deflection to achieve low speeds can also have a good safety record.

9.6.5 Roundabouts can have a large land requirement and their circular geometry does not sit comfortably in dense urban areas. The signs and road markings generally associated with roundabouts can be very intrusive, although advice is given in **Chapter 13** on how this can be minimised.

9.6.6 When roundabouts are proposed, the recommended approach is to make the overall diameter of the junction as compact as possible to minimise land take. This will reduce the disruption to pedestrian desire lines, with crossings placed close to entries and exits. This may have some impact on traffic flow, but this should not always be seen as an unacceptable outcome, given the underlying need to encourage walking and cycling. Placing crossings on pedestrian desire lines will avoid the need for guardrailing.

9.6.7 Entries, exits and circulatory carriageways should be as narrow as possible, ideally to a single lane, subject to capacity considerations. UK practice has generally been to have generous entry and exit radii and avoid re-entrant curves, but moving towards a more 'continental' or 'compact' geometry will result in slower traffic speeds on the entries, exits and circulatory carriageway, which will be of benefit to cyclists and pedestrians.

9.6.8 Compact roundabouts are recommended in TD16/07⁵⁶ for single carriageway roads, and are particularly suitable where there is a need to accommodate the movement of pedestrians and cyclists. Further guidance on providing for cyclists at compact roundabouts is given in Traffic Advisory Leaflet (TAL) 9/97⁵⁷.

9.6.9 The widths of circulatory carriageways should be checked using swept path analysis, considering the largest vehicle that will regularly negotiate the junction, rather than always designing for the largest legal articulated vehicle, and using predetermined widths based simply on diameter. This may well allow smaller roundabouts to be achieved, particularly in urban areas.

9.6.10 Roundabouts do not always have to be circular, and ovoid or less regular shapes can be used in constrained situations. Care should be taken however to avoid sharp curves which can result in an overturning hazard for long vehicles.

9.6.11 Left turn slip lanes are often used to increase traffic capacity when there is a heavy demand for this movement. These create a particular hazard for cyclists, however, when they are leaving the circulatory carriageway and find themselves between two moving traffic lanes. Designers should not use these designs without resolving this problem satisfactorily.



Cyclists leaving this roundabout can find themselves in the outside lane of a dual carriageway.

9.6.12 Central islands at roundabouts can be utilised as sites for public art and monuments, but this is likely to be much more successful when these sites can be reached and enjoyed by people on foot.



Although the Wellington Arch, London is situated on a large roundabout, the direct crossing facilities mean that it is accessible by people on foot, cycle and on horses.



The monument at Seven Dials, London, acts as a place to sit and linger, as well as a place to move through and is a public square where seven routes meet. Roundabout priority is established by the placing of signs only on the entries to the junction.

9.7_ Mini-Roundabouts

9.7.1 Mini-roundabouts are essentially the application of a road marking (TSRGD diag 1003.4)⁵⁸ which defines a give-way to the right rule, circulating the marked central island. Detailed guidance is given in TD 54/07⁵⁹ but (as with all sections of DMRB) this is written specifically for trunk roads and, where used in other situations, should not be applied uncritically.

9.7.2 In particular, although TD 54/07 states that new mini-roundabouts are not to be used at new junctions on trunk roads, no such presumption applies elsewhere, and mini-roundabouts remain a valid choice of junction type for new as well as existing junctions.

9.7.3 Further detailed guidance on the design of mini-roundabouts is given in the DfT and County Surveyors' Society (now ADEPT) publication 'Mini roundabouts good practice guidance'⁶⁰.

9.7.4 Many mini-roundabouts have been installed at existing junctions where they can bring advantages such as the reduction in traffic speed on all approaches and a reduction in overall traffic delay. The land requirement of this type of junction is small - they can be fitted into junctions with an overall diameter of around 12m or less and thus create little diversion for pedestrians. They are safer for cyclists than large conventional roundabouts.



This mini-roundabout has an overall diameter of around 12m. It was installed as part of a village traffic calming scheme and has resulted in a significant reduction in collisions.

9.7.5 Mini-roundabouts cannot easily achieve good entry deflection and so are only suitable in locations where approach speeds are 30mph or below. One way of achieving a slow approach speed is to raise the junction on a table.

9.7.6 Most designs are unlikely to deliver high traffic capacities; mini-roundabouts with multiple approach lanes have been used but these are less easy for pedestrians and cyclists to negotiate safely, and can lead to higher approach speeds.

9.7.7 Mini-roundabouts work best where the traffic flow on different arms is reasonably balanced, so that drivers on all approaches slow down in anticipation of having to give way. When one or more arms has a relatively light traffic flow, a means of reducing traffic speeds, such as placing the junction on a speed table, may be a solution.

9.7.8 The requirements for road markings and signs at mini-roundabouts do have a considerable visual impact and can be particularly intrusive.

9.7.9 Some authorities have responded to this by installing junctions that are designed to encourage drivers to adopt circulatory priority, but they are in fact uncontrolled junctions - see Example of Julian Road, Bath, overleaf.



Julian Road Bath – Before and After

The scheme involved the redesign and realignment of a stretch of busy road outside a primary school in the west of Bath between Marlborough Street and the junction with Harley Street. A ghost island junction was replaced by an uncontrolled junction that used pavement materials to encourage circulatory priority.

In the three years prior to the scheme, there were nine recorded serious accidents in the relevant area, including one fatality. There have been no recorded accidents in the three years since the scheme was completed. The scheme included removal of most signs, barriers and road markings, and the creation of simple informal “places” instead of sweeping priority junctions.

9.7.10 Mini-roundabouts can also have controlled crossings close to exits, on pedestrian desire lines.



Zebra crossing close to mini-roundabout exit.

9.8.2 Traffic signals are widely used in urban situations and in rural locations and can cater for high traffic flows, although they are less appropriate than roundabouts when approach speeds are high. They generally have a worse road safety record than roundabouts in terms of vehicle-vehicle collisions, but are better suited to accommodate pedestrians and cyclists on their desire lines, although less so as the size and complexity of the junction increases.

9.8_ Traffic Signals

9.8.1 The principles of traffic signal control are set out in TAL 01/06⁶¹ and the design of pedestrian facilities at signals is covered by TAL 05/05⁶². Detailed guidance is given in TD 50/04⁶³ but (as with all sections of DMRB) this is written specifically for trunk roads and, where used in other situations, should not be applied uncritically.



Traffic signal junction with clear and simple pedestrian crossings and advance cycle stop lines. Note lack of guardrailing and buildings close to junction corner, and tight corner radii.

9.8.3 Traffic signals add to street clutter, particularly layouts that require large numbers of signal heads and other equipment. They can therefore have a severe visual impact. The minimum number of signals at crossings is specified in the Schedule to Direction 54 of TSRGD⁵⁸. For example, a non-staggered crossing only requires one primary and one secondary signal. Straight ahead crossings generally require fewer signal heads and therefore create less clutter.



Traffic signals can have a severe visual impact

9.8.8 Many traffic signal layouts include segregated left turn lanes, which may be signal-controlled or operate as give way junctions. Whilst they can increase capacity, they make pedestrian crossing movements much more difficult, adding an extra crossing which can significantly increase overall crossing times. They also add to the number of signal heads needed, and therefore clutter. These disbenefits should be expressly considered before this type of layout is adopted.



Segregated left turn lanes make pedestrian crossing movements more complex and slow, as well as adding to clutter.

9.8.4 Traffic signals generally occupy less land take than roundabouts, depending on the number of approach lanes and the need for separate turning lanes.

9.8.5 Even where it is judged that pedestrian phases at traffic signals are not justified, pedestrians can still cross more easily at traffic signals than at other locations, when traffic streams are stopped by red signals or during intergreen periods.

9.8.6 As with priority junctions, tight corner radii will make it easier for pedestrians to cross and will reduce the speed of turning traffic, although this will also reduce saturation flows and will need to be taken into account in capacity assessments.

9.8.7 Visibility requirements between arms of traffic signals as set out in TD 50/04⁶³ may affect the ability to position buildings close to the corners of traffic signal junctions, which can affect the ability to create a well-enclosed space. Reducing corner radii can enable stop lines to be brought forward to reduce this effect, but designers may need to consider whether the strict application of these visibility requirements is always appropriate, particularly in urban situations where speeds are low; or where stop lines are set back considerable distances due to swept path requirements or other reasons, giving rise to large intervisibility zones.

9.8.9 Traffic signal junctions in urban areas should generally incorporate advanced cycle stop lines to which enable cyclists to position themselves at the head of traffic streams where they are more visible and safer.

9.8.10 Outside peak hours traffic signals can cause greater levels of delay to all road users than other types of junction, due to the time lost when changing between signal stages. Keeping the number of signal stages to a minimum will reduce this disbenefit. Some authorities have begun to experiment with the removal of traffic signal control to reduce delays, and research studies have found this can lead to significant economic benefits⁶⁴.

9.8.11 Notwithstanding these potential benefits, care needs to be taken that the removal of traffic signals does not worsen road safety, or make conditions worse for pedestrians and cyclists.

9.8.12 Traffic signal controllers should be sited to allow unimpeded use of the footway by pedestrians. In the example below, a signal controller has been installed in a bench.



Bench containing traffic signal controller

9.8.13 Most highway authorities specify backing boards with white borders to traffic signals, but they are not legally required. Local Transport Note 1/98⁶⁵ notes that backing boards may be omitted at urban sites where speeds are low and there are no distracting backgrounds.



Signalised crossing with no white borders to signal heads

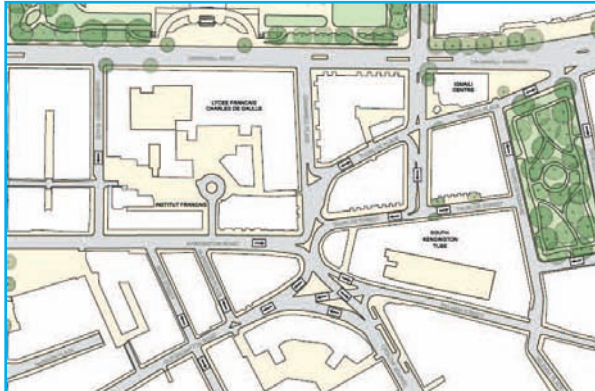
9.9_ Traffic Management and One-Way Systems

9.9.1 In many towns and cities traffic management systems, often involving networks of one-way streets, have been created. The usual aim of these systems is to increase network capacity by simplifying turning movements at junctions. These aims are understood, but the improvements in traffic flow capacity are offset by reductions in legibility and accessibility for all road users. One-way streets also tend to cause higher traffic speeds.

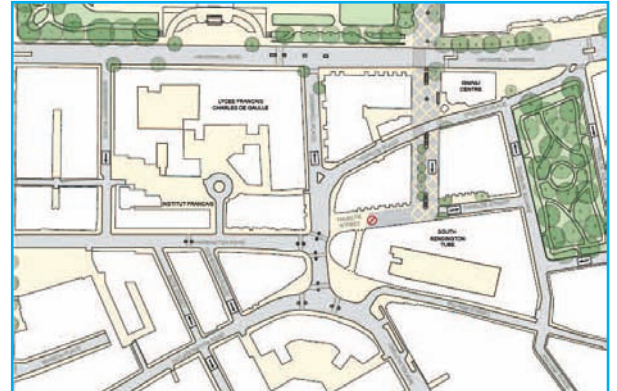
9.9.2 Cyclists are particularly disadvantaged by such systems, since the additional travel distance can be significant. Pedestrians can become disorientated by one-way streets, and fail to look for traffic in the correct direction before crossing. This is a particular problem where there are contraflow bus lanes.

9.9.3 However, with appropriate designs to minimise vehicle speeds, one-way streets can result in narrower carriageways which can create more space for pedestrians, cyclists and the public realm.

9.9.4 Some towns and cities have begun to simplify traffic management systems, judging that the benefits to other road users outweighs any additional travel time for motor vehicles. In South Kensington (see overleaf) a complex one-way system has been removed, whilst at the same time considerable areas of carriageway space have been given over to pedestrians.



Before



After

Changes at South Kensington - a complex one-way system has been simplified



Before



After

Area outside Underground station

9.10_ Direct Frontage Access

9.10.1 Providing direct access to buildings and public spaces is an important element in creating streets that are linked to their surroundings, rather than simply being conduits for passing traffic. Access is a key part of the place function of streets and should be facilitated where possible.

9.10.2 MfS1 referred to research which looked at the relationship between traffic flow and road safety on streets with direct frontage access to dwellings (MfS1 7.9.5). A limit of 10,000 vehicles per day (vpd) was advised, but this related to the limited number of sites considered with more than this level of traffic, rather than an indication that road safety declines above this level of flow.

9.10.3 Research referred to in TD 41/95³ examined the relationship between access frequency and collisions on 3,000km of all-purpose trunk roads in England, both urban and rural, dual and single carriageway. The research showed that there was no simple statistical relationship between the number of collisions and the number of vehicular connections in the form of minor junctions and direct accesses.

9.10.4 For rural roads, there was a statistically significant relationship between collisions and traffic flow, link length and the total number of all access connections. In the case of urban roads, however, only traffic flow had a significant effect on the number of collisions at this level of confidence, and was found no direct relationship between access provision and collision occurrence.

9.10.5 It is therefore clear that the advice given in MfS1 concerning direct access is applicable to all urban roads, and that providing direct frontage access is unlikely to have significant disbenefits in road safety terms.

10_Visibility

10.1_Introduction

10.1.1 This section of MfS2 incorporates Section 7.5 of MfS1. It is based on a combination of the research carried out by TRL²³, the research carried out by TMS Consultancy for MfS2⁶⁶, a review of recent research and international standards and the outcome of public inquiries since MfS1 was published (see Example below).

10.1.2 Sight distance parameters can be based on various models, such as stopping sight distance, overtaking distance or gap acceptance. UK practice generally focuses on Stopping Sight Distance (SSD). The effect of sight distance on the capacity of priority junctions is discussed in **Chapter 9** above.

10.1.3 This section provides guidance on SSDs for streets where 85th percentile speeds are up to 60 kph (37mph). This will generally be achieved within 30mph limits and may be achieved in some 40mph limits.



Inspectors at public inquiries have accepted that SSD guidance in MfS1 applies to non-residential streets. At an appeal into a development of some 100 dwellings, accessed from the B5215 Leigh Road in Wigan, the Inspector concluded that MfS1 did apply, notwithstanding the volume of traffic (approximately 1,700vph peak times) or the classification of the highway (part of the Strategic Route Network).

10.1.4 Stopping sight distance (SSD) is the distance drivers need to be able to see ahead and they can stop within from a given speed. It is calculated from the speed of the vehicle, the time required for a driver to identify a hazard and then begin to brake (the perception-reaction time), and the vehicle's rate of deceleration. For new streets, the design speed for the location under consideration is set by the designer. For existing streets, the 85th percentile wet-weather speed is used.

10.1.5 The basic formula for calculating SSD (in metres) is:

$$SSD = vt + v^2/2(d+0.1a)$$

where:

v = speed (m/s)

t = driver perception-reaction time (seconds)

d = deceleration (m/s²)

a = longitudinal gradient (%)

(+ for upgrades and - for downgrades)

10.1.6 The Desirable Minimum SSDs in general use prior to MfS1 were based on a driver perception-reaction time of 2 seconds and a deceleration rate of 2.45 m/s² (equivalent to 0.25g, where g is acceleration due to gravity (9.81 m/s²)). The Absolute Minimum SSD values kept the same reaction time of 2 seconds, but assumed a deceleration rate of 3.68 m/s² (0.375g).

10.1.7 The SSD values recommended in MfS1 were based on a perception-reaction time of 1.5 seconds and a deceleration rate of 0.45g (4.41 m/s²). This value is appropriate for cars and other light vehicles, but heavy goods vehicles and buses have different deceleration characteristics. When deciding whether to carry out separate checks for cars, HGV and bus SSDs, highway authorities should consider the following factors:

- Volume of HGVs and buses
- Proportion of HGVs and buses
- Presence of priority lanes which may enable higher bus/HGV speeds

10.1.8 As a guide, it is suggested that bus/HGV SSD should not need to be assessed when the combined proportion of HGV and bus traffic is less than 5% of traffic flow, subject to consideration of local circumstances.

10.1.9 Based on international vehicle standards (see Example) HGVs must be able to achieve peak deceleration rates of at least 0.509g. However, allowing for the delay in the maximum effectiveness of air braking systems, overall minimum stopping distances are also specified which reduce the minimum overall deceleration rate^A under the regulations to some 0.36g. Real life tests carried out by ROSPA (also see Example) indicate that these values are likely to be exceeded in practice and therefore the pre-MfS1 Absolute Minimum value of 0.375g is recommended for HGVs. These average deceleration rates already allow for the time taken for air braking systems to apply and therefore the same reaction time of 1.5 seconds should be used.

10.1.10 For buses, the limiting design factor is passenger comfort and safety rather than the ability of the vehicle to stop, and therefore for buses, the recommended maximum deceleration rate is the same as the pre-MfS1 Absolute Minimum value of 0.375g, as used for the pre-MfS1 Absolute Minimum SSD values.

^A The minimum overall deceleration rate means the deceleration rate, expressed as a uniform value, from the instant when the brakes begin to be applied when the vehicle stops, required by the standards.

10.1.11 Where designers wish to determine different SSD values for HGVs and buses it will be necessary to use appropriate design speeds for these classes of vehicle. Where SSD is being calculated for existing highways, actual 85th percentile values for these types of vehicles should be measured and the worst case SSD be used for horizontal measurements of visibility.

10.1.12 Based on free flow vehicle speeds travelling in 30mph limits given in Transport Statistics Bulletin 2008⁴⁵, buses travel at 90% of the average speed for all vehicles.

HGV Braking Performance

Minimum standards for lorry braking systems are set out in the UNECE Vehicle Regulation 13⁶⁷, which requires that the mean fully developed deceleration rate achieved by the braking system (with the engine disconnected) should be at least 5.0m/s² (0.509g). In addition, the stopping distance of the vehicle must be no more than $0.15v + v^2/130$, where v=vehicle speed in kph (up to 60kph), and $0.15v + v^2/103.5$ (v up to 90kph).

At 50kph the maximum allowable stopping distance is therefore 26.7m, and this is equivalent to a minimum overall braking rate of 3.6m/s² or 0.37g.

A series of real life braking tests were carried out by ROSPA using a wide range of vehicles in 2001, as reported in

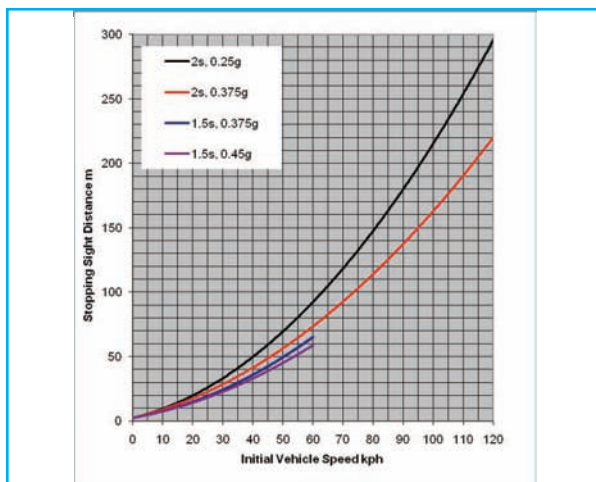
<http://www.rosipa.com/RoadSafety/AdviceAndInformation/Driving/hgv-truck-braking-systems.aspx>

Deceleration rates have been calculated from the results of these tests which show that the minimum overall braking rate achieved was 0.44g, for a 36 tonne Foden vehicle, which stopped in 20.68m from 30mph. (One vehicle did take longer to stop, at 27m, but this was on a down slope). Cars were also tested by ROSPA, and the best performing of these was a Ford Mondeo, which stopped from 30mph in 7.14m, an overall deceleration rate of 1.27g.

10.1.13 In summary, recommended values for reaction times and deceleration rates for SSD calculations are given in **Table 10.1** below and the resulting SSD values for initial speeds of up to 120kph are shown on the graph beneath.

Design Speed	Vehicle Type	Reaction Time	Deceleration Rate	Comments
60kph and below	Light vehicles	1.5s	0.45g	
	HGVs	1.5s	0.375g	See 10.1.9
	Buses	1.5s	0.375g	See 10.1.10
Above 60kph	All vehicles	2s	0.375g (Absolute Min SSD)	As TD 9/93
	All vehicles	2s	0.25g (Desirable Min SSD)	As TD 9/93

Table 10.1: Summary of Recommended SSD Criteria



Graph showing recommended SSD values, allowing for bonnet length.

10.2_Visibility Requirements

10.2.1 Visibility should be checked at junctions and along the street. Forward visibility is measured horizontally and vertically.

10.2.2 Using plan views of proposed layouts, checks for visibility in the horizontal plane ensure that views are not obscured by vertical obstructions.

10.2.3 Checking visibility in the vertical plane is then carried out to ensure that views in the horizontal plane are not compromised by obstructions such as the crest of a hill, or a bridge at a dip in the road ahead. It also takes into account the variation in driver eye height and the height range of obstructions. Eye height is assumed to range from 1.05m (for car drivers) to 2m (for bus and HGV drivers).

10.2.4 Drivers need to be able to see obstructions from 2m high down to a point 600 mm above the carriageway. The latter dimension is used to ensure small children can be seen.

10.2.5 The SSD figure relates to the position of the driver. However the distance between the driver and the front of the vehicle is typically up to 2.4m, which is a significant proportion of shorter stopping distances. It is therefore recommended that for assessments of SSD, an allowance is made by adding 2.4m to the distance calculated using the formula.

10.3_Foreward Visibility

10.3.1 The minimum forward visibility required is equal to the minimum SSD, based on the design speed at the location being considered. It is checked by measuring between points on a curve along the centreline of the inner traffic lane (see Fig.10.1).

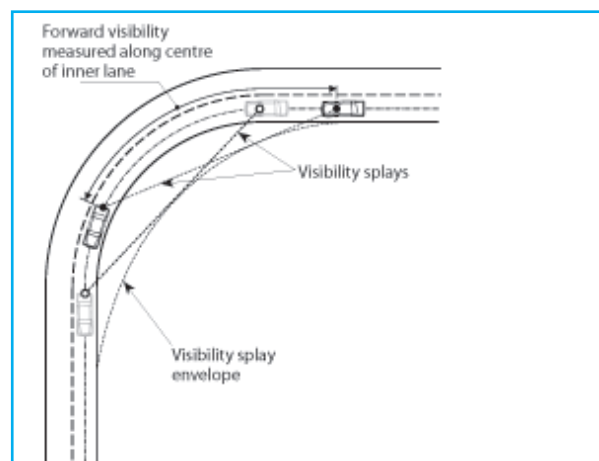
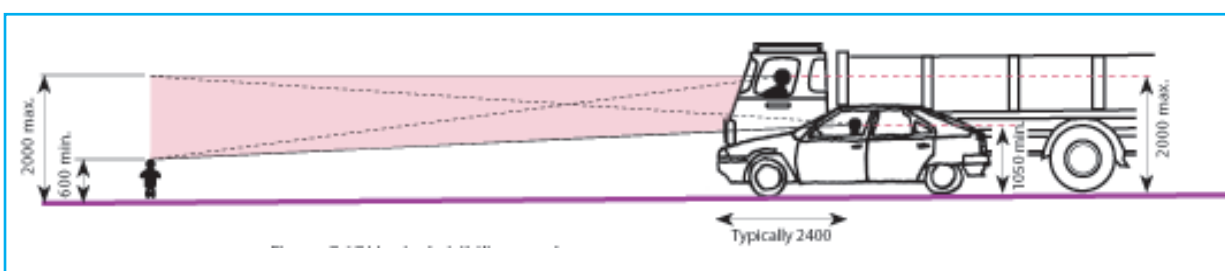


Figure 10.1 - Measurement of forward visibility

10.3.2 However there will be situations in locations with design speeds of 60kph or less where it is desirable and appropriate to restrict forward visibility to control traffic speed - research carried out for MfS1 describes how forward visibility influences speed. An historic example is shown below.



Spaniards Inn, Hampstead – historic building restricting forward visibility and carriageway width



10.4_ Visibility At Priority Junctions

10.4.1 The visibility splay at a junction ensures there is adequate inter-visibility between vehicles on the major and minor arms.

10.4.2 It has often been assumed that a failure to provide visibility at priority junctions in accordance with the values recommended in MfS1 or DMRB (as appropriate) will result in an increased risk of injury collisions. Research carried out by TMS Consultancy for MfS2⁶⁶ has found no evidence of this (see research summary below). Research into cycle safety at T-junctions found that higher cycle collision rates are associated with greater visibility⁵⁵.

High Risk Collision Sites and Y Distance Visibility

Introduction

The accepted approach to visibility at priority junctions has been to provide a minimum stopping sight distance value appropriate to a particular design speed. The assumption made by some designers and road safety auditors is that this value provides a minimum road safety requirement, and that collision risk will increase if the SSD is not achieved.

The purpose of this research was to examine this assumption and to identify whether or not a direct relationship can be established between variations in Y distance SSD and collision frequency at priority junctions.

Methodology

Site Selection

A series of “high risk” priority junctions was identified as the basis for research. Uncontrolled crossroads and T- junctions were selected for all classes of road throughout all 20, 30 and 40mph speed limits in Nottinghamshire, Sandwell, Lambeth, and Glasgow. For each area a list of all non-pedestrian collisions was ranked in descending order of collision total for a recent five-year period, with over 1500 collisions listed in total. Each location was then analysed in detail to identify specific collision characteristics.

Collision Analysis

Collisions involving vehicles emerging from junctions into the path of vehicles on the main road, together with nose-to-tail shunts on the minor road were identified as the type of incident that could have been caused by “poor visibility”. The locations were then ranked in descending order of these types of crashes, and site visits were carried out at the “worst” sites.

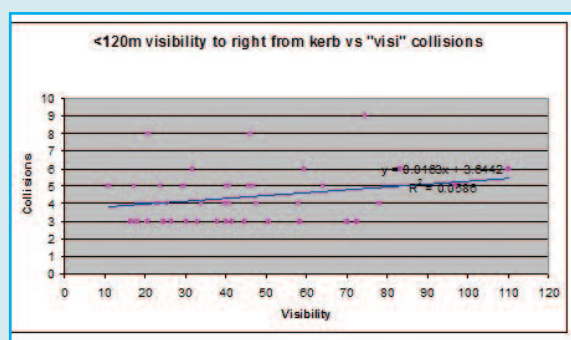
In addition to the 626 potential “poor visibility” collisions, a record was made of 203 collisions involving main road shunts, 46 collisions involving main road bus passengers, 22 collisions involving main road large goods vehicles, and 216 collisions involving main road two-wheeled vehicles. There is a concern that these types of collisions could be over-represented at locations with poor visibility.

Site Visits

Two investigators visited each location, and measured visibility to the left and right, from a point on the side road, 2.4m back from the main road channel line. Visibility was measured from a height of 1.05m, to a point at the kerb edge and a second point 1m out from the kerb edge, where observations showed that visibility increased.

Summary of Findings

- “High risk” sites were defined as locations that had three or more potential poor visibility collisions - in a five year period (94 in total). Of these 90 were on 30mph roads, with 3 on 40mph roads. At 55 of the 94 locations the worst case visibility (either to the left or right) was restricted to less than 120m. Thus in relation to the total number of uncontrolled junctions that exist, the proportion of “high risk” sites where visibility is less than that recommended for 70kph in DMRB is likely to be very low. It is possible that some former high risk priority junctions have been converted to other forms of junction control.
- In two thirds of the cases where visibility was less than 120m, the restriction was due to parked vehicles or street furniture. It is not possible to determine whether the parking was present at the time of the collision.
- Linear regression to compare potential poor visibility collisions with Y distance has a very low R^2 value, which shows that the variation in collision frequency was explained by factors other than Y distance visibility, for a large number of different situations. Therefore Y distance cannot be seen as a single deterministic factor at these high-risk collision locations (see example graph below).



Visibility measured to right, to nearside kerb.

	No. of sites	No. collisions	Collisions per year	Collisions per site per year
0-20m	4	16	3.2	0.80
20-40m	14	58	11.6	0.83
40-60m	15	64	12.8	0.85
60-80m	5	24	4.8	0.96
80-100m	2	11	2.2	1.10
100-120m	1	6	1.2	1.20
120m+	48	208	41.6	0.87

- A series of collision types at high risk locations where Y distance was less than 45m were compared with locations with more than 45m visibility. There were no statistically significant differences between the two sets of data. The data analysed included main road bus and large goods vehicle collisions, and the research did not find high numbers of collisions involving these types of vehicles at low visibility sites.

Collision type	No & % in sites <45m vis	No & % in sites >45m vis
Potential visi collisions in dark	40 (31.75%)	90 (30.3%)
Main road shunts	24 (8.79%)	50 (9.11%)
Bus passenger	10 (3.66%)	10 (1.82%)
Main road HGV	1 (0.37%)	5 (0.91%)
Main road two-wheeled.	38 (13.92%)	85 (15.58%)

Conclusions

- This study has been unable to demonstrate that road safety concerns regarding reduced Y distance are directly associated with increased collision risk at “high-risk” urban sites;
- Previous research for MfS1 demonstrated that main road speed is influenced by road width and forward visibility. Many of the locations in this study were straight roads with good forward visibility. The ability of the driver to stop is likely to be affected by more than just what is happening in the side road and an understanding of the factors influencing main road speed is important when assessing visibility requirements.

10.5_ X and Y Distances

Measurement of X and Y distances

10.5.1 The distance back along the minor arm from which visibility is measured is known as the X distance (**Figure 10.2**). It is generally measured back from the 'give way' line (or the main road channel line if no such markings are provided).

10.5.2 This distance is normally measured along the centreline of the minor arm for simplicity, but in some circumstances (for example where there is a wide splitter island on the minor arm) it will be more appropriate to measure it from the actual position of the driver.

10.5.3 The Y distance represents the distance that a driver who is about to exit from the minor arm can see to the left and right along the main alignment. For simplicity it has previously been measured along the nearside kerb line of the main arm, although vehicles will normally be travelling at a distance from the kerb line. Therefore a more accurate assessment of visibility splay is made by measuring to the nearside edge of the vehicle track. The measurement is taken from the point where this line intersects the centreline of the minor arm (unless, as above, there is a splitter island in the minor arm).

10.5.4 When the main alignment is curved and the minor arm joins on the outside of a bend, another check is necessary to make sure that an approaching vehicle on the main arm is visible over the whole of the Y distance. This is done by drawing an additional sight line which meets the kerb line at a tangent.

10.5.5 Some circumstances make it unlikely that vehicles approaching from the left on the main arm will cross the centreline of the main arm - opposing flows may be physically segregated at that point, for example. If so, the visibility splay to the left can be measured to the centreline of the main arm.

Recommended values for X and Y distances

10.5.6 An X distance of 2.4m should normally be used in most built-up situations, as this represents a reasonable maximum distance between the front of a car and the driver's eye.

10.5.7 Longer X distances enable drivers to look for gaps as they approach the junction. This increases junction capacity for the minor arm, and so may be justified in some circumstances, but it also increases the possibility that drivers on the minor approach will fail to take account of other road users, particularly pedestrians and cyclists. Longer X distances may also result in more shunt collisions on the minor arm. TRL Report No. 184⁶⁸ found that collision risk increased with greater minor-road sight distance.

10.5.8 A minimum X distance of 2m may be considered in some slow-speed situations when flows on the minor arm are low, but using this value will mean that the front of some vehicles will protrude slightly into the running carriageway of the major arm, and many drivers will tend to cautiously nose out into traffic. The ability of drivers and cyclists to see this overhang from a reasonable distance, and to manoeuvre around it without undue difficulty, should be considered. This also applies in lightly-trafficked rural lanes.

10.5.9 The Y distance should be based on the recommended SSD values. However, based on the research referred to above, unless there is local evidence to the contrary, a reduction in visibility below recommended levels will not necessarily lead to a significant problem.

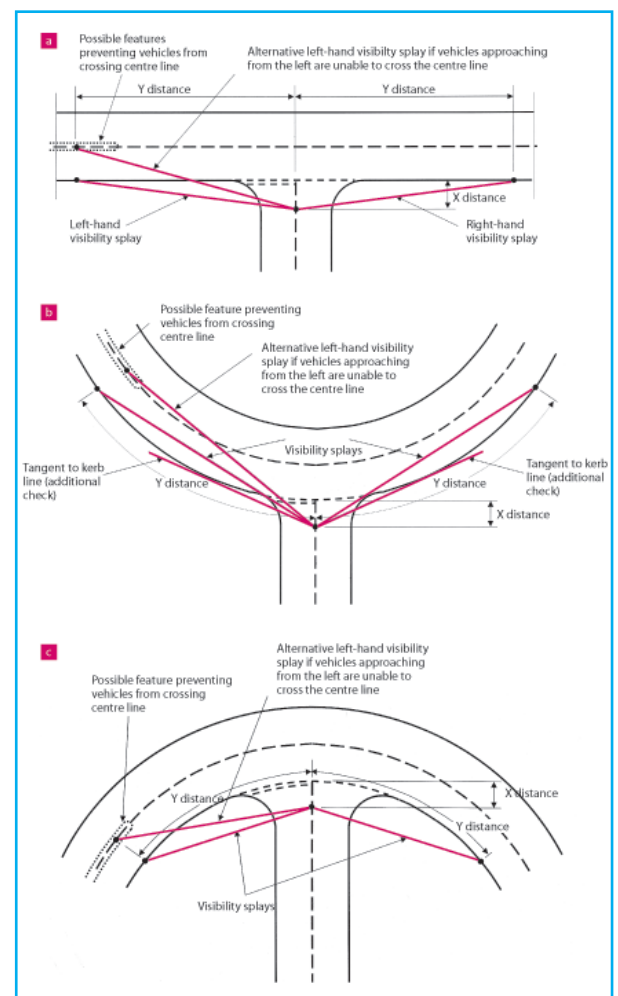


Figure 10.2

10.6_ Visibility Along The Street Edge

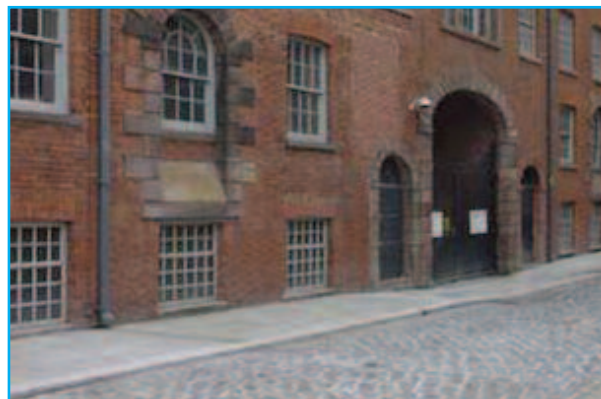
10.6.1 Vehicle exits at the back edge of the footway mean that emerging drivers will have to take account of people on the footway. The absence of wide visibility splays at minor accesses will encourage drivers to emerge more cautiously - similarly to how vehicles pull out when visibility along the carriageway is restricted (see Example below)

10.6.2 . Consideration should be given to whether this will be appropriate, taking into account the following:

- the frequency of vehicle movements;
- the amount of pedestrian activity; and
- the width of the footway.

10.6.3 When it is judged that footway visibility splays are to be provided, consideration should be given to the best means of achieving this in a manner sympathetic to the visual appearance of the street (**Figure 10.3**). This may include:

- the use of boundary railings rather than walls; and
- the omission of boundary walls or fences at the exit location.



Access to commercial property with limited visibility.

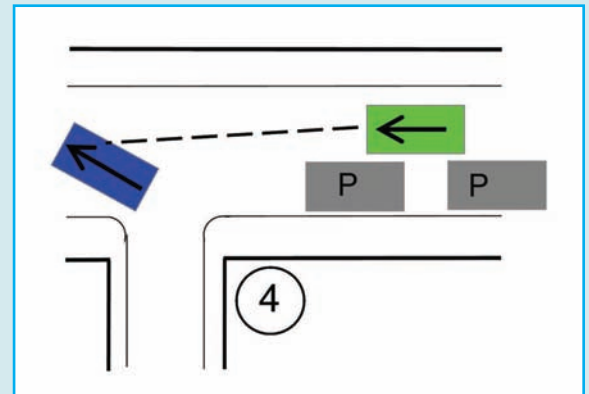
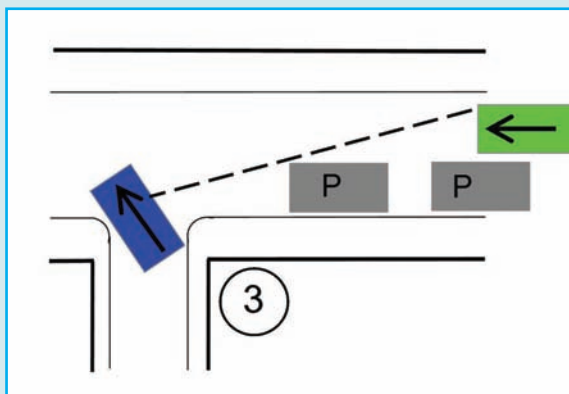
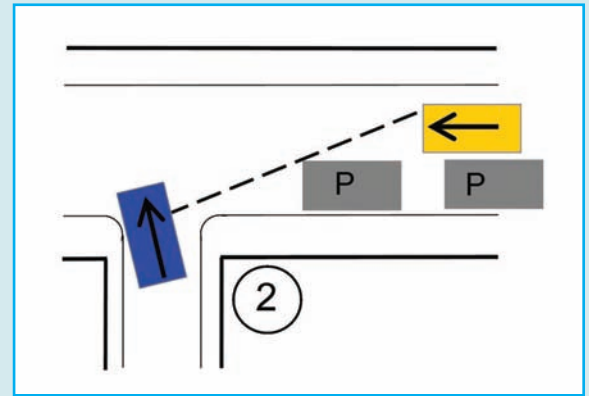
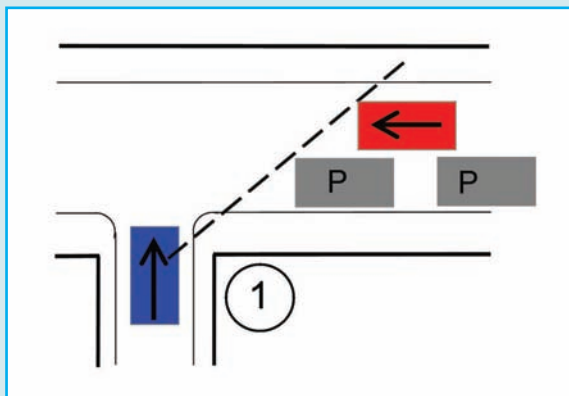


Figure 10.3

10.7_ Obstacles To Visibility

10.7.1 Parking in visibility splays in built-up areas is quite common, yet it does not appear to create significant problems in practice. Ideally, defined parking bays should be provided outside the visibility splay. However, in some circumstances, where speeds are low, some encroachment may be acceptable. (See Example below.)

10.7.2 The impact of other obstacles, such as street trees and street lighting columns, should be assessed in terms of their impact on the overall envelope of visibility. In general, occasional obstacles to visibility that are not large enough to fully obscure a whole vehicle or a pedestrian, including a child or wheelchair user, will not have a significant impact on road safety.



At urban junctions where visibility is limited by buildings and parked cars, drivers of vehicles on the minor arm tend to nose out carefully until they can see oncoming traffic, and vice-versa.

In the images above, the blue car moves forward slowly until it can see far enough past the parked vehicles to see that the gap to the next oncoming vehicle is long enough for it to pull out. Drivers on the major route will also be able to see the vehicle pulling forward slowly and may slow down or stop to allow it to pull out.

11_ On-Street Parking and Servicing

11.1.1 Parking is an important consideration in the planning and design of highway networks, particularly in urban areas. General guidance on the development of parking strategies is given in the IHT publication 'Parking Strategies and Management' (2005)⁶⁹ and the document 'Car Parking, what works where'⁷⁰ provides a comprehensive analysis of the design of parking in residential and mixed-use areas.

11.1.2 On-street car parking can be a vital component of highways, particularly where routes pass through town centres and commercial areas. The decision whether or not to provide on-street car parking should take into account its positive and negative effects, as summarised in MfS1:

Positive Effects

- A common resource, catering for residents', visitors' and service vehicles in an efficient manner.
- Able to cater for peak demands from various users at different times of the day, for example people at work or residents.
- Adds activity to the street.
- Typically well overlooked, providing improved security.
- Popular and likely to be well-used.
- Can provide a useful buffer between pedestrians and traffic.

Negative Effects

- If there are few places for pedestrians to cross with adequate visibility it can introduce a road safety problem, particularly if traffic speeds are above 20mph.
- Can be visually dominant within a street scene and can undermine the established character.
- May lead to footway parking, unless the street is properly designed to accommodate parked vehicles.
- Vehicles parked indiscriminately can block vehicular accesses to premises.
- Cars parked on-street can be more vulnerable to opportunistic crime than off-street spaces.
- Providing parking bays potentially reduces footway space, which could also be used for cycle parking.

11.1.3 Where car parking is provided, a good solution is to break it into discrete groups of spaces with build outs that provide opportunities for pedestrians to cross with good visibility.

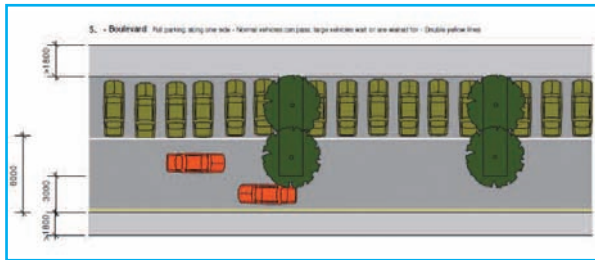


Well-integrated on-street parking.

11.1.4 Car parking alongside carriageways can be longitudinal, echelon or at right angles to the kerb. Longitudinal parking will be more appropriate where traffic speeds and volumes are higher, since vehicles entering and exiting the spaces cause less interruption to traffic flow. In town centres and other locations where speeds are low, echelon and right angled parking may be the best solution, since it is more efficient and creates a stronger statement that the area is for 'place' activities as well as for movement.



Manchester Ancoats Before and After.



Manchester Ancoats Plan

11.1.5 Echelon parking may be more difficult for pedestrians to pass through than longitudinal and right angled parking, depending on the spacing of parked vehicles, and can provide a greater barrier to crossing the street. This can be solved by leaving regular gaps between parked vehicles, however. It is easier for vehicles to enter and exit echelon than right angle spaces and so the former have less impact on through traffic.

11.1.6 With echelon and right angle parking, care has to be taken that overhanging vehicles do not have an adverse impact on the available footway width. This can be addressed by providing generous footways, or using street furniture or wheel stops, in the form of dished channels, to prevent vehicles from encroaching too far.

11.1.7 On-street servicing bays are often required in urban centres where commercial premises can only be accessed from the front. Where they are designed as lay-bys, they can be difficult to keep clear of parked cars and take space away from pedestrians that is empty for much of the time. Some authorities are placing loading areas on strengthened areas of the footway, which makes it much less likely that space will be used for parking, and allows pedestrians to use the space when there are no vehicles present.

11.1.8 This approach has been used in numerous locations in London in recent years⁷¹.



On-footway servicing bay - Walworth Road MPR Scheme, London

11.1.9 The minimum widths required to manoeuvre to/from 2.4m wide parking spaces are as follows:

- 90° - 6m
- 60° - 4.2m
- 45° - 3.6m
- 30° - 3.6m

11.1.10 Where parking is provided on street, this manoeuvring width will generally be provided by the carriageway.

11.1.11 For echelon and right angle parking, manoeuvring space can be reduced by providing wider spaces, as shown in Figure 8.20 of MfS1.

12_ Street Furniture and Trees

12.1_ Introduction

12.1.1 Street furniture is the collective term for the wide range of extraneous items that are placed in highways, most of which is to be found outside the carriageway. Street furniture has an important role to play in facilitating the use of the highway for many purposes, and some items support important 'place' functions, such as seating and cycle parking. While trees may not be strictly classed as street furniture, they are important elements within highways that are highly beneficial, although they should be located and managed carefully.

12.1.2 In recent years there has been increasing concern that excessive and poorly-planned and maintained street furniture is seriously degrading the quality of the local environment.

12.1.3 Based on the guidance that is already contained in MfS1 the key principles that should be followed with respect to street furniture, including traffic signs, are as follows:

- Designers should start from a position of having no street furniture and only introduce these elements when they serve a clear function.
- Street designs should be as self-explanatory as possible, so that the number of signs can be minimised. Providing additional signs may not solve a particular problem - it may be necessary to consider removing signs and dealing with the problem another way.
- Excessive street furniture should be avoided, although street furniture that is of direct benefit to street users, such as seating and cycle parking, can contribute to a sense of place, making the street a destination in its own right.
- Street furniture should be laid out so that pedestrian routes along and across the street are kept clear.
- New street furniture should be well designed and in sympathy with the character of the street. Items of historic interest should be retained.

12.1.4 Further detailed advice on minimising the number and impact of traffic signs is given in **Chapter 13**.



Excessive signs and street furniture can have a severe impact on the public realm.

12.1.5 A proliferation of street furniture can often arise in mixed-use environments. This is made worse when complex traffic management systems are also used. Consequently the key principles from MfS1 are even more important to consider in the context of the wider range of street and road types that are covered by this document.

12.1.6 Local Transport Note 1/08 'Traffic Management and Streetscape'²⁴ provides advice on how to manage street furniture in a more sensitive way, with particular emphasis on the processes that should be followed. Whilst LTN 1/08 focuses on traffic management schemes, its principles can be applied more generally, including on new and improved highway schemes.

12.1.7 Reducing the amount of street furniture will bring significant benefits in terms of visual amenity. It is only possible to appreciate the character of an area if it is not obscured by excessive standardised street paraphernalia.



Character Obscured



Character Revealed - same location, same street furniture, but rationalised (Images Courtesy Colin Davis)

12.1.8 Other benefits of reducing the amount of street furniture include:

- reducing the costs of provision and maintenance.
- improving the overall image of a place, helping it to function well economically and making its features of interest, such as heritage buildings and structures, stand out more clearly.
- improving the safety and amenity of pedestrians, particularly people with impaired mobility and people who are blind or partially sighted.
- making those signs that are most important stand out more clearly, improving safety and user behaviour.

In summary, less can be more.



Mare Street Hackney - Before and after a decluttering scheme in August 2007. Casualty records have revealed a safety neutral outcome.

12.2_ Procedures For Reducing Street Furniture

12.2.1 In existing streets, highway authorities, working closely with other agencies and other interested parties, can carry out targeted decluttering schemes, reviewing traffic signs and street furniture. This will identify what can be removed without adversely affecting road safety and the proper functioning of the street. Highway authorities should also work with external bodies, such as the statutory undertakers, and with other local authority departments to prevent streets becoming degraded with excessive street furniture over time.

12.2.2 It is also recommended that highway authorities adopt a process of decluttering as an integral part of their ongoing maintenance regimes. It will often be possible to identify items of street furniture that are redundant during routine street inspections so that they can be removed at little cost during maintenance operations. This process is covered by the 'tidy up' step in the London Mayor's Better Streets strategy²⁵, set out in **Chapter 4**.



This guardrail has no function - the pedestrian route it was protecting has been closed - and can therefore be removed.

12.2.3 When new highways are built or improvements are carried out, designers may over-provide and over-specify traffic signs, markings and other street furniture, based on the principle that they will only have one opportunity to provide such items. This practice adds unnecessarily to street clutter and should be avoided. Instead, the starting point should be that they are not to be provided unless there is a clear need for them. Where there is doubt over the need for any items, they should be omitted, and the situation monitored closely to establish whether they are justified in the light of experience.



Junction of Corporation Street and Croft Road, Coventry - Junction simplified, traffic signs, bus lane, keep left bollards and guardrail removed, cycle parking on median.



12.2.4 Local policy and guidance on streetscape design and implementation processes has a key role to play in setting procedures for the progressive reduction of street clutter while promoting walking and cycling - see Example below.

12.2.5 Local highway authorities are encouraged to develop policy documents to ensure that similar principles are adopted as a matter of course when existing highways are maintained and improved, and when new ones are being designed.

Transport for London's 'Streetscape Guidance'⁷² contains detailed advice on the use of appropriate materials and details across the TfL network, and requires designers to ensure that:

- Signs are sufficient to enforce the regulations but are not excessive in terms of numbers and size.
- Key views and landmark buildings are not obstructed by poorly located street furniture, unless there is an unavoidable safety or security need.
- Clear pedestrian routes are maintained by removing redundant furniture and locating new furniture outside pedestrian desire lines.
- Clutter is reduced by combining elements of street furniture, such as signals and signs on street lighting or CCTV columns, incorporating bins and seats into bus shelters, and by mounting street signs and equipment on buildings or structures, wherever it is safe and acceptable to do so and the agreement of the owner has been obtained.
- The extent and visual impact of safety fences and barriers is reduced to the minimum required for safety and security to lessen visual impact and severance effects.

12.3_ Keeping Footways Clear

12.3.1 Guidance on the space requirements for pedestrians is contained in Section 6.3 of MfS1 and can be related to the volume of pedestrians per square metre (Fruin Level of Service). Experience from Copenhagen⁷³ indicates that pedestrians start to take alternative routes when the flow exceeds 13 people per metre of footway width per minute.

12.3.2 In many places, however, particularly in town centres, the effective width of footway is significantly reduced by the presence of street furniture and other obstacles (see box out on UCL research). Waste bins are a particular hazard in many cities. ADEPT have published their practical guide for developers and local authorities called 'Making Space for Waste'⁷⁴.

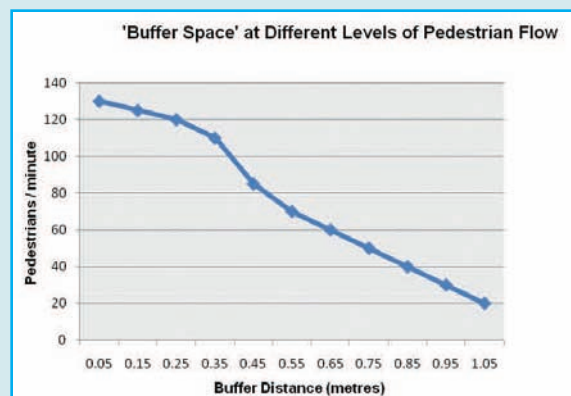
The Influence of Street Furniture on Pedestrian Footway Capacity

Research carried out at UCL by Peter Jones and Rachel Palfreeman⁷⁵ looked at the space requirements of different types of street furniture located on the footway. The amount of space taken up by such objects is often much greater than their

physical footprint due to two factors. First each object has a 'no go' buffer space around it as pedestrians seek to avoid coming into contact with the object. The literature has historically assumed a 0.3 to 0.45m buffer width, but this research suggests that it varies according to pedestrian flow rates and can be as little as 0.1m at high rates of flow – see figure below.



Street furniture and other clutter affecting footway capacity



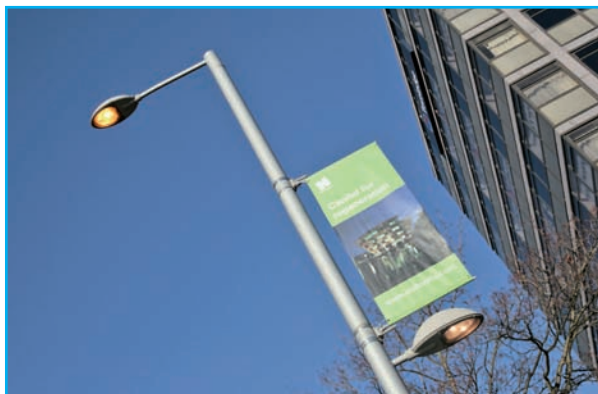
But there is a second factor which further reduces pedestrian capacity, which has not previously been taken into account. This is the 'footprint in use' of the object. This may result either from the intended use of an object (e.g. additional space taken up by a cycle parked against a cycle rack; a person sitting on a bench with shopping bags or a pushchair alongside; or people queuing to use a cash

machine), or from unintended use (e.g. rubbish bags left next to a bin, or cycles parked alongside pedestrian guardrailing). The 'footprint in use' may add considerably to the physical footprint of the object itself, as shown in the table below, and so have a major impact on pedestrian flows and the use of the footway.

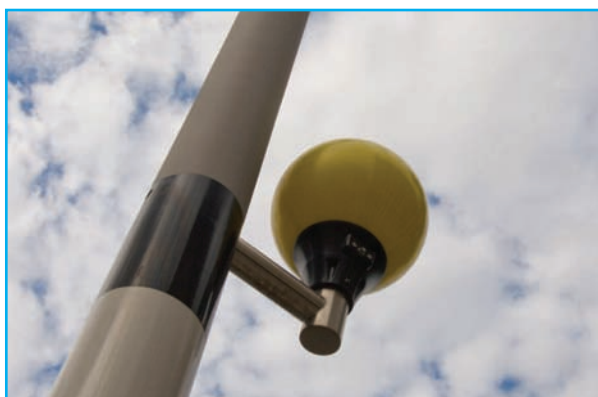
Item of Street Furniture	Typical Dimensions	Extra footprint (footway width occupied) when in use
Bus Shelter	0.28m x 3.9m to 1.3m x 5.2m	0.4m to 1.1m
Cycle Stands	0.1m x 0.6m to 0.1m x 0.7m	0.5m
Litter Bins	0.5m x 0.5m to 0.6m x 0.6m	0.1m to 0.9m
Cash Machines	NA	0.55m to 1.6m

12.3.3 The first step to improve conditions for pedestrians is to remove any unnecessary obstacles, whether through regular maintenance processes, a decluttering programme or through the prevention of ad-hoc installation of features by external agencies such as utilities, by developing local working and communication arrangements. Encroachment by frontagers, such as by A-boards or licensed street trading, should also be controlled.

12.3.4 Where substantial items of street furniture, such as street lighting columns, are to be replaced the opportunity should be taken to co-locate items onto a single pole wherever possible, with individual departments of a local authority and external agencies working together. Items such as traffic signal heads, belisha beacons and litter bins can all be dealt with in this way. Street elements can also be mounted on walls and other structures to remove the need for a pole entirely.

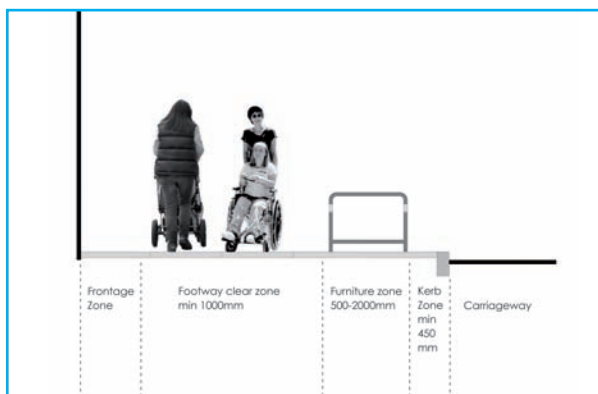


Maid Marian Way, Nottingham



Belisha Lamp Column

12.3.5 Street furniture should be located in a consistent place so that a clear pedestrian zone is maintained. Normally street furniture will be positioned between pedestrians and the carriageway to avoid affecting access to buildings and to provide a buffer to passing traffic.



Source - TfL 'Streetscape Guidance'⁷². Note - 'Inclusive Mobility'³⁵ advises that minimum width for pedestrians of 1m should only be used for distances of up to 6m.

12.3.6 Bollards create an obstacle to pedestrian movement and can also be visually intrusive, particularly when used in large numbers. They are often installed where there is a concern that vehicles will encroach onto pedestrian areas, particularly in level surface schemes, but they have tended to be over-used as they provide an 'easy' design solution.

12.3.7 Where designers consider it essential to prevent vehicles gaining access to a footway or pedestrian area, items of street furniture with a definite purpose, such as seating, cycle racks or trees, will often be preferable. Better enforcement of parking can also have a part to play.



Bollards can add considerably to street clutter.

12.3.8 When used, bollards should be of a minimum height of 1m so that they are detectable by visually-impaired people.

12.4_ Guardrail

12.4.1 Guardrail is usually installed where there is a risk, or perceived risk, that pedestrians and/or cyclists will, in its absence, cross carriageways away from designated crossing points, or will otherwise wander into places where they can come into conflict with motor traffic. It is widely used in the UK, both on existing streets where a problem has been identified, and often on new or improved highway schemes as a matter of course.

12.4.2 Guardrail is a very intrusive element. It disadvantages pedestrian movement by making people walk further, away from their desire lines, and creates an unpleasant feeling of restraint. It also narrows the usable footway which can lead to congestion. It is unsightly and detracts from local character and visual amenity, and there is evidence that it can increase traffic speeds and present an increased risk to cyclists, who can be crushed against it by vehicles.

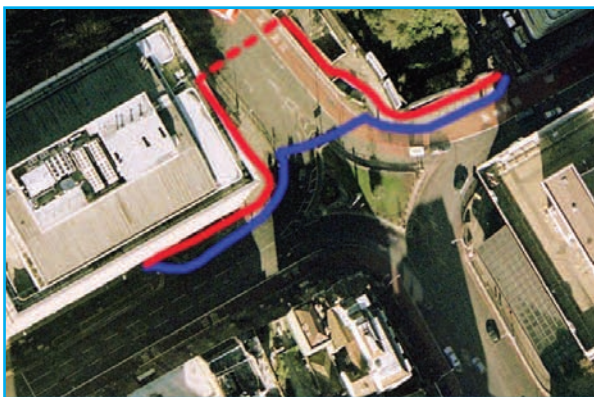


12.4.4 Local Transport Note 2/09, 'Pedestrian Guardrailing'¹⁷⁶, provides advice with respect to guardrailing, including:

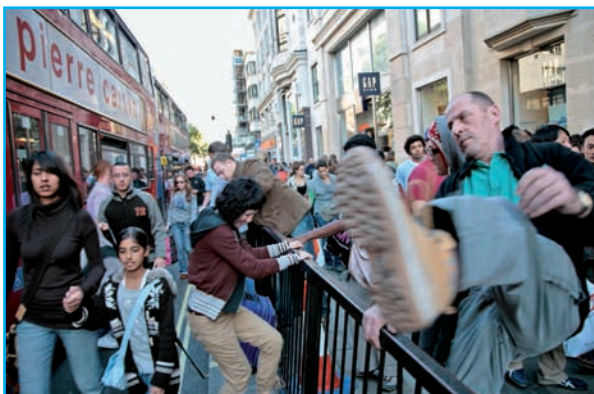
- a description of the development of policy guidance on guardrailing;
- an assessment procedure for the evaluation of the need for the installation or removal of guardrailing; and
- encouragement for authorities to consider developing and using an audit trail, recording decisions and actions when considering guardrailing.

12.4.5 LTN 2/09 advises that alternative measures should be considered before a decision is taken to install guardrailing. Such measures may include:

- Reducing traffic speed;
- Relocating or installing a new pedestrian crossing to better fit pedestrian desire lines;
- Footway improvements and widening;
- Providing straight-ahead pedestrian crossings; and
- Using other means of directing pedestrians if this is necessary.



Despite extensive guardrailing, many pedestrians still choose to take the shortest path, putting themselves at greater risk. The red line shows the designated path, the blue line where many people walk.



Guardrailing can add to pedestrian congestion

12.4.3 There is a pressing need to strike a more appropriate balance in the use of guardrail. That is not to say that there are no locations where it may be necessary - but it should only be used when no other solution to a significant safety problem is practically possible, and the adverse effects on amenity, capacity and safety have been fully evaluated and recognised.

12.4.6 Experience has shown that the careful removal of guardrail from existing streets does not necessarily result in a worsening of road safety (see Prince of Wales Road Example below).

Prior to its improvement, as part of the DfT's Mixed Priority Route demonstration project Prince of Wales Road in Norwich had a very poor collision record and a poor quality environment.

As part of the scheme, guardrails were removed from most of the street, footways were widened, all on-street parking moved into defined bays, and the public realm was improved (including the rationalisation and reduction of street furniture and the introduction of street trees).



Before and after pictures of Prince of Wales Road and Upper King Street, Norwich

At some junctions, kerbs have been used successfully to define staggered crossings rather than using guardrail. These give guidance to less confident pedestrians (including visually impaired people) on the direction of stagger, whilst allowing more confident pedestrians to cross on their direct desire lines.



Pedestrians choosing different routes to cross the carriageway

Prior to the scheme being implemented the street had a very poor casualty record of 23 per year (44 per km), 75% of whom were pedestrians and cyclists. In the three years after implementation, the average number of casualties had reduced by 60% despite an increase of 16% in pedestrian footfall.

12.4.7 Guardrail has been extensively used in the past as a means of preventing footway parking, and of discouraging parking generally. This is not an appropriate use of guardrail - better enforcement should be used instead. If it is necessary to control vehicle access to an area, other useful street furniture such as a bench could be used. Where footway overrunning is a problem it may be simpler just to increase the construction depth so that overrunning can be tolerated.

12.4.8 Guardrail is commonly installed when pedestrian and cycle routes meet a carriageway. There should be no presumption that this is necessary, unless there is a reason to think that pedestrians are more at risk than when approaching a junction along a footway next to a carriageway - a situation where guardrail is not provided by default.

12.4.9 Guardrail is often installed as a matter of course at new junctions, even when there is no particular reason to think that pedestrians are at a high risk of injury. As with other street elements, highway authorities should start with the presumption that no guardrail is necessary. If it is considered that it may be needed, only the minimum amount should be installed, after considering all other ways of resolving the issue. If in doubt, it may be better to omit the guardrail and carefully monitor the site after the scheme opens to establish whether it is needed in the light of actual usage.



Newly-implemented highway scheme with extensive guardrailing

Guardrail assessment procedures

12.4.10 When considering the removal of guardrail, authorities should go through a well-documented process to show that the decision has been made following careful consideration of all relevant factors. General advice on managing authorities' liability is given in **Chapter 3**.

12.4.11 LTN 2/09⁷⁶ provides an assessment tool for authorities considering the removal of guardrail from existing junctions, based on research carried out by the University of Southampton (see box out). The method uses the evidenced comparison of sites with and without guardrail, and does depend on data from a similar comparison site being available. It focuses on the degree of compliance with crossing points rather than a road safety assessment.

Guardrail research

Research on the effectiveness of guardrail has been carried out by University of Southampton for the Department for Transport. The research for DfT, which underpins LTN 2/09⁷⁶, examined 78 junction and crossing sites with and without guardrailing in the UK outside London and found that:

- The frequency of all collisions and pedestrian collisions was some 1.5 to 1.6 times higher at sites with guardrailing than sites without guardrailing, (although this may in part be due to the with-guardrail sites having slightly higher traffic flows and speeds).
- Guardrailing does (unsurprisingly) increase the proportion of pedestrians that cross in the designated places.
- However, there is no conclusive evidence that the inclusion of pedestrian guardrailing at any type of pedestrian crossing or junction has any statistically significant effect on road safety.

12.4.12 Transport for London has developed a Guardrail Risk Assessment Form⁷⁷ which provides a method for the assessment of the suitability of pedestrian guardrail at an existing site.

12.4.13 A more context-sensitive methodology for the assessment of the need or otherwise for guardrailing has been developed by Urban Initiatives for LB Hackney⁷⁸. Details of the procedure are given in the box out below.

12.4.14 Local highway authorities are advised to develop similar tools, which can also consider how measures described in 12.4.5 above, together with more general public realm improvements, can reduce or eliminate the need for guardrail.

LB Hackney – Guardrail Assessment Procedure

The methodology consists of two parts:

Part A provides a framework for the determination of the necessity for guardrail, up to the stage at which revised design proposals, if necessary, are brought forward. These proposals should be audited in an independent safety audit.

Part B considers the recommendations of the safety audit, and, where problems are identified with the scheme developed in Part A, weighs up all the information considered in the previous stages, and records the authority's conclusion.

Part A

Stage 1a of the procedure considers the character of the place, how different users perceive it and how the current design favours one or more groups. Stage 1b then considers road safety issues specifically, including the collision record, vehicle speeds and the presence of any vulnerable users.

Stage 2 assigns the location to one of 12 street types, ranging from a pedestrianised street to a major distributor road in a non-built up area.

Stage 3 assesses the in-principle appropriateness of guardrail, depending on the street type. For example, guardrail is considered to be never appropriate in a pedestrianised street, sometimes appropriate in high streets and likely to be necessary on major distributor roads.

Stage 4 then identifies desire lines on the assumption that there is no guardrail considering local origins and destinations such as doors in nearby buildings. The assessor then identifies where these important pedestrian movements coincide with major vehicle movements. Guardrail may be needed to influence these conflict points but should not otherwise be considered in most situations.

Stage 5 assesses the severity of these conflicts at coincidence points and other locations, and whether there are any particular concerns.

Stage 6 then considers whether guardrail is an appropriate means of diminishing danger at these conflict points, or whether there are any other/better tools that could be used, even if these cannot be delivered in the short term. From this assessment, proposals for the installation or retention of guardrail, or other measures, are developed.

Part B

The recommendations from Part A may then be subject to a Road Safety Audit. If this does not identify problems with the proposals, the process is complete.

If problems are raised by the Safety Audit, a documented process considers the previous proposals and the Audit recommendations, leading to an exception report and a final decision.

12.5_ Street Trees and Planting

12.5.1 Trees bring a wide range of benefits both to individual people and to society as a whole. They contribute to character and distinctiveness, create visual interest and help to soften the urban environment. However, their potential contribution goes far beyond the purely visual; they have a critical role to play in helping to adapt urban areas to climate change, for instance, by providing shade and reducing the local environmental temperature⁷⁹ or by slowing the rate at which rainfall enters the drainage system.

12.5.2 The introduction of trees as part of a scheme or improvements around existing trees is as much a specialist discipline as highway engineering and designers need to take advice from a qualified and professional arboricultural consultant or tree officer from the planning or highway authority at the planning stage of a scheme to ensure that suitable trees are used and their needs in terms of growth, protection and maintenance are appropriately catered for.

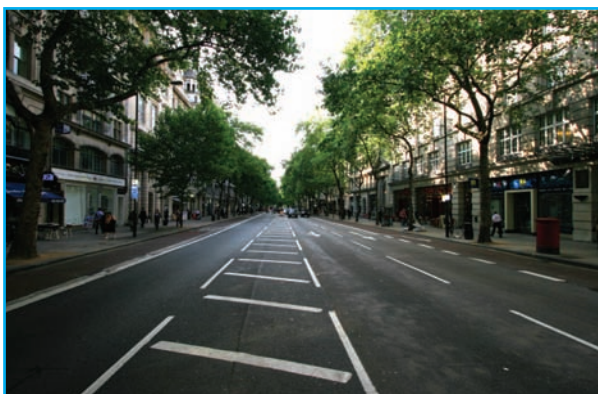
12.5.3 Although providing and maintaining street trees have financial implications, the economic, environmental and social benefits vastly outweigh these costs. For example, a recent cost:benefit analysis study of New York street trees has revealed significant cost benefits⁸⁰. Guidance on the asset valuation of trees (for non-timber purposes) has recently been published by the RICS⁸¹.



The street trees in the centre of The Circus in Bath are an example of how trees can contribute significantly to the quality of place.

12.5.4 Recent studies have shown that in urban areas all over England trees are under threat⁸². Large, mature trees are under particular threat, while new trees being planted tend to be smaller varieties. It is worth noting that the benefits that trees bring are proportionate to their size: large, mature trees bring more benefits than small ones. The potential contribution of trees will be further improved where they are integrated into 'green infrastructure' networks.

12.5.5 Large species will grow to have large canopies and extensive root networks. Designers should choose appropriate species and ensure that their physiological needs are incorporated into scheme designs. Information about the types of trees that will survive in urban areas in England can be found at <http://www.right-trees.org.uk>.



Designers need to plan now to achieve streets lined with large canopy trees which will be vital in reducing the expected increase in urban temperatures anticipated with climate change. Appreciation of long-term growth issues such as root ball size and overhang of carriageway must be taken into account.

12.5.6 Designers should take steps to prevent conflicts between tree root systems, underground services and building foundations⁸³. Wherever possible underground services should be routed in shared service ducts. Ducts make maintenance easier and minimize the amount of space taken by services. Modern utilities in plastic ducting can tolerate deformation by tree roots in ways that older services cannot.

12.5.7 Tree pits are an important part of tree planting proposals in an urban street environment and the design will be site specific due to the nature and conditions of the local environment. An arboricultural consultant or tree officer must be consulted to provide advice on tree pit design to ensure trees can grow to maturity.

12.5.8 One of the underlying reasons why urban trees are under threat is that many people believe they cause a range of problems. This section considers whether or not these perceptions are realistic, and outlines ways in which potential problems can be avoided.

12.5.9 The incidence of subsidence in urban areas that is caused by trees is far lower than assumed. One study in a London borough found that only 0.05% of its building stock was affected by tree-related insurance claims annually. Selecting appropriate species for a location and maintaining the tree appropriately will ensure that roots do not affect building stock. The London Tree Officers Association has produced 'A risk limitation strategy for tree root claims'⁸⁴.

12.5.10 Measures to be taken to avoid common problems include:

Pavement lift:

- Ensure that the planting pit is designed and built to allow for root expansion in the future.
- Where necessary, it might be possible to have non-structural surface roots removed.

Footpath obstruction

- Ensure pavements are sufficiently wide to accommodate large species trees where appropriate.
- Where trees have already grown too wide for a path, it might be possible to build the path out into the street so that pedestrians can go round the tree trunk.

Leaf litter and fruit fall

- Leaf litter and fruit fall can be collected by local authorities and used to create locally sourced compost.
- Blocked gutters and drains can be avoided by fitting mesh guards.

12.5.11 For further guidance, see:

- Trees and Design Action Group
<http://www.tdag.org.uk>
- CABI 'Managing Urban Trees'⁸⁵
- Trees for Cities <http://www.treesforcities.org.uk> and guidelines on street trees⁸⁶
- Mayor of London's Street Trees
<http://www.london.gov.uk/streettrees/>
- Greater London Authority 'Right Trees for a Changing Climate' <http://www.righttrees.org.uk>
- Communities and Local Government trees web pages
<http://webarchive.nationalarchives.gov.uk/+http://www.communities.gov.uk/planningandbuilding/planning/treeeshighhedges/trees/>
- Chris Britt and Mark Johnston, 2008 'Trees in towns II: a new survey of urban trees in England and their condition and management'⁸²
- Communities and Local Government, 2006 'Tree Roots in the Built Environment'⁸⁷

12.6_ Street Lighting

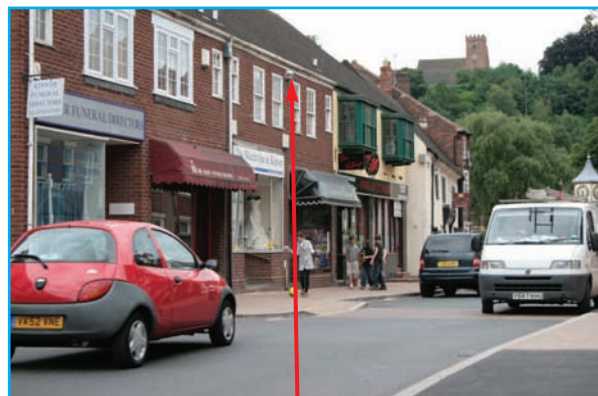
12.6.1 Street lighting can contribute to:

- improving road safety;
- assisting in the protection of property;
- discouraging crime and vandalism;
- making residents and street users feel secure;
- Enhancing the appearance of the area after dark; and
- Encouraging walking, cycling and the use of public transport.

12.6.2 MfS1 provides advice on the design of street lighting. The following key principles are given, which can be applied to the range of highway types covered by MfS2.

- Lighting should be planned as an integral part of the street layout, including any planting. The potential for planting to shade out lighting through growth should be considered when deciding what to plant.
- Lighting should be appropriate to context and street function. In some locations, such as rural villages, lighting may not have been provided elsewhere in the settlement and therefore it may not be appropriate in new developments.
- Lighting should illuminate both the carriageway and footway.
- The height of street lighting units should be appropriate to the cross-section of the street. Lowering the height of lighting can make the scale more human but this will mean that more lighting units are required.
- Lighting levels do not have to be constant during the hours of darkness.
- Lighting columns should be placed so that they do not impinge on the available widths of footways.

- Lighting design should ensure that shadows are avoided in streets where pedestrians may be vulnerable. Sudden changes in lighting level can be particularly problematic for partially sighted people.
- It is important that lighting is carefully designed to reduce stray light.
- Consideration should be given to attaching lighting units to buildings to reduce street clutter.



Inconspicuous lighting units on buildings help to minimise clutter in this village high street.

12.6.3 Sustainability is an important consideration. The Carbon Reduction Commitment Energy Efficiency Scheme (CRCEE) and the Energy Using Products Directive (EuP) should be taken into account in the design of lighting schemes. Other recent legislation that should be considered includes the Climate Change Act (2008) and the Energy Act 2008 (Consequential Amendments) Order (2009).

12.6.4 Current guidance documents on street lighting include the following:

- BS 5489 (2003) Code of Practice for the Design of Road Lighting - Part 1: Lighting of Roads and Public Amenity Areas⁸⁸.
- BS EN 13201-2: 2003 Road Lighting - Performance Requirements⁸⁹.
- BS EN 13201-3: 2003 Road Lighting - Calculations of Performance⁹⁰.
- BS EN 13201-4: 2003 Road Lighting - Methods of Measuring Lighting Performance⁹¹.
- *Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations⁹².
- 'Guidelines for Minimising Sky Glow'⁹³.
- Institution of Lighting Engineers (ILE) (2005) 'Guidance Notes for the Reduction of Obtrusive Light'⁹⁴.
- 'Lighting in the Countryside: Towards Good Practice'⁹⁵.



Anti-ram walls that also provide seating outside the Supreme Court, Parliament Square

special materials and foundations and, in so doing, they are not frangible or likely to bend if accidentally hit.

12.7_ Security Measures

12.7.1 With an evolving criminal and terrorist threat to infrastructure and areas where high concentrations of the public may gather, certain sites may have anti-ram protection measures installed to protect them from vehicle-borne attack. Such countermeasures would typically consist of vehicle security barriers such as bollards, planters, structural walls or balustrades, appropriately resilient landscape architecture, or using structural elements concealed within common streetscape items such as shelters, benches, cabinetry, signposts and lighting columns.

12.7.2 For protection reasons, their position is usually optimised as far from the vulnerable site as possible. The advantage of having an effectively managed cordon-based scheme, where barriers are located at the furthest perimeter of a vulnerable site, is that individual assets within the area will not typically need to be protected with extra security barriers, thus helping a local authority achieve its objectives with minimal clutter.

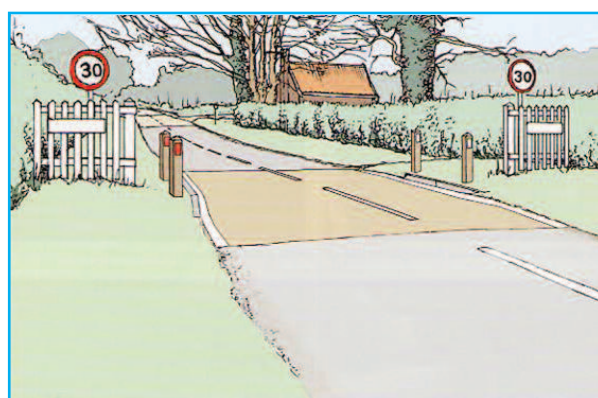
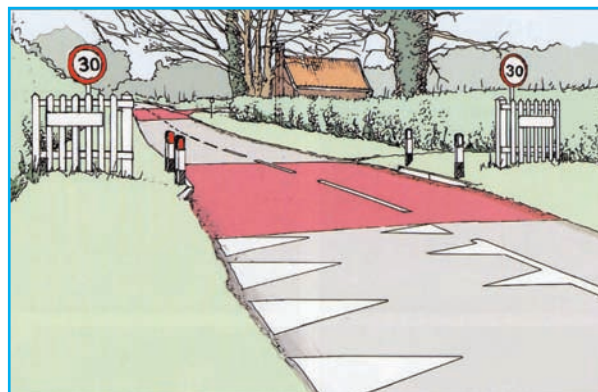
12.7.3 If designed to be permeable by pedestrians then the spacing between structures will be no more than 1.2m apart such that hostile vehicles cannot encroach through the gaps. They are unlikely to be less than 1 metre apart so that people with impaired mobility are not inconvenienced. Although dressed to blend in to the architecture and streetscape in an urban area, these measures are designed to resist forced attack using

13_ Traffic Signs and Markings

12.7.4 In future years, town and city centres may install permanent retractable bollard and gate schemes not just for bus priority or environmental reasons but also to include a security theme and thus be specified to a security specification. These measures may be in place full time or just at times of increased risk (e.g. when the site is crowded or when a secure event is being hosted in town).

12.7.5 Any traffic regulation introduced for this national security purpose will typically be accompanied by Anti-Terrorist Traffic Regulation Orders (ATTROs using Sections 22C or 22D of the Road Traffic Regulation Act 1984 as amended by the Civil Contingencies Act 2004).

12.7.6 Further information is available in the Home Office's documents "Working Together to Protect Crowded Places"⁹⁶, "Crowded Places: The Planning System and Counter Terrorism"⁹⁷ and "Protecting Crowded Places: Design and Technical Issues"⁹⁸. Protective security advice and a palette of appropriately resilient vehicle security barriers or structural elements for embedding in the public realm are available from specialists at the UK Government's Centre for the Protection of National Infrastructure (CPNI) or via the local police Counter-Terrorism Security Adviser (CTSA).



Village gateways do not have to use garish colours - images taken from the Suffolk Countryside Manual, produced by Suffolk County Council¹⁰⁰.

13.1_ Introduction

13.1.1 Traffic signs and markings add significantly to the amount of street furniture and it is important that highway authorities look for opportunities to reduce excessive signing, where this would not have a detrimental impact on road safety. Examples of where this could be done, whilst complying with the legal requirements of the Traffic Signs Regulations and General Directions (TSRGD) and other Regulations, are given in this section of the document.

13.1.2 Based on the guidance that is already contained in MfS1 the key principles that should be adopted with respect to traffic signs are as follows⁹:

- The Traffic Signs Manual (TSM)⁹⁹ and other DfT publications such as Traffic Advisory Leaflets provide advice to designers on signing.
- Whilst signs must comply with legislation in the form of the TSRGD⁵⁸ and the Crossing Regulations⁵², there is flexibility within the regulations.
- Highway Authorities should not see TSRGD and the TSM as constraining documents, and they are able to use the flexibility in the documents to suit local circumstances.
- TSRGD does not require any signs to be installed. However, signs are needed to warn, inform or to give effect to Traffic Regulation Orders.

13.1.3 Chapter 3 of the Traffic Signs Manual notes that research has shown that the greater the number of signs

that drivers are presented with simultaneously, the greater the difficulty they are likely to have in assimilating all the information.

13.1.4 Excessive signs and road markings can be particularly intrusive in rural areas, where it can have an urbanising influence. The impact is not only aesthetic; many rural economies are dependent on tourists, attracted by the quality of the landscape, which can be damaged by insensitive design. Some authorities, such as Dorset County Council, have developed policies for managing rural roads in a more sensitive way.

⁹ Note – road 'markings' are legally 'signs' and so the latter includes the former

13.2_ Size and Mounting Height Of Signs

13.2.1 Advice on the size of signs is given in the various chapters of the Traffic Signs Manual⁹⁹ and is generally related to actual traffic speed (85th percentile values) and in some cases the speed limit.

13.2.2 Although highway authorities should take account of this advice in determining the size of signs, it should be noted that it is not unlawful to deviate from the advice contained in these documents. TSRGD⁵⁸ sets out the



Sign mounted at low level

sizes of signs that can be used, and highway authorities are at liberty to select from these alternative dimensions.

13.2.3 The Traffic Signs Manual confirms this, noting (in Chapter 3, Appendix A) that smaller signs may be used where special amenity considerations apply, but noting that this will offer drivers less time to react to the sign. Highway authorities will need to judge, based on the importance of the information on the sign and the consequences of drivers not being able to read it in time, whether this will lead to a significant road safety problem.

13.2.4 There is no legal requirement for signs to be mounted at a particular height, although the Traffic Signs Manual recommends that signs are generally set with their lower edge between 0.9m and 1.5m above carriageway level, and 2.1 to 2.3m above footways and cycle tracks. While their effectiveness may be reduced, mounting signs at lower levels can reduce the visual impact of signs and may be appropriate in some situations, particularly rural



If all signs have yellow backing boards, how well does a particular sign stand out?

areas where it is often important to mount traffic signs below adjacent hedges or walls to minimise the impact on long views across the countryside.

13.3_ Yellow Backing Boards

13.3.1 Yellow backing boards are placed on signs to increase their conspicuity and while this may be appropriate in some exceptional circumstances, this technique significantly worsens their visual impact. The effect is particularly marked when a blanket decision is



Multiple yellow retroreflective bollards can have a significant visual impact.

^c Note – retroreflective bollards complying with BS 8442:2006 section 14 incorporating traffic signs which are not lit require special authorisation from the Department for Transport since they do not comply with TSRGD.

taken by a highway authority to use yellow backing boards on all signs along a route.

13.3.2 Chapters 3, 7 and 8 of the Traffic Signs Manual⁹⁹ provide advice on the use of backing boards and notes that there are potential disadvantages to their use:



Keep left bollard, with rear face uncoloured

- Yellow backing boards can be especially environmentally intrusive, and their over-use devalues their attention-attracting benefits.
- Even a grey board can deprive triangular and circular signs of a primary recognition aid, their distinctive silhouettes.



Pedestrian refuge without keep left bollards, Walworth Road
Mixed Priority Route scheme

- The larger overall size of the assembly can sometimes obstruct sight lines.
- Where it is necessary to increase a sign's conspicuity, a less garish way of doing this may simply be to provide a standard sign of larger size. Not only will this be more noticeable than a smaller sign, but it will also improve legibility and hence reading distance, which a yellow backing board cannot.
- Yellow backing boards will not normally be necessary when signs indicate an increase in the speed limit.



Sign to diagram 610 mounted on hoop top frame.



Sign to diagram 610 mounted on post. Note - yellow backing is not compulsory.

- Where it seems that a sign is not being noticed by drivers, it should be checked to ensure that it is well sited, not obscured by vegetation or other obstructions and is of the appropriate size and in good condition. Only then should the use of a yellow backing board be considered.

13.4_ Keep Left/Right Signs



The London Road, Southampton scheme omits central line markings for part of its length.

13.4.1 Signs to Diagram 610 (keep left or right) or 611 (pass either side) are typically provided at the ends of central islands and refuges and at kerb build-outs to warn drivers of the obstacle in their path. They are often mounted within illuminated or reflectorised bollards, which over recent years have increasingly been of the passively safe type, usually with a yellow reflective finish^c.

13.4.2 These can be highly intrusive, particularly where a large number of such bollards are installed at a junction.

13.4.3 Where the highway authority considers that retro-reflective bollards are essential, they should give consideration to specifying that the coloured material is only provided on the side of the bollard that faces the traffic flow, so that the overall intrusive effect is reduced.

13.4.4 Highway authorities should consider whether signs and bollards are required at every central island or kerb build-out, particularly where the area is lit and other vertical features would alert drivers to the presence of the obstacle. The Crossings Regulations⁵² make it clear that signs to diagrams 610 and 611 are optional.

13.4.5 Similarly, there is no legal requirement for such bollards and signs on the median islands on the approaches to roundabouts.

13.4.6 Where traffic signs are necessary, there is a range of mounting and lighting arrangements that can be used. The hoop type of sign mounting has been used in many schemes, for various types of sign, and can be lit from below when this is necessary. Signs to Diagrams 610 and 611 can also be mounted on lamp columns and other street furniture.



Excessive use of coloured surfacing can be visually intrusive

13.5_ Centreline Markings

13.5.1 MfS1 notes that the use of centre lines is not an absolute requirement and includes reference to the reductions in traffic speed that result by omitting centreline markings on carriageways. This has been done successfully on busy routes in urban areas as well as in village settings. Removing centrelines can be done easily when carriageways are resurfaced, with an immediate saving in capital and ongoing maintenance costs.

13.6_ Zig-Zag Markings

13.6.1 Zig-zag markings on the approaches to pedestrian and cycle crossings are required under the Crossing Regulations⁵², which state that the number of zig-zag marks shall be between 8 and 18 in number. However, the regulations also state that the number of zig-zag



This junction has the Give Way marking (1003) and the approach triangle (1023) but no Give Way sign. It would have been possible to omit the approach triangle. Note also table to slow speeds and make pedestrian crossing easier.

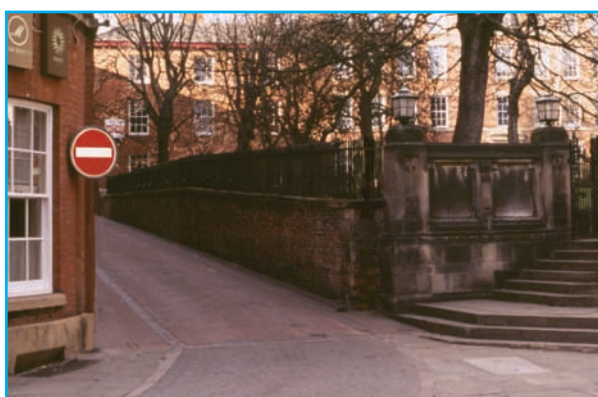
marks may be reduced to 2, of a minimum length 1m, where the traffic authority is satisfied that, by reason of the layout or character of the location, it will be impracticable to comply with the normal requirements.

13.7_ Coloured Surfacing



Roundabout in Taunton town centre with proceed left signs to Diagram 606 but no black and white chevrons to diagram 515. Note - cobbled surface is difficult for cyclists.

13.7.1 Coloured road surfacing is often used to give greater conspicuity to areas that are hatched (to Diagrams 1040, 1040.2, 1040.3 and 1040.4) as being areas that should not be entered by vehicles unless it is considered by the driver to be safe to do so. It is also often applied to



One sign (Diagram 616), as shown on the lower image, can be legal and sufficient.

bus and cycle lanes in an effort to improve compliance. Anti-skid surfacing is also sometimes coloured, although less intrusive grey and buff colours are available.

13.7.2 Coloured road surfacing has no legal significance. It adds to visual intrusion and should not be used by



Visually intrusive yellow lines in a narrow street.

default. It should be reserved for situations where it is considered that it will have a particular safety benefit, and where this outweighs the aesthetic disadvantages. Studies have shown¹⁰¹ that coloured surfacing can reduce the number of vehicles overrunning hatched areas, but that the effect reduces with time as the colour fades. Coloured surfacing therefore creates an ongoing maintenance liability.

13.8_ Signs and Markings at Junctions

13.8.1 There is no legal requirement to use road markings to define priority at T-junctions or crossroads.

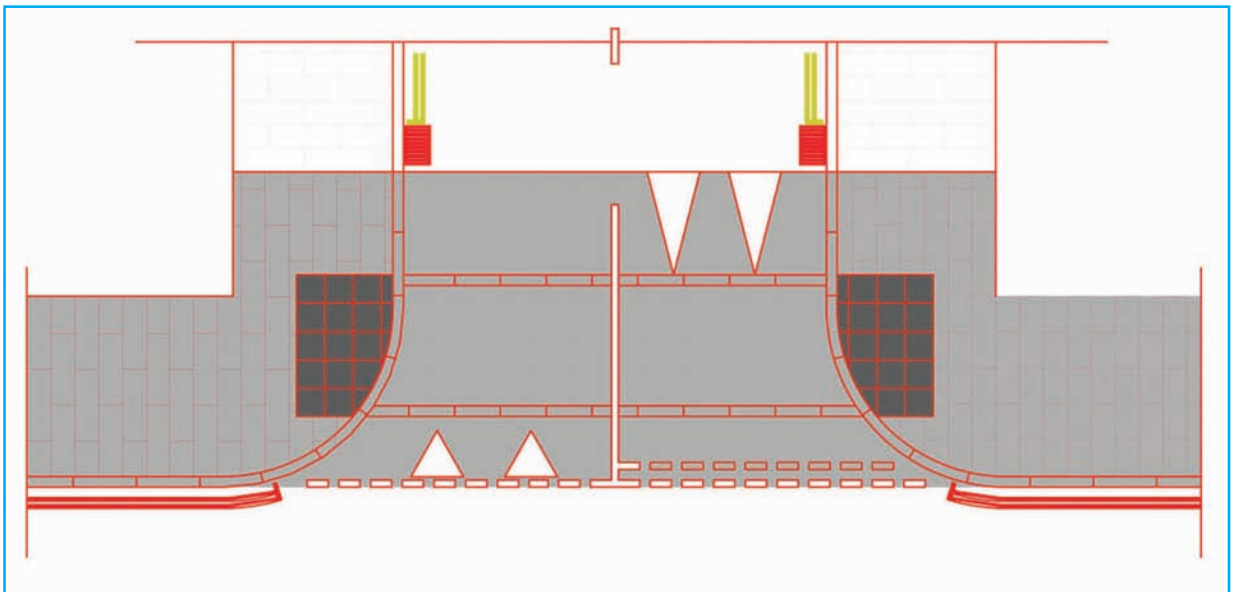
13.8.2 The give way rule at T-junctions is often signed using both road markings to Diagram 1003 (give way line) and 1023 (approach triangle) and a sign to Diagram 602 (Give Way). However, not all are mandatory and highway authorities should consider whether it is necessary to go beyond the minimum legal requirement. The following options are possible:

- Give Way marking (1003) alone
- Give Way marking (1003) and approach triangle (1023)
- Give Way marking (1003) and approach triangle (1023) and Give Way sign (602)

13.8.3 Roundabout central islands are usually signed with the proceed left arrow sign (Diagram 606) and black and white chevrons (Diagram 515) but it is lawful to omit both types of sign, or to use Diagram 606 without Diagram

515. At roundabouts and bends consideration could be given to reducing the size of signs.

13.8.4 No entry signs (Diagram 616) are normally provided on either side of the entrance to a one-way street from a junction, but this is not a requirement of TSRGD where the carriageway or vehicle track width is less than 5m.



Detail for tabled side road crossing, omitting yellow/red markings across table

L. Equality and Diversity Overview Report



Suffolk Level Crossing Reduction Order

Equality and Diversity Overview
TWAO Document Ref 367516/RPT196

February 2018

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1 Introduction and approach

1.1 Introduction

This Equality and Diversity overview has been prepared by Mott MacDonald on behalf of Network Rail in relation to the closure of, and/or changes to rights at, 25 level crossings on railway lines within the county of Suffolk. Collectively, these level crossing closures or changes will be contained in the draft Suffolk Level Crossing Reduction Order which is part of the wider Anglia Level Crossing Reduction Strategy.

This report has been produced in response to updated proposals for the sites identified below in order to:

- support good decision-making by ensuring that equality and diversity issues are taken into account when delivering the Strategy in Suffolk;
- summarise the equality, diversity, and inclusion impacts arising from the implementation of the Strategy in Suffolk; and
- identify whether level crossing sites are likely to require a full Diversity Impact Assessment (DIA) to ensure that the individual closures are implemented having shown due regard to Network Rail's obligations under the Public Sector Equality Duty.

1.2 The Anglia Level Crossing Reduction Strategy

The purpose of the Anglia Level Crossing Reduction Strategy is to improve safety, allow Network Rail to more effectively manage its assets in the Anglia Region, reduce the ongoing maintenance liability of the railway and help enable various separate enhancement schemes to be developed in the future. Network Rail has considered options to provide alternative means of crossing the railway and developed proposals for the possible closure or change to public rights of way at around 130 level crossings in Anglia.

The Strategy comprises 5 phases; however, the Suffolk Order only relates to Phases 1 and 2. Phase 1 (mainline) and 2 (branch line) comprise selected level crossings where the proposals do not include any new form of grade separation across the railway.

The proposals are based on level crossings where benefits may be deliverable and affordable within the Network Rail Control Period 5 (to 31/3/19).

Phases 3 to 5 are intended to cover new grade separated crossings of the railway and diversion or downgrading of major highways. Network Rail has advised that these later Phases are likely to be implemented within Control Period 6 (2019 to 2024) after Phases 1 and 2 have been implemented. Phases 1 and 2 are not dependent on later Phases being implemented.

Within Phases 1 and 2, the Anglia Level Crossing Reduction Strategy comprises three separate projects, in the following administrative areas:

- The county of Cambridgeshire (the Cambridgeshire Level Crossing Reduction Order);
- The county of Suffolk (the Suffolk Level Crossing Reduction Order); and
- The county of Essex, the county of Hertfordshire, the unitary authorities of Thurrock and Southend-on-Sea and the London Borough of Havering (the Essex and Others Level Crossing Reduction Order).

Each of the three projects will be the subject of a separate application under the Transport and Works Act (TWA) 1992. Each Transport and Works Act Order (TWAO) application will include the necessary powers to implement the projects including the closure of certain crossings; the power to construct scheduled works (footpath/bridleway bridges and potentially new or altered roads) and other ancillary works; the extinguishment of or alteration (including downgrading) of the rights of way across certain levels crossings; the creation of new diversionary rights of way and the temporary occupation of, or permanent acquisition of, land or rights in land to construct and maintain works to create the new rights of way.

The nature and purpose of the works to be constructed is therefore:

- To close or downgrade the level crossings and extinguish / amend existing rights of way across them, including erection of fencing; and
- To provide new rights of way (public or private) on diversionary routes where possible, including the construction of a number of footpath/bridleway bridges, and new or altered roads, creation of public paths, bridleways and cycle track and additional footways under the provisions of the Highways Act 1980. These will require associated fencing, stiles, gates, signs, or other conveniences to create the new rights of way and may in some instances require surfacing to be provided.

1.3 Level crossing sites

The table below provides a summary of each of the sites within the Suffolk TWAO application.

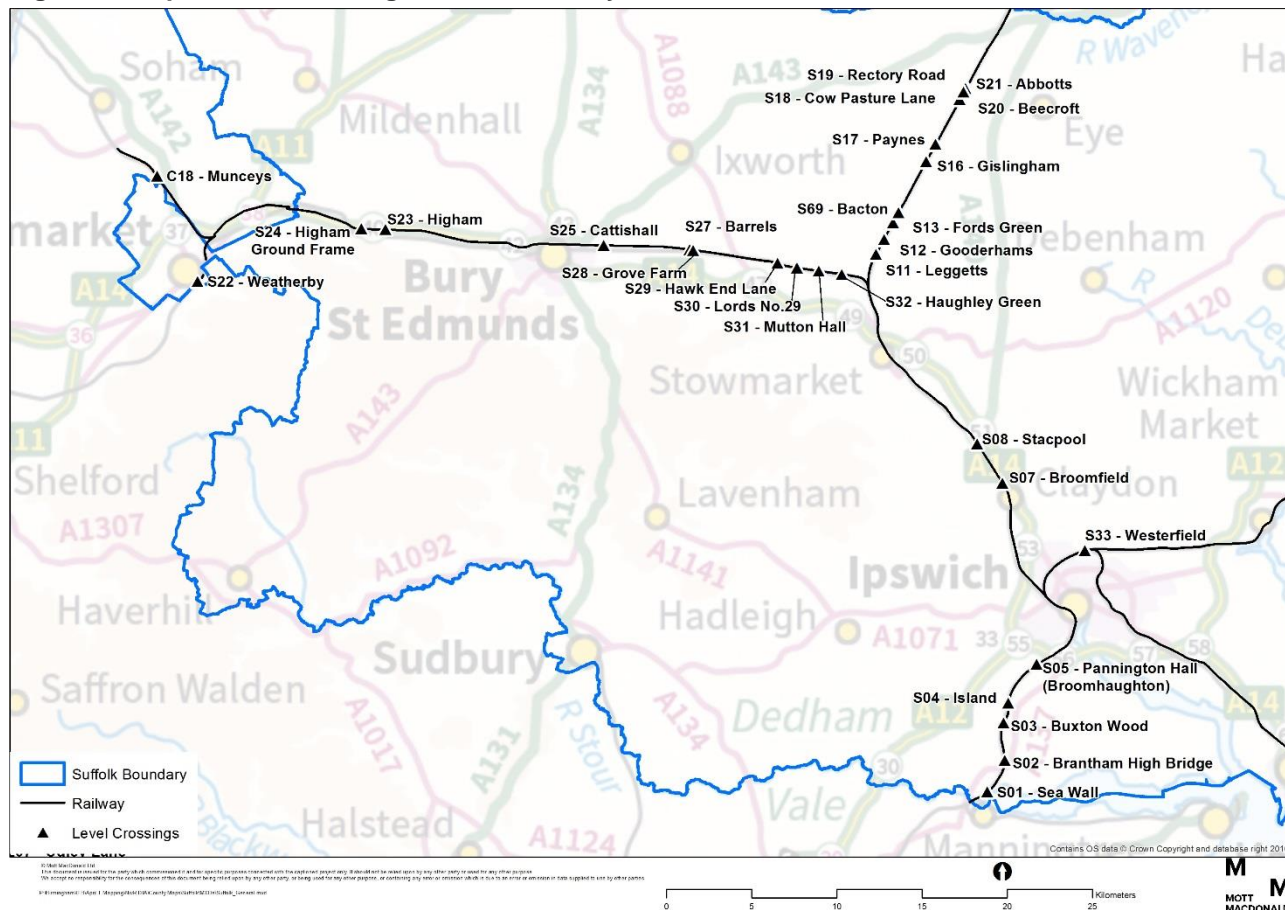
Table 1: Suffolk level crossing summary

Code	Name
S01	Sea Wall
S02	Brantham High Bridge
S03	Buxton Wood
S04	Island
S05	Pannington Hall (Broomhaugton)
S07	Broomfield
S08	Stacpool
S11	Leggetts
S12	Gooderhams
S13	Fords Green
S16	Gislingham
S17	Paynes
S18	Cow Pasture Lane
S21	Abbotts
S22	Weatherby
S23	Higham
S24	Higham Ground Frame
S25	Cattishall
S27	Barrels
S28	Grove Farm
S29	Hawk End Lane
S30	Lords No. 29
S31	Mutton Hall
S33	Westerfield
S69	Bacton

Source: Network Rail and Mott MacDonald

The figure below shows the location of the level crossing sites within Suffolk County that form part of the project.

Figure 1: Map of level crossing sites and railway lines in Suffolk



Source: Network Rail / Mott MacDonald

1.4 Approach and methodology

National policy drivers behind the DIA process

Under the Equality Act 2010, public bodies (or those carrying out public functions) are required to show due regard to equality under the Public Sector Equality Duty (PSED).

A key element of the PSED requires public bodies to consider all individuals in shaping policy, in delivering projects and services, and in relation to their own employees. It requires that government departments, public authorities, and those responsible for delivering public functions, including Network Rail, have due regard to the following three aims:

- Eliminating unlawful discrimination, harassment, and victimisation;
- Advancing equality of opportunity between different groups; and
- Fostering good relations between different groups.

Public authorities must demonstrate that they have shown due regard to the PSED through informed decision-making. While the PSED does not specify a particular process for considering the likely effects of policies, programmes and projects on different sections of society for public

authorities to follow, this process is usually undertaken through some form of equality analysis, which can include the DIA process and the analysis contained in this overview report.

The process is intended to support good decision making. It encourages public bodies to understand how different people will be affected by their activities, so that their policies and services are appropriate, accessible to all and meet the needs of different sections of society. By understanding the effect of their activities on different people, and how inclusive delivery can support and open up opportunities, public bodies can be more efficient and effective. The PSED therefore helps public bodies to deliver the Government's overall objectives for public services.

The PSED specifies that public bodies should minimise disadvantages experienced by people due to their protected characteristics, take steps to meet the different needs of people from protected groups, and encourage participation from these groups where participation is disproportionately low. Undertaking this process helps to demonstrate how Network Rail is complying with the PSED by:

- Providing a written record of the equality considerations which have been taken into account;
- Ensuring that decision-making includes a consideration of the actions that would help to avoid or mitigate any negative impacts on particular protected groups;
- Supporting evidence-based decision-making; and
- Supporting more transparent decision-making processes.

Network Rail equality, diversity, and inclusion drivers

The Network Rail Equality, Diversity, and Inclusion Policy and Framework were published in October 2014 and identified the following aims (amongst others) to ensure that equality, diversity, and inclusion are embedded in their culture:

- Enhance decision-making and innovation, by encouraging positive interactions and involvement throughout the business;
- Increase their ability to relate to existing and potential customers wherever they exist;
- Build effective and productive relationships in the wider community through partnerships with community-based groups and stakeholders;
- Be committed to exceeding the minimum legal requirements; and
- Be committed to reviewing all existing policies within Network Rail to ensure they demonstrate equality, diversity, and inclusion values.

The project will also support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- **Commitment 1: Get everyone home safe every day**

This commitment puts safety centrally to network design, management, and maintenance. Improving crossing safety reduces the risk of crossing the railway for all users. The Strategy will help to improve safety for rail users by reducing interaction with the railway.

- **Commitment 2: Deliver reliable infrastructure**

This commitment focusses on the management of all Network Rail assets, with the aim of reducing long-term costs. The Strategy will help to deliver more reliable infrastructure.

- **Commitment 6: Being a customer focused organisation**

This commitment focusses on ensuring clearer accountability to local people, and understanding the needs of customers, to become more flexible and collaborative. The Strategy is working with local stakeholders and aims to help to improve the safety of journeys for infrastructure users.

- **Commitment 9: A railway fit for the future**

This commitment focusses on sustainability, making the business more efficient, and protecting and future-proofing railway assets. An inclusive and accessible railway will link people to communities, education, and jobs – ultimately delivering economic growth. The Strategy helps to deliver required improvements to ensure network infrastructure is fit for future use.

About DIA and the equality and diversity review process

The DIA process is a systematic assessment of the likely or actual effects of policies or proposals on social groups with the following protected characteristics (as defined by the Equality Act 2010):

- **Age**, including all age groups, such as children aged 16 and under, younger people aged 16-25 and older people aged 65 and over.
- **Disability**, including people with sensory impairments, mobility impairments, learning disabilities, mental wellbeing disabilities, and long term medical conditions.
- **Gender reassignment**, including persons who are proposing to undergo, are undergoing, or have undergone gender reassignment.
- **Marriage and civil partnership**, with a focus purely on discrimination on the basis of whether someone is married or in a civil partnership – single people are not covered by this characteristic.
- **Pregnancy and maternity**, including pregnant women and nursing mothers.
- **Race and ethnicity**, including ethnic or national origins, colour, or nationality.
- **Religion or belief**, including all religion, faith, or belief groups, including lack of belief.
- **Sex**, including both women and men.
- **Sexual orientation**, including heterosexuals, lesbians, gay men, and bisexual people.

The process does this by:

- Assessing whether one or more of these groups could experience disproportionate effects (over and above the effects likely to be experienced by the rest of the population) as a result of the proposed policy being implemented. A DIA includes examining both potential positive and negative effects.
- Identifying opportunities to promote equality more effectively or to a greater extent.
- Developing ways in which any disproportionate negative impacts could be removed or mitigated to prevent any unlawful discrimination and minimise inequality of outcomes.

Methodology

The preparation of this Equality and Diversity Overview Report included the following tasks:

- A review of the different level crossing sites within the Suffolk Order to understand the content and proposed changes at each site.
- Desk based evidence and policy review focussing on key national, regional, and local policy, Network Rail's strategic aims, and key published literature on rail infrastructure, the pedestrian environment, accessibility, safety, severance and community cohesion, and their relationship to equality and diversity.
- Analysis of available data on different protected characteristics to provide a comparison with national and regional averages, and to map the density of different equality groups within Suffolk.

- A review of work already undertaken on the sites in relation to equality and diversity, including previous DIA scoping work submitted as part of Phase 1 of the Anglia Level Crossing Reduction Strategy work, and the draft DIAs being prepared for selected sites as part of Stage 2.
- Analysis of available evidence to identify key conclusions and recommendations relating to the proposed level crossing closures within Suffolk.

Overall, the overview report provides a summary of the potential impacts identified from the work undertaken in support of the TWAO submission for the project in Suffolk.

1.5 Purpose and structure of this report

This report has been collated from existing evidence prepared as part of the TWAO submission and as part of the DIA process.

The remainder of this report is structured as follows:

- **Chapter 2** provides an overview of the key impact arising from the project and those groups upon whom those impacts are likely to fall disproportionately.
- **Chapter 3** provides a demographic profile of Suffolk, focussed on those protected characteristics most at risk, and on those for whom data is available.
- **Chapter 4** provides an overview of the potential equality and diversity impacts associated with individual sites that form part of the project.

2 Key impacts and at-risk groups

2.1 Introduction

This chapter identifies potential issues associated with level crossing closures and the groups likely to be affected by those issues; it is based on a review of relevant literature, level crossing details and user data provided by Network Rail, as well as an examination of the demographic data for the area. Potential impacts and issues related to level crossings closures are identified and the relevant protected characteristics are identified under each issue heading.

2.2 User safety

Level crossings account for an estimated 9% of the total rail system safety risk¹ and account for half of all fatalities on the railways when suicides and trespasses are excluded.² In 2014 there were ten accidental deaths on level crossings including eight pedestrians and two people killed in vehicles hit by trains.³ If a walking trip includes a level crossing, the fatality risk to a pedestrian is approximately double the risk of an average walking trip without a level crossing and overall there is around an 8% increase in the risk of a fatality during an average car journey that includes a level crossing, compared with one that does not.⁴

The safety issues associated with level crossings do not impact all users uniformly. Certain user groups are particularly vulnerable to level crossing hazards because they have more difficulty processing the speed of objects coming towards them. Research conducted on behalf of the House of Commons Transport Select Committee, showed that **children** perceived cars moving towards them at more than 20 mph as stationary. **Older people** may also be vulnerable because their field of view can diminish over time; studies have suggested that this can be at a rate of between 1° and 3° per decade.⁵

In addition, research by University College London has shown that older pedestrians (aged 65 or over) walk more slowly than other pedestrian users (the mean walking speed achieved in controlled studies was 0.9 metres per second (m/s) in men and 0.8 m/s in women, compared to mean for the population as a whole of 1.2 m/s), placing them at greater risk.⁶

Similarly, **disabled people** may also be more at risk than those without a disability. Not only are crossing speeds likely to be slower for people with disabilities, but level crossings require users to cross a surface which may pose physical challenges due to its structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may be less able to cross safely because of these factors. People with visual or hearing impairments can

¹ Network Rail (unknown date): 'Level crossings risk reduction in CP5'

² House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

³ RSSB (2014) 'Overview of safety performance for 2014' <http://www.rssb.co.uk/Library/risk-analysis-and-safety-reporting/SafetyPerformance-Overview-2014.pdf>

⁴ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

⁵ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

⁶ 1.2 meters per second is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.⁷

Other analysis of level crossing accidents data show that **men** are more commonly struck by trains at level crossings than females, and the risk of being struck by a train increases steadily with age for adult users. Male pedestrians dominate accidents at level crossings, associated with 70% of all train strikes. Given that males represent approximately 49% of the population as a whole (according to UK government statistics) this would suggest male pedestrians are more at risk at level crossings than female pedestrians.⁸

2.3 Accessibility

Where a level crossing is replaced by a bridge, underpass or diversion there is a potential effect on accessibility. Whilst some users can face difficulties when trying to cross level crossings due to design issues, accessibility challenges can also arise where a level crossing is replaced by a bridge, underpass or diversion which does not fully accommodate the needs of all those using it.⁹

Certain protected characteristics groups, particularly **disabled people** and **older people**, are more likely to experience accessibility difficulties than the general population. Footbridges, underpasses and diversions can act as barriers for those with mobility impairments, can confuse blind and partially sighted people, create additional distance for frail and elderly people to travel, and be a difficult gradient to manage for those in wheelchairs, **people pushing prams** or carrying heavy bags.¹⁰

2.4 Walking distances

Walking distances are an important consideration for people with certain protected characteristics, and schemes that can affect existing walking distances may result in disproportionate impacts on some groups – such as **disabled people** and **older people**. For example, Inclusive Mobility – a key document to support inclusive design of the pedestrian environment – found that of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.¹¹ Similarly, older people are also more likely to have difficulties walking long distances than the general population.

The study also found that **disabled people** tend to find standing to rest difficult and/or painful and therefore it is important for the provision of seated resting points where walking distances are increased for users.

2.5 Community severance

Level crossings provide a means of traversing the rail network and can act as an important point of access for the communities in which they are situated. The removal of level crossings therefore has the potential to cause issues related to community severance. Although there is

⁷ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁸ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁹ Law Commission (2010): 'Level Crossings: Consultation Paper'.

¹⁰ Accesscode (2009): 'External Environment Fact Sheet'.

¹¹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

not one agreed definition, community severance is generally understood to be comprised of three key dimensions:

- Physical barriers: such as the introduction of new or removal of existing infrastructure
- Psychological or perceived barriers: such as traffic noise or road safety fears
- Social barriers: such as the disruption of 'neighbourhood lifestyle' or inhibition of social interaction

The safety risks associated with existing level crossings could act as both a real and as a perceived barrier; however, the removal of level crossings and the replacement with / diversion to new or existing infrastructure such as bridges and underpasses may potentially act as a physical barrier. There is recognition that some social groups are more vulnerable to the effects of community severance than others; including **disabled people** with restricted mobility; **older people** and school children (**younger people**).¹² As identified above, older people are more at risk of social isolation which can be compounded by transport barriers. The effects of community severance also have a disproportionate effect on disabled people who also experience higher rates of social exclusion and existing barriers to transport.¹³

2.6 Rurality

The majority of the proposed level crossings closures in Suffolk are in rural areas. Rural areas are more likely to have problems associated with access to services, public transport and shops as they have a lower population density than urban areas and tend to be a greater distance away from key services.¹⁴ Generally, people living in rural settlements have lower overall accessibility to key services compared with people living in towns and cities, and those people living in rural areas in a sparse setting usually experience the lowest overall levels of accessibility.¹⁵

Rural areas also have a higher proportion of **older people**; over 50% of the population in rural areas are aged 45 and above, compared with around 40% in urban areas.¹⁶ Social isolation is a key concern for many groups in rural areas, but particularly for older people, and transport can be a key influencing factor – it is considered as a basic necessity of rural life.¹⁷

Transport barriers (for example, no longer having a private driving licence, inconvenient timetables or inaccessible bus stop locations¹⁸) can limit older residents' access to basic services, reduce social and civic participation, and pose critical challenges to engagement with health services.

2.7 Summary of impacts and protected characteristic groups

The table below summarises the findings of the desk-based review process, and the groups identified as being particularly vulnerable to changes in level crossing arrangements in Suffolk.

¹² Department for Transport (2005): 'Understanding Community Severance'

¹³ Bristol City Council (2014): 'Social isolation and physical and sensory impairment'

¹⁴ Department for Transport (2013): 'Valuing the social impacts of public transport'

¹⁵ Defra (2015): 'Statistical digest of rural England: April 2015 edition'

¹⁶ Defra (2015): 'Statistical digest of rural England: April 2015 edition'

¹⁷ Defra (2015): 'Statistical digest of rural England: April 2015 edition'

¹⁸ Department for Environment Food and Rural Affairs (2013) '2013 Rural Ageing Research Summary Report of Findings'

Table 2: Impacts by protected characteristic group

Impact	Relevant protected characteristic	Potential impact identified
User safety	Disabled people – people with mobility and sensory impairments	Higher crossing risk than general population due to reduced mobility
	Age – older people	
	Age – younger people	Higher crossing risk than general population due to difficulty judging speeds
	Sex - males	Higher crossing risk than general population
Accessibility	Disabled people – those with mobility impairments	Difficulty using non-accessibly designed level crossings, bridges, underpasses and diversions due to steps, steep gradients, uneven surfaces, and other design shortcomings leading to inaccessible routes
	Age - older people	
	Pregnancy / Maternity – people with pushchairs	
Walking distances	Disabled people – those with mobility impairments	Difficulty in walking longer distances due to frailty of mobility impairment
	Age - older people	
Community severance	Disabled people	Higher vulnerability to impacts of community severance than general population due to potential lack of transport options and reduced mobility
	Age – older people	
	Age –younger people	
	All protected characteristics	Access to relevant community facilities restricted by change in access arrangements
Rurality	Age – older people	More likely to experience social isolation and difficulty accessing services due to high proportions of older people in rural locations

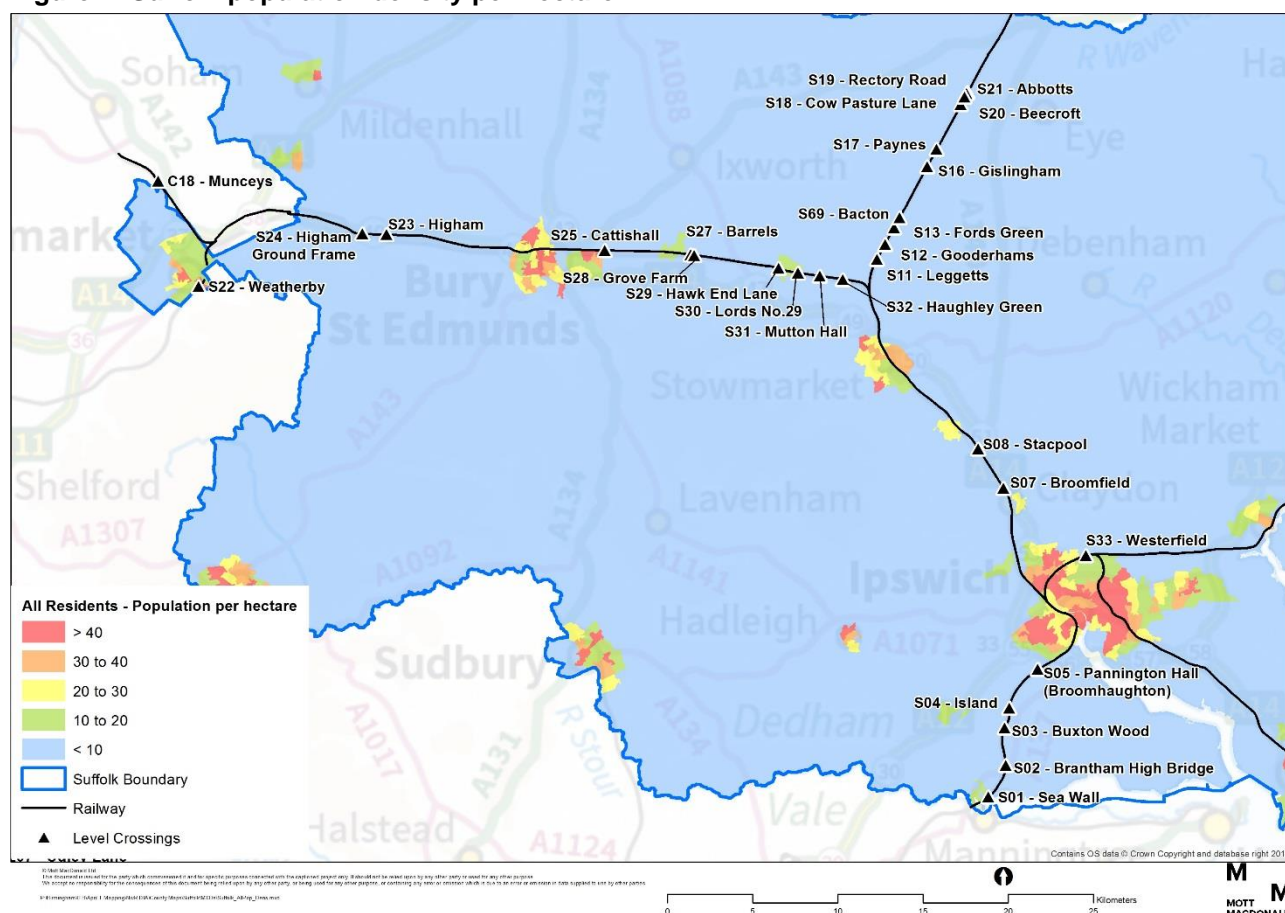
3 Suffolk Demographic Profile

3.1 Introduction and population overview

This chapter examines the demographic profile of groups with the following protected characteristics as defined by the Equality Act 2010 (age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race and ethnicity, religion and belief, gender and sexual orientation) both nationally and in Suffolk.

Analysis shows that the majority of Suffolk is rural with low densities of all of the protected characteristic groups. Ipswich (the county town) has a moderate to high density of all of the groups, as do some of the other county towns – trends indicate a split between urban and rural areas. As illustrated in the figure below:

Figure 2: Suffolk population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.2 Age

This section explores two key age brackets that may experience disproportionate impacts when compared with the general population:

- Children (aged under 16); and
- Older people (aged 65 and over).

Children (Under 16s)

The table below indicates that the proportion of people under the age of 16 living in Suffolk is comparable (1% lower) than the national proportion.

Table 3: Number and proportion of people under the age of 16 living in Suffolk

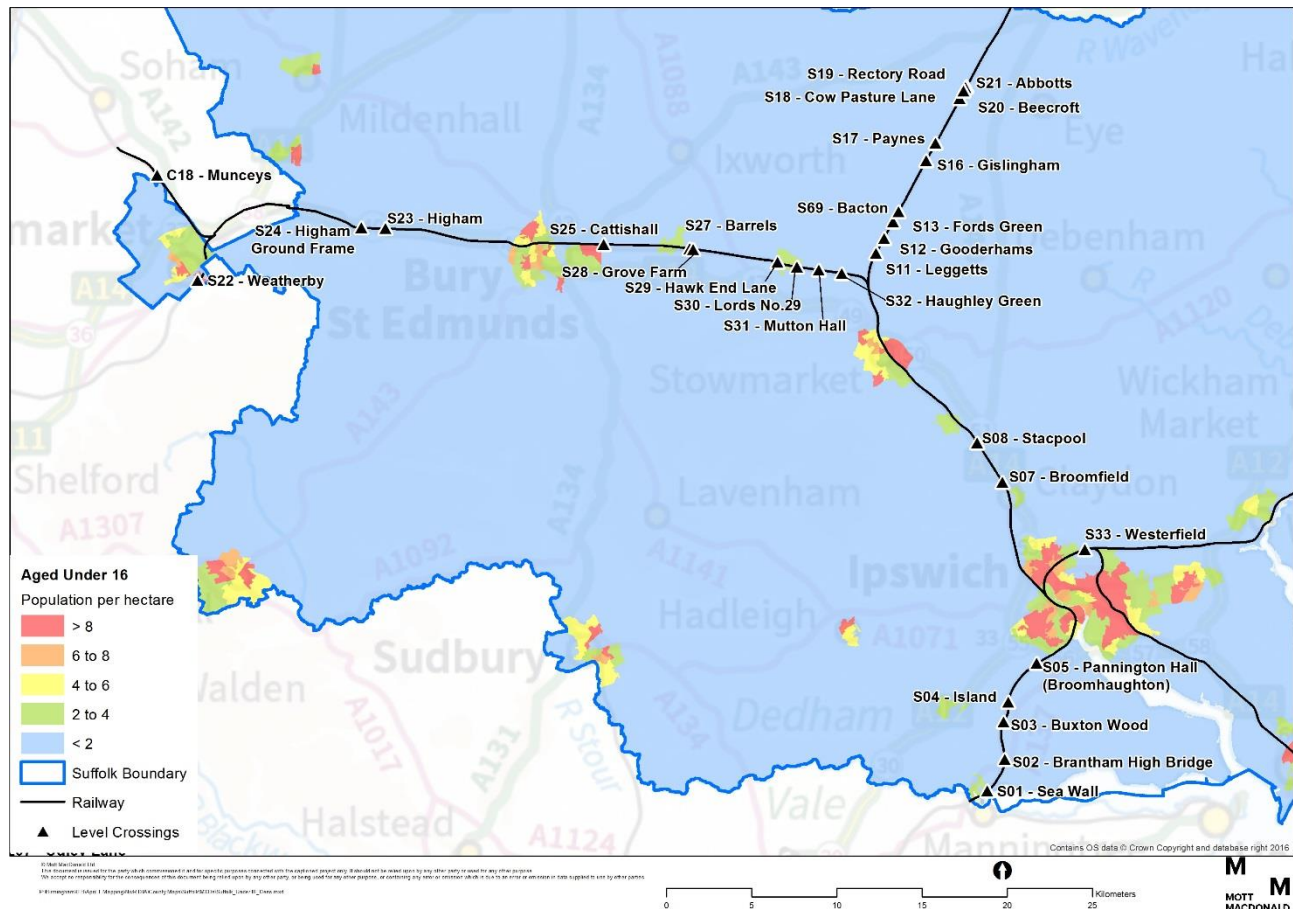
Age – under 16	Suffolk	England
Number	134,000	10,405,100
Percentage	18	19

Source: ONS Census 2011 – mid-year population estimates 2015

The map below illustrates that:

- Ipswich has a high density of people under 16. This extends into the suburbs of the town.
- There are other areas within the county that have notably densities, including Bury St Edmunds and Stowmarket.
- As the county as a whole is very rural, the majority of the people under 16 live in urban centres.

Figure 3: Suffolk under 16 population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

Older people (65 and over)

As identified in the table below, the proportion of people over 65 living in Suffolk is higher (4%) than the national average.

Table 4: Number and proportion of people over 65 living in Suffolk

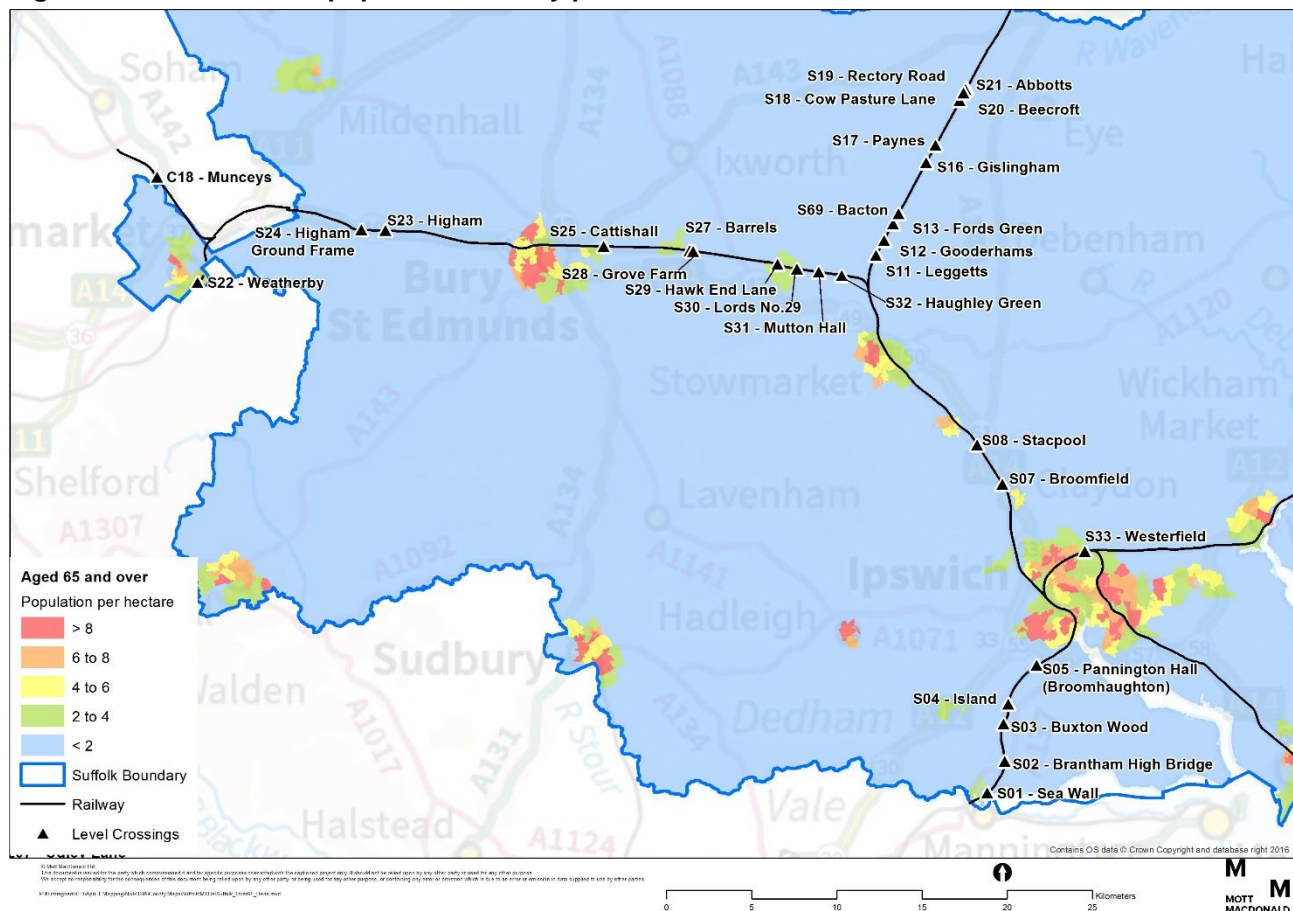
Age – over 65	Suffolk	England
Number	166,400	9,711,600
Percentage	22	18

Source: ONS Census 2011 – mid-year population estimates 2015

The map below illustrates that:

- Ipswich has a moderate to high density of people over 65, particularly in the east of the town.
- There are other areas in the county with moderate to high densities, such as Bury St Edmunds. Some smaller places within the county, such as the market towns of Hadleigh and Sudbury also have high densities.
- As with the other protected characteristic groups, the county overall has low levels of people over 65.

Figure 4: Suffolk over 65 population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.3 Disability

The Equality and Human Rights Commission notes that: “You’re disabled under the Equality Act 2010 if you have a physical or mental impairment that has a 'substantial' and 'long-term' effect on your ability to do normal daily activities.”¹⁹

For the purposes of the demographic profile, we have analysed the number of people living with a long-term limiting illnesses (LLTI) within Census and mid-year population data.

As identified in the table below, the proportion of people living in Suffolk with a LLTI is slightly lower than the national proportion.

¹⁹ See: <http://www.equalityhumanrights.com/advice-and-guidance/new-equality-act-guidance/protected-characteristics-definitions/>.

Table 5: Number and proportion of disabled people in Suffolk

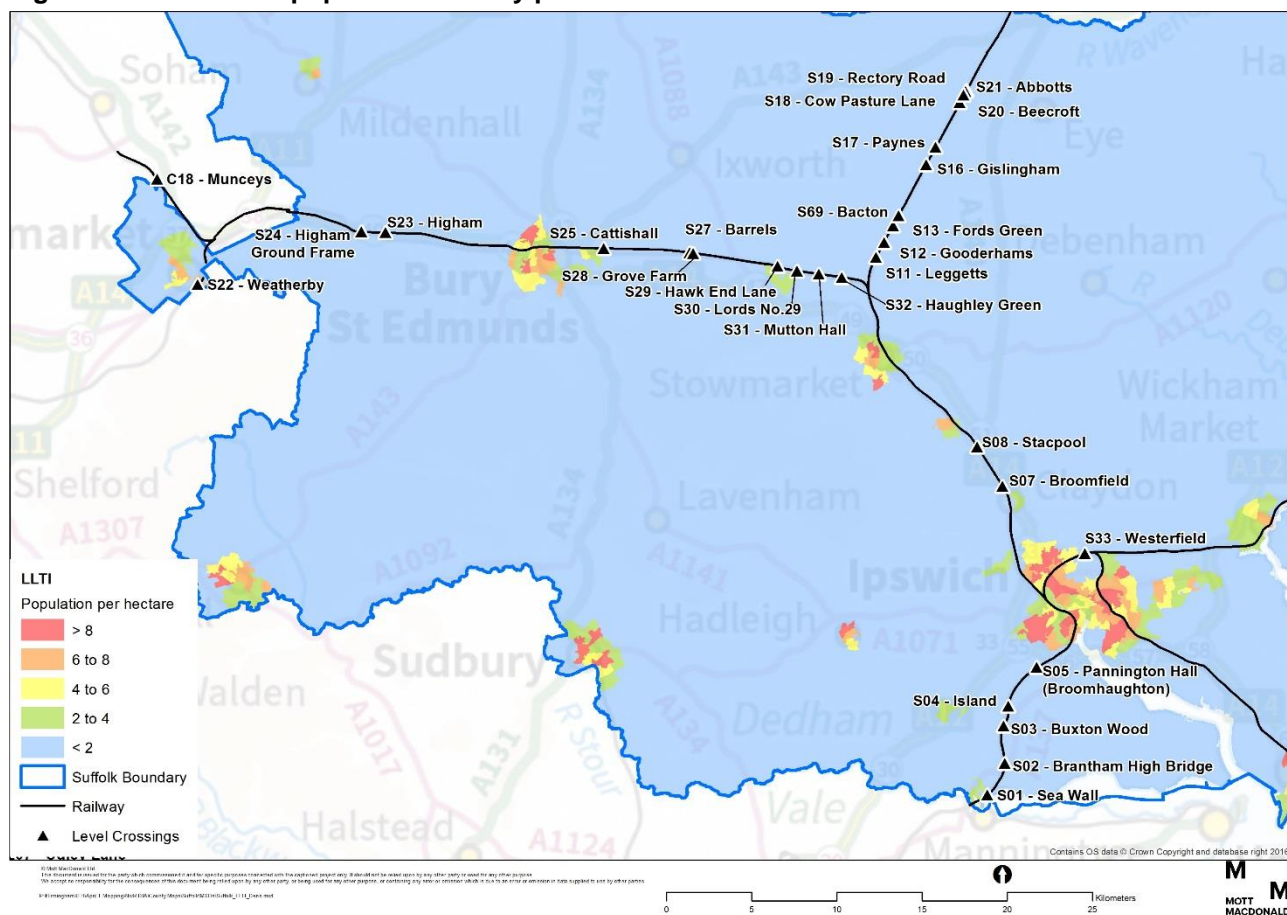
LLTI	Suffolk	England
Number	130,700	9,352,600
Percentage	18	18

Source: ONS Census 2011 – mid-year population estimates 2015

The map below illustrates that:

- Ipswich has a moderate to high density of people living with an LLTI, which is equally spread throughout the town.
- Other areas within the county, such as Bury St Edmunds and Sudbury, also have moderate densities.
- The county as a whole has very low levels of people with an LLTI.

Figure 5: Suffolk LLTI population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.4 Gender reassignment

There are multiple definitions of 'gender reassignment'. For the purposes of equality law, gender reassignment is defined as 'a process which is undertaken under medical supervision for the purpose of reassigning a person's sex by changing physiological or other characteristics of sex,

and includes any part of such a process.' This means that an individual does not need to have undergone any specific treatment or surgery to be protected by the law.²⁰

There are no official or census data for the number of gender variant people in Suffolk or in England.

The ONS, though, has estimated that the size of the Trans community in the UK could range from 65,000 to 300,000.²¹ Additionally, statistics from the Ministry of Justice show that between 2005 and 2014, 3,662 full Gender Recognition Certificates have been issued.²²

3.5 Marriage and Civil Partnership

Marriage and civil partnership is covered by the Equality Act 2010 only on the grounds of unlawful discrimination.²³ People who are married, or in a civil partnership, must be treated the same as people who are not and, similarly, same sex civil partners must be treated the same as married heterosexual couples on a wide range of legal matters.

In 2011, 51.4% of people were married in Suffolk which is slightly higher than the national figure of 47%. The percentage of people in same sex civil partnerships was consistent at 0.2% in both Suffolk and nationally.

Table 6: Marriage and civil partnership

Marital Status	Suffolk		England	
	Number	Percentage	Number	Percentage
Total population	595,261	100%	595,261	100%
Single (never married or never registered a same-sex civil partnership)	170,614	28.7%	170,614	28.7%
Married	306,031	51.4%	306,031	51.4%
In a registered same-sex civil partnership	1,175	0.2%	1,175	0.2%
Separated (but still legally married or still legally in a same-sex civil partnership)	14,801	2.5%	14,801	2.5%
Divorced or formerly in a same-sex civil partnership which is now legally dissolved	57,718	9.7%	57,718	9.7%
Widowed or surviving partner from a same-sex civil partnership	44,922	7.5%	44,922	7.5%

Source: ONS Crown Copyright Reserved [from Census 2011]

3.6 Pregnancy and Maternity

The EHRC defines pregnancy as 'the condition of being pregnant or expecting a baby'.²⁴ Protection against maternity discrimination is for 26 weeks after giving birth.

There is no single indicator by which to measure the overall distribution of 'pregnancy and maternity' within a given area. There are, however, a number of proxy measures that can be used.

²⁰ EHRC (2013): 'Transgender: what the law says'. See: <http://www.equalityhumanrights.com/advice-and-guidance/your-rights/transgender/transgender-what-the-law-says/>.

²¹ ONS (2009): 'Trans Data Position Paper'.

²² Ministry of Justice (2014): 'Tribunals and gender recognition statistics: July to September 2014' See: <https://www.gov.uk/government/statistics/tribunals-and-gender-recognition-certificate-statistics-quarterly-july-to-september-2014>.

²³ See: <https://www.equalityhumanrights.com/en/equality-act/protected-characteristics>.

²⁴ See: <http://www.equalityhumanrights.com/advice-and-guidance/new-equality-act-guidance/protected-characteristics-definitions/>.

In 2014, the total fertility rate decreased to 1.83 children per woman (from 1.85 in 2013).²⁵ In England in 2015, there were 697,852 live births, with 8,028 in Suffolk.²⁶

A further proxy measure for pregnancy and maternity is available by identifying the population under the age of 1. This is set out in the table below and shows that the proportion of people living in Suffolk and nationally under the age of 1 is the same (1%).

Table 7: Number and proportion of people under the age of 1 living in Suffolk

Age – under 1	Suffolk	England
Number.	7,900	663,000
Percentage	1	1

Source: ONS Census 2011 – mid-year population estimates 2015

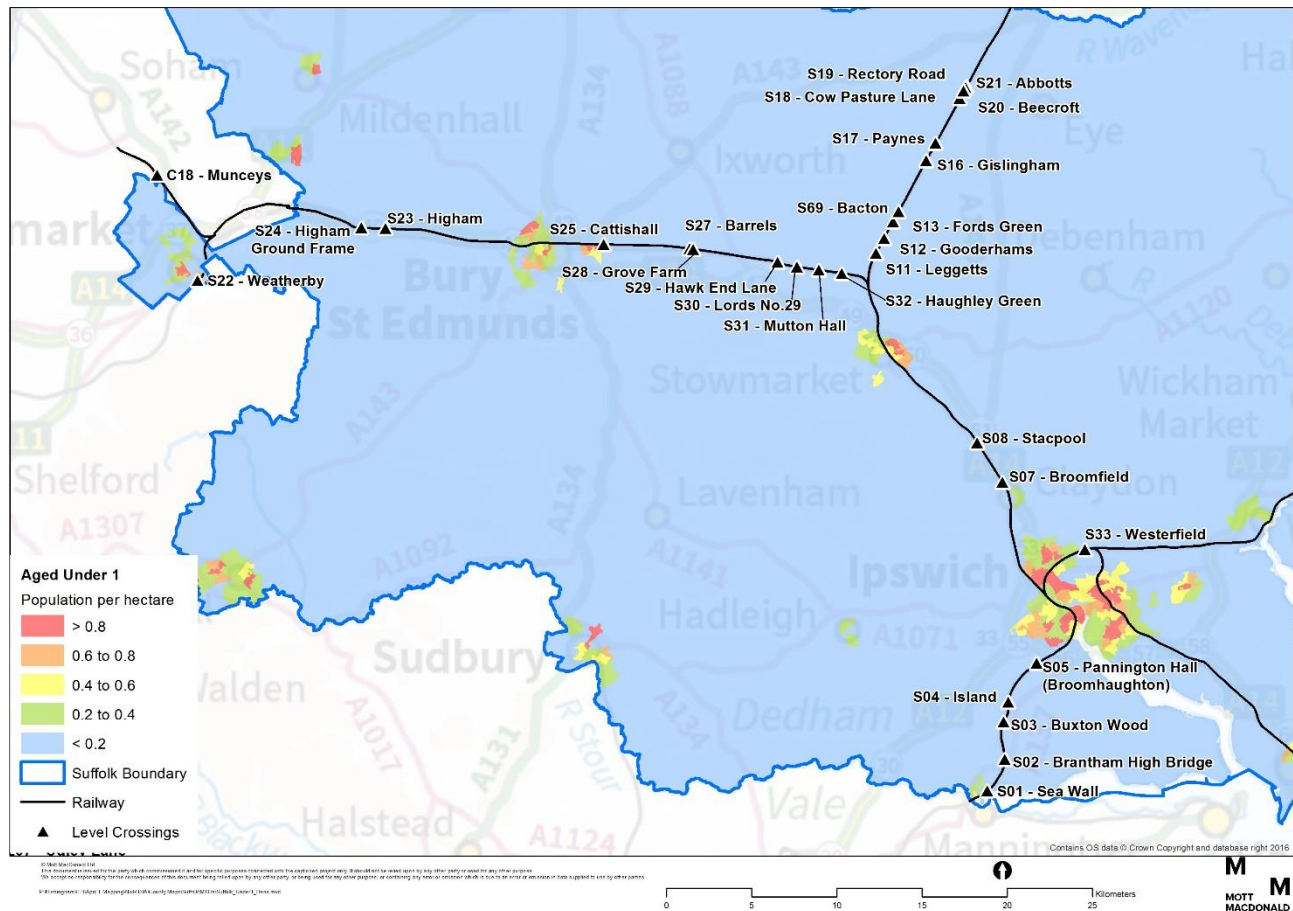
The map below illustrates that:

- Ipswich has a moderate density of people under 1, with some areas of the town having high densities.
- There are other areas within Suffolk which have moderate densities, but these are not significant.
- The wider county has very low levels of people under 1 living in the area.

²⁵ ONS (2015): 'Birth summary tables'. See:
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthsummarytables>.

²⁶ ONS (2015): 'Birth summary tables'. See:
<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthsummarytables>.

Figure 6: Suffolk population under 1 density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.7 Race and ethnicity

Race and ethnicity refers to a group of people defined by their race, colour, nationality (including citizenship), ethnicity, or national origin.

As set out in the table below, the proportion of people from a BAME background in Suffolk is significantly lower (less than half) of the national figure.

Table 8: Number and proportion of people from BAME backgrounds living in Suffolk

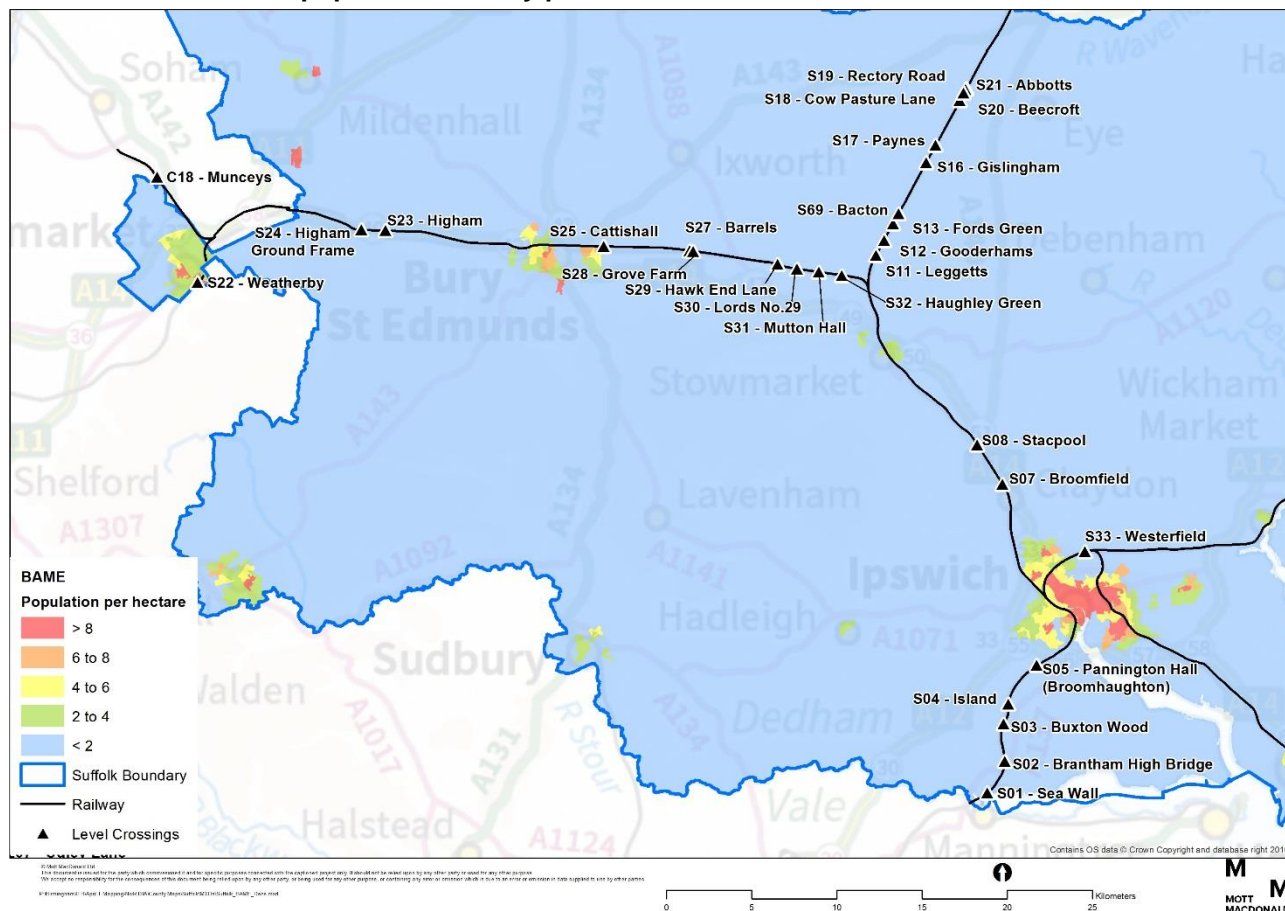
BAME	Suffolk	England
Number	66,700	10,733,200
Percentage	9	20

Source: ONS Census 2011 – mid-year population estimates 2015

The map below illustrates that:

- Ipswich has a high density of people from BAME backgrounds. This is particularly concentrated in the centre of the town.
- The other market towns within the area have only minimal proportions of people from this protected characteristic group, and throughout the wider county the proportions are very low.

Table 9: Suffolk BAME population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.8 Religion and belief

Religion and belief refers to any religion or belief, including lack of belief.

Distinctions are frequently drawn in order to identify those professing a ‘minority faith’ which in the UK tends to include Buddhism, Hinduism, Islam, Judaism, and Sikhism (as well as other faiths, such as Baha’i and smaller groups such as pagans). This distinction is made because in most areas the majority of the population tend to express their religion or faith as some form or denomination of Christianity, as a professed lack of religion or faith (including atheists and humanists) or a preference not to answer.

As shown in the table below, the proportion of people from a minority faith group in Suffolk is significantly lower (7%) than the national figure.

Table 10: Number and proportion of people from minority faith groups living in Suffolk

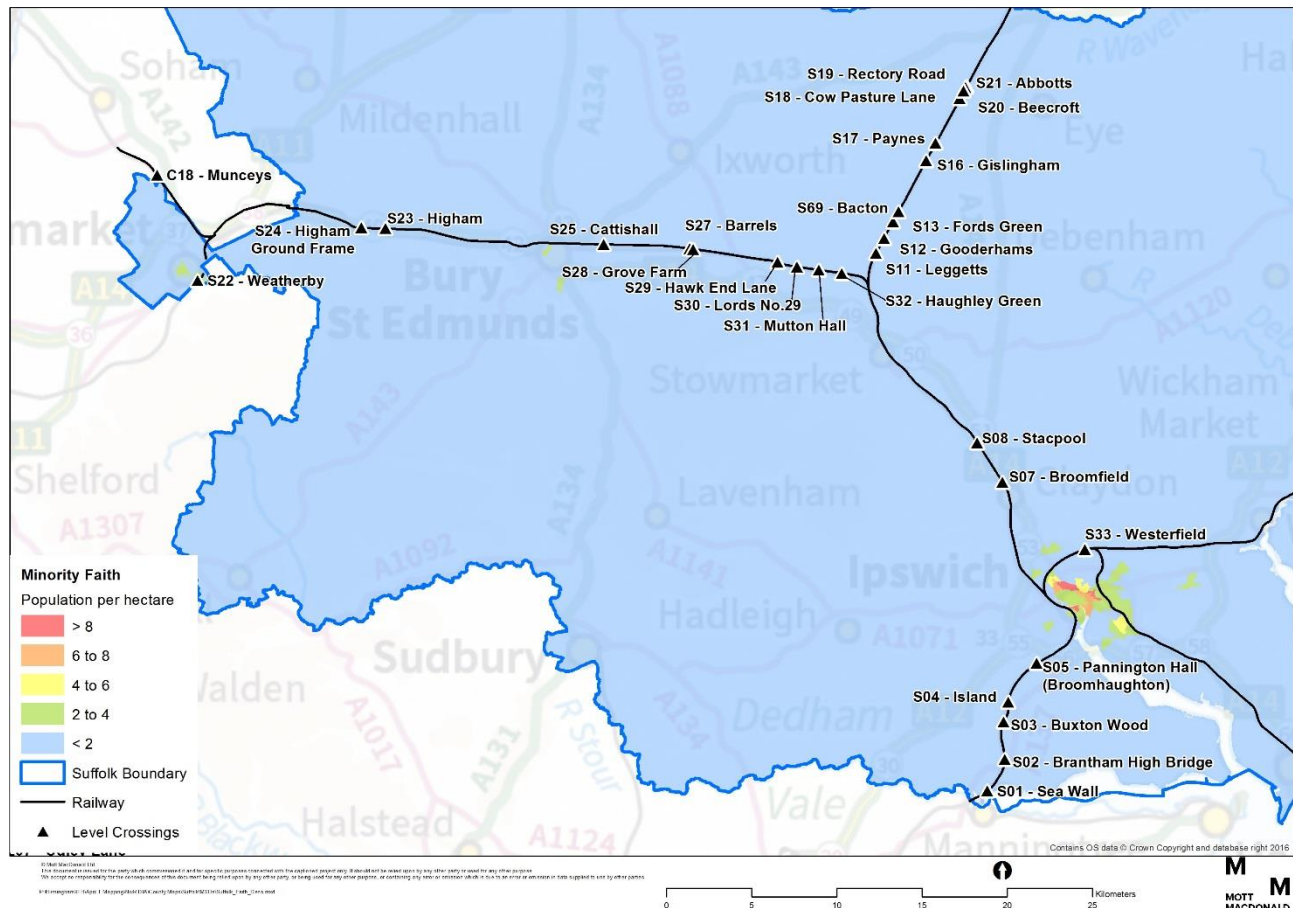
Minority faith	Suffolk	England
Number.	14,400	4,614,200
Percentage	2	9

Source: ONS Census 2011 – mid-year population estimates 2015

The map below illustrates that:

- Across Suffolk, the density of people from this protected characteristic group is very minimal.
- The only area with any significant proportion of people from a minority faith group is Ipswich – even here density is very low.

Figure 7: Suffolk minority faith population density per hectare



Source: ONS Census 2011 – mid-year population estimates 2015

3.9 Sex / gender

Sex is defined as the biological distinction between a man and a woman, while gender is the socially-determined roles of men and women, which are often accompanied by social norms such as specific dress conventions and established social and familial roles.

According to the 2015 Mid-Year Population Estimates (based on the 2011 Census), there were 31.1 million men (49% of the total population) and 32.1 million women (51% of the population) in Great Britain. In Suffolk, there were 359,787 men (49%) and 368,376 women (51%), which matches national trends.

3.10 Sexual orientation

Sexual orientation concerns whether a person's sexual attraction is to their own sex, the opposite sex or both sexes. In general, consideration of this characteristic focuses on lesbians, gay men and bisexuals who frequently refer to themselves as the LGB community.

There are no official or census figures for the LGB community and estimates vary. In 2005 the government estimated the number of LGB people in the UK at 3.6 million or around 6% of the population. This has been accepted by the charity Stonewall as a reasonable estimate of the UK LGB community.²⁷

Local area statistics are even harder to identify. Experimental statistics published by the ONS from the results of the Integrated Household Survey (undertaken from April 2011 to March 2012) indicated that around 1.5% of adults in the UK identify themselves as LGB. This is highest amongst people aged 16-24 (2.7%), compared with 0.4% of people aged 65 and over. In the East of England (including the county of Suffolk), the overall figure for people identifying as LGB was slightly lower at 1%.²⁸

3.11 Summary

While not all of the above-mentioned groups will be affected by the closure of the level crossings included within the order, there is potential for impacts across all the protected characteristics depending on the particular circumstances of each crossing closure.

However, as noted in Chapter 2, the sections of society most likely to experience impacts are:

- Disabled people – particularly wheelchair users and those with mobility impairments, sensory impairments, and respiratory illnesses;
- Older people with mobility impairments;
- Parents with children in pushchairs or prams;
- Those at greatest risk from level crossings including children, disabled people, older people and men; and
- Users of community facilities in close proximity to the crossings.

²⁷ See: <https://yougov.co.uk/news/2014/07/04/average-brit-knows-31-lesbians-55-gay-men/>

²⁸ Office for National Statistics (2012): 'Integrated Household Survey April 2011 to March 2012: Experimental Statistics'. See: http://www.ons.gov.uk/ons/dcp171778_280451.pdf

4 Site analysis

4.1 Introduction

This chapter provides a site by site analysis of the existing level crossing and local context, accessibility, risk factors and proposed works for each of the crossings in the Strategy within Suffolk.

4.2 Sites

Existing configuration				Future configuration		
Site description	Accessibility	Risk factors	Population and amenities	Proposed works	Diversion route accessibility	Assessment
S01 - Sea Wall						
The Sea Wall level crossing connects a coastal walking route with an industrial estate in Brantham, Suffolk.	The accessibility of this crossing is limited by the unpaved, uneven path from which the crossing can be reached. The crossing also requires users to negotiate the stiles and steps that lead up to the crossing. This would have the effect of reducing the ability of users with limited mobility or who use a wheelchair from accessing the crossing.	<p>The overall risk rating for this site is C4 with the risks of sun glare and the high frequency of trains identified as key risk factors. There are approximately 286 trains per day using this section of track, travelling at speeds of up to 100mph.</p> <p>The presence of signage and whistle boards are noted as key safety features at this site. It is estimated that approximately 12 pedestrians or cyclists use the crossing each day and despite the risks, there have been no reported accidents, near misses or incidents of user misuse at this crossing.</p>	<p>The nearest residential properties are located approximately 470m north of the level crossing at Cattawade, north of Brantham Industrial Estate. These properties are screened from the level crossing by the Industrial Estate.</p> <p>Stour and Orwell Estuaries is designated as Ramsar, SPA and SSSI and located 20m south of the level crossing.</p> <p>There is a low to moderate density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>	This level crossing will be closed to all users. Users will be diverted to an existing footbridge to the northeast of the crossing. The diversion route will make use of byway E-159/014/0 to the north of the railway to connect to the footbridge. A new circular route will be provided on the south of the railway with the creation of a new 2m wide type P1 footpath looping E-159/013/0 back to the footbridge. This new footpath will follow the railway to the footbridge and a type S-B1 timber footbridge will be provided over a drainage ditch. New public wayfinding signs with details to be discussed and agreed with the local authority. The sections of E-159/013/0 either side of Sea Wall shall be extinguished to prevent a dead-end section of path being created up to the level crossing, and for reasons of nature conservation. Crossing infrastructure will be removed and type F4 and F7 fences installed to prevent trespass onto the railway.	<p>The diversion route will include use of both an existing and a new footbridge, which may result in accessibility limitations for those requiring level surfaces – such as wheelchair users. However, the existing footbridge is ramped and accessed via paved even tracks, potentially mitigating some of the negative implications on pedestrian accessibility.</p> <p>The diversion route mostly has a gradient of under 5%, although there are potentially some sections with a gradient between 5 and 15%. It is also noted that there is the potentially for gradients of up to 44% due to use of the above existing footbridge. This is steeper than the current route and may be challenging for older people, wheelchair users, or parents with pushchairs.</p> <p>To the north of the railway users are required to walk in the carriageway on Factory Lane; this may restrict pedestrian accessibility as the road is likely to be used by lorries accessing the industrial area to the north of Sea Wall crossing.</p> <p>The proposed diversion route increases walking distance to 1282m – an increase of 458m. This may be challenging for people with mobility problems to manage.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>Due to the problems with accessibility at the current crossing (notably the presence of steps, stiles and uneven paths), the diversion route has the potential to improve pedestrian accessibility – in terms of a ramped footbridge and new paths. Although it is acknowledged that increased walking distances and potentially steep gradients may reduce any potential benefits. It is also noted that the crossing is very remote and has limited usage for leisure purposes.</p> <p>Therefore, a DIA is not required for Sea Wall level crossing.</p>
S02 - Brantham High Bridge						
<p>This level crossing is a public footpath crossing that provides pedestrian access between two areas of agricultural land.</p> <p>Footpath E-159/006/0 starts on an unnamed track north of the Junction of Church Lane and Ipswich Rd A137 along the west and north boundary of an agricultural field. The nearest residential properties are located approximately 240m south at Hill Farm.</p>	The crossing is currently inaccessible for those with mobility and visual impairments, as well as parents with pushchairs. Not only are crossing stiles a physical barrier, but so are the steep approaches to the railway line. It should also be noted that young children may be at risk from the stile, unmaintained nettles and other weeds, as well as the loose aggregate surfaces that also surround the crossing.	Each day, 181 trains pass through Brantham High Bridge level crossing, travelling at speeds of 100mph. While no accidents, near misses or incidents of misuse have been reported at the site, the frequent trains, risks of sun glare and low sighting time have merited the level crossing with a risk rating of C8. Several safety features are present at the level crossing including whistle boards and signage. A nine-day census undertaken in 2016 recorded two adult users across the survey, indicating infrequent use.	<p>There are four grade II and one grade II* listed building within 1km of the works. Three of these (including the grade II* listed St Michael and All Saints Church (List Entry ID 1033431) are over 500m from the works and therefore the minor nature of the works are not anticipated to impact on the setting of the assets.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. The crossing</p>	This level crossing will be closed to all users. Users will make use of the dedicated footway on to the side of the highway bridge on Ipswich Road to cross the railway. The existing public right of way network to the west of the railway shall be used by connecting E-159/006/0 to Ipswich Road via a new 2m wide footpath along Jimmy Lane, an existing track. The section of E-159/006/0 to the east of the woodland to the crossing would be extinguished to prevent the creation of a dead end whilst maintaining access into the woodland. Boundary fencing (type F1) will be installed where the footpath is to	<p>The implementation of a new footbridge and steps may restrict accessibility for some users, particularly as it is not fully accessible.</p> <p>The proposed diversion route adds 680m to the route – an increase from 466 to 1146m. This is likely to pose problems for people with mobility problems, who will struggle with this increased distance.</p> <p>The proposed diversion route also requires use of new 2m wide footpaths, which may improve pedestrian accessibility along the</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>Due to the current accessibility problems at the crossing (notably the presence of stiles and heavily overgrown approaches), there is unlikely to be any adverse impact on pedestrian accessibility through closure and redirection. Although, it is</p>

Existing configuration

does not provide pedestrian access to any community facilities which may be required by persons with protected characteristics and is additionally far from any built up areas.

Future configuration

be extinguished. To the east of the crossing a new 2m wide type P1 footpath running parallel to the railway would be provided from E-159/006/0 within field margins to The Street via steps and a proposed footbridge over a drainage ditch. A new public right to use The Street would be required. The new proposed footpath would be separated from the railway within Network Rail land using type F7 fencing. New wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure would be removed and type F7 fencing installed to prevent trespass onto the railway.

proposed route. This is particularly important on Jimmy Lane, as the current track is currently inaccessible for some users due to its uneven nature.

The diversion also potentially includes stretches with gradients of between 5% and 15%, this is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs.²⁹

noted that there is likely to be a significant increase in walking distances, it is not felt that accessibility will decrease as a result. It is also noted that the crossing is in a remote location and has low pedestrian usage.

Overall, it is felt that a DIA is not required.

S03 - Buxton Wood

Buxton Wood level crossing is a public footpath crossing located in the outskirts of Bentley, Suffolk.

The eastern and western approaches are along an uneven, natural footpaths which currently limit accessibility for those with mobility impairments and parents with pushchairs. Users will also have to manage wooden stiles to traverse the line.

An estimated 286 trains, travelling as speeds of 100 mph use this part of the network daily. Due to the high frequency of trains and risks of sun glare, Buxton Wood level crossing has acquired a risk rating of C6. To date, no incidents of misuse, near misses or accidents have been recorded at the site.

A pedestrian user census undertaken in September / October 2016, 11 adults were recorded using the crossing over the nine-day period.

The crossing is completely surrounded by fields with a few properties located approximately 300m south of the level crossing. It is worth noting that the level crossing route stems from these properties, via the level crossing, and toward a primary school located approximately 500m west of the Buxton Wood level crossing.

There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.

This level crossing will be closed to all users. Users will make use of Falstaff level crossing to the north. The footpath W-138/022/0#1 to the west of the railway will be extinguished to prevent a long section of footpath with a dead end. To maintain connectivity in the network footpath W-138/022/0#3 shall be extended with a new 2m wide footpath to connect to W-138/019/0 at Falstaff level crossing. New wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure at Buxton Wood level crossing would be removed and type F7 fencing installed to prevent trespass onto the railway.

The proposed diversion route takes users to an uncontrolled level crossing (Falstaff level crossing), which has the same ALCRM score (C6) as Buxton Wood level crossing. This limits the safety benefits associated with closing the crossing.

Both existing and new footpaths along the diversion route may also restrict pedestrian accessibility, due to their unsurfaced nature and location in field margins. This may pose problems for people who require even surfaces – namely those in wheelchairs, with pushchairs / prams or those with mobility problems.

The diversion also potentially includes stretches with gradients of between 5% and 15%, this is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs.³⁰

The proposed diversion route increases walking distances to 906m, an increase of 371m. This may pose problems for people who struggle to walk long distances.

Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.

Due to current accessibility problems at the crossing, such as the presence of stiles and uneven, natural footpaths, it is felt that there is the potential for improved pedestrian accessibility due to closure and redirection. It is also noted that there is a low pedestrian usage.

Therefore, no DIA is required.

S04 - Island

This crossing is a public footpath level crossing that connects two fields with rudimentary footpaths formed of grass channels along the edges of cultivated fields. Farm houses and some community amenities, such as Bentley Church, located further beyond the fields.

ProW W-138/018/#2 leads from Bentley Hall along a paved track on an east-west axis to connect with W-138/018/#1, which leads to the Island crossing. ProW W-138/036/0#2 is a footpath leading from Church Road west of Malting Farm to the west across the Island level crossing to connect with Footpath W-138/018/#1.

The pathways leading to the crossing would be difficult for many people with limited mobility to use. Wheelchair users and people with pushchairs would not realistically be able to navigate stiles and steps at both sides of the crossing. This effectively excludes these groups from using the crossing.

The crossing is rated a B6 for overall risk, meaning that there is a significantly high risk to the individual and a medium risk to others. This high individual risk can be explained as being a result of the high frequency of trains that use this line, being approximately 286 per day travelling at speeds of up to 100mph, the low sighting time due to the bends in the track and glare from the sun that further reduces the vision of both train drivers and crossing users. Signs warning users of the risks they face and there are whistle boards positioned on each line.

The nearest residential properties are located approximately 270 m south-west of the level crossing (Uplands Fruit Farm) and 280 m east of the level crossing (building near Maltings Farm).

There are four grade II* and six grade II listed buildings within 1km of the works. A number of these are in close proximity to the works.

There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.

This level crossing will be closed to all users. The diversion route for users will make use of the highway bridge footway (Bentley Bridge) to the north. New 2m footpaths will be provided to the east and west of the railway along field margins linking existing footpaths to Bentley Bridge. The new footpath to the east of the railway will be mainly within Network Rail land and will have type F4 fencing to prevent trespass on to the railway. New wayfinding signs with details to be discussed and agreed with the local authority. The section of W-138/018/0#1 through the woodland leading to the crossing will be extinguished to prevent a dead end path being formed. Crossing

The proposed diversion route takes users to Bentley Bridge to the north of the crossing. This may restrict pedestrian accessibility, as there is only a narrow footpath on either side of the bridge which does not extend beyond the bridge.

Although most of the diversion route has a gradient under 5%, there is the potential for gradients between 5 to 15% and greater than 15% - particularly on the approaches to Bentley bridge. This is steeper than the current route and may be challenging for older people, wheelchair users, or parents with pushchairs.

Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.

Due to current problems with accessibility at the crossing (primarily the presence of both steps and stiles), the proposed diversion route and route improvement measures have the potential to improve pedestrian accessibility. Although, it is noted that there is likely to be a significant increase in walking distances and the potential for steep gradients, it is not

²⁹ The diversion includes stretches with a gradient of over 15%, however after assessing the data against the terrain this is likely to be due to an error in the available data. See section 1.5 for more detail.

³⁰ The diversion includes stretches with a gradient of over 15%, however after assessing the data against the terrain this is likely to be due to an error in the available data. See section 1.5 for more detail.

Existing configuration		Future configuration				
		A pedestrian user census undertaken in 2016, recorded 37 adults using the crossing over the survey period.		infrastructure shall be removed and type F7 fencing installed to prevent trespass onto the railway.	However, the creation of new 2m wide paths along the road may improve pedestrian accessibility and help to mitigate some of the potential negative implications. The diversion route increases walking distance to 1,336m, an increase of 1,188m. This is a significant increase that is likely to impact people who struggle to walk long distances – particularly people with mobility problems.	felt that accessibility will decrease as a result. It is also noted that pedestrian usage is relatively low. Therefore, no DIA is required.
S05 - Pannington Hall						
Pannington Hall level crossing is a public footpath level crossing in Wherstead, Suffolk.	The approach to the crossing is through fields which are completely unsurfaced (i.e. mud). The surface is uneven and is not accessible to wheelchairs or pushchair users. The crossing itself is fenced off - on both sides users have to step over a stile to access the crossing and walk down 12 steps to reach the railway line. The crossing would be difficult to access for any users with mobility difficulties.	Approximately 184 trains cross this part of the network each day travelling at speeds of 100mph. No incidents have been recorded at this crossing. The risk factors for this crossing are low sighting time, sun glare and frequent trains. As such, the crossing has a risk rating of C8. Safety protection at this crossing consists of signage and whistle boards provided on the rail approaches. A pedestrian user census undertaken in June / July 2016, 20 users were recorded using the crossing over the nine-day period. This consisted of 20 adults and two unaccompanied children.	The crossing provides access between agricultural fields to the north and south. On the south side of the crossing agricultural fields lead to a visitor farm and clothes retailer approximately 480m from the crossing. There are no other community facilities in the area. There is an alternative crossing point around 300m west of the crossing via a vehicle bridge on The Street. It is therefore unlikely that community severance impacts will arise as a result of the closure of this crossing. The nearest residential properties are located approximately 490 m south east (Jimmy's Farm). There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.	This level crossing will be closed to all users. Users will be diverted to The Street highway bridge to the southwest to cross the railway. To the north of the railway users will make use of the existing PROW and highway network. To the south of the railway two new sections of 2m wide footpath shall be provided. One will follow the field boundary on the north side of The Street to connect the highway bridge with E-559/041/0. The other will follow the field boundary on the south side of the street to connect E-559/029/0 to E-559/030/0. A short section of new 2m wide footpath will be provided north of The Street highway bridge in the field margin. New wayfinding signs with details to be discussed and agreed with the local authority. The section of E-559/030/0 leading to the crossing shall be extinguished to prevent a dead end path being formed. Crossing infrastructure will be removed and type F7 fencing installed to prevent trespass onto the railway.	The diversion route directs users to The Street bridge southwest of the crossing. This may restrict pedestrian accessibility, due to the lack of pedestrian footways, meaning users would have to walk in the carriageway. The creation of new footpaths on The Street may, however, positively benefit users who would otherwise be forced to walk in the carriageway. To the north of the bridge, users would also be required to continue walking in the road for approximately 100m before turning right onto an existing footpath (E-559/033/0). This may also restrict accessibility, as it is an uneven track. The creation of new footpaths in field margins may also restrict pedestrian accessibility, as these may be unsurfaced and so cause problems for people with mobility problems. Walking distances associated with closure of the crossing are likely to reduce by 317m, meaning total walking distances of 980m. Most of the proposed diversion route has a gradient of under 5%, although parts have gradients over 15%. However, this is unlikely to impact accessibility along this route as it seems likely that these figures are due to errors in the available data.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Due to current problems with accessibility at the crossing (notably the presence of steps, stiles and unsurfaced paths), there is the potential for improved accessibility and reduced walking distances through the closure and redirection of users. Therefore, no DIA is required.
S07 - Broomfield						
The Broomfield crossing is a public footpath that connects the village of Great Blackenham with the Barham Pits quarry and fishing lake. Footpath E120/0/12/0#1 connects Barham CP (east of railway) to Great Blakenham CP (west of railway) via tracks through an open space of manmade waterbodies and the Gipping Valley River.	The pathways leading to the level crossing are uneven and unpaved meaning those people requiring wheelchairs or prams will likely struggle to access the crossing. Stiles located on either side of the crossing further exclude those with mobility impairments.	The risks identified for this crossing are the risk of sun glare and the high frequency of trains using this line - 205 trains per day, travelling at 100mph. The mitigation for these risks includes the signage and whistle boards. There has however been one accident since August 2014. Broomfield crossing has been given a risk rating of C4. A pedestrian user census undertaken in June / July 2016 recorded 152 adults, eight accompanied children, 11 unaccompanied children, four older people and two impaired users.	The crossing is surrounded by the lake (to the east) and a field (to the west), with several houses located beyond, on either side of the crossing. A church and Great Blackenham Village Hall are located approximately 400m west of the level crossing, therefore the crossing may be used by individuals wishing to access these facilities from the eastern dwellings. The nearest residential properties are located approximately 290m south of the level crossing at Great Blakenham and 300 east of the crossing at Barham. The Gipping Valley River Path also crosses the railway approximately 350 m north and approximately 310 m south of the level crossing. There are 11 grade II and one grade I listed buildings and one registered park and garden (List Entry ID 1000155) within 1 km of the works.	This level crossing will be closed to all users. Users will make use of an existing underpass to the south to cross the railway. An improvement to E-120/030/0#1 shall provide a 2m wide compacted stone footpath immediately to the north of existing footpath up to the underpass. To the east of the railway a new footpath will be provided to connect E-120/011/0#1 and E-120/012/0#1. This will be a 2m wide footpath right on the existing track. New wayfinding signs with details to be discussed and agreed with the local authority. The section of E-120/012/0#1 to the west of Broomfield crossing will be extinguished to prevent a dead end path being formed. Crossing infrastructure at will be removed and type F7 and F4 fencing installed to prevent trespass onto the railway.	The proposed diversion route takes users to an existing underpass to the south of the crossing. This appears to have a relatively narrow path and lots of vegetation, potentially restricting some users ability to use the route. Taking this route will increase walking distances by 130m (from 539 to 669m). This is unlikely to cause significant problems for any users. The diversion also potentially includes some short sections with a gradient of between 5 and 15%. This is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Due to current problems with accessibility (notably the presence of stiles and unpaved pathways), there is the potential for improved accessibility. The proposed diversion route does not significantly increase walking distances. Therefore, a DIA is not required.

Existing configuration

Future configuration

S08 – Stacpool							
<p>This crossing is a pedestrian crossing that connects a side road off Lower Street, the B1113 to an area of fields and a small quarry currently owned and operated by Lafarge tarmac.</p> <p>Footpath W-121/034/0 leads from Darmsden Hall (approximately 620 m west of Railway) across Lower Street the level crossing to connect with the Gipping Valley River Path east of the railway line.</p>	<p>The accessibility of the Stacpool crossing is limited by the presence of stiles, narrow pathways and grassy inclines that have the effect of reducing the ability of those with limited mobility or who use a wheelchair to access the site. These features may also exclude users with impaired vision who face an additional risk from the layout of the crossing and from trains that do not give an audible warning of their approach.</p>	<p>The overall risk rating of this site is C5 with the risks of sun glare and the high frequency of trains identified as key risk drivers and the presence of signage is identified as the key mitigation of these risks. This section of the line sees approximately 205 trains travelling at speeds of up to 100mph pass this crossing each day. Despite the risks at this site, there have been no reported accidents, near misses or incidents of user misuse.</p> <p>A pedestrian user census undertaken in 2016, indicated that 39 adults used the crossing over the nine day period.</p>	<p>The nearest residential properties are located approximately 450 m north east of the level crossing (Pipps Hall).</p> <p>There are 11 grade II listed buildings, a registered park and garden (List Entry ID 1000155) and a scheduled monument (List Entry ID 1006033) within 1km of the works. The closest of these to the works is the Baylham Roman Site scheduled monument at 350m south east. As the footpath creation in this location will be aligned along the existing railway it is not anticipated that the setting of any of these assets will be affected.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. This crossing does not provide access to any community facilities or homes. It is estimated that approximately nine people use this crossing each day.</p>	<p>This level crossing will be closed to all users. Users will make use of an existing bridge on W-121/031/0 to the north of the crossing. Users shall be routed along of a new 2m wide public footpath to the east of the railway between W-121/033/0 and W-121/031/0. Fencing will be installed to separate the new footpath from quarry traffic. New wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure will be removed and type F1 fencing installed to the west side of the railway and type G1 gate to the east side to prevent trespass onto the railway.</p>	<p>The diversion route takes users across an existing bridge to the north of the crossing. This may reduce pedestrian safety, as the bridge has no footpath, is very narrow and is likely to be used by quarry traffic.</p> <p>The bridge potentially includes gradients that are above 15%. There is also the potential for sustained periods with gradients between 5 and 15% on the track to the west of the crossing (W-121/035/0) and on the B1113. This is likely to cause significant effects as the diversion route may be difficult for older people, wheelchair users, or parents with pushchairs negotiate.</p> <p>Use of existing and new tracks may also limit pedestrian accessibility, especially for those who require even surfaces.</p> <p>Users would also be required to use the existing footway on Lower Street to the west of the crossing; although this only has a narrow footpath on one side of the road, this may be unsuitable for use by some groups – particularly people in wheelchairs and with pushchairs / prams, who may be forced to walk in the carriageway on a busy road.</p> <p>Users may also be negatively impacted by the significant increases in walking distances, which will rise to 1,149m from 578m – an increase of 571m.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>As pedestrian accessibility at the current site is restricted by stiles and narrow paths, it is unlikely that access using the diversion route will reduce pedestrian accessibility. Although, it is noted that there is likely to be a significant increase in walking distances, it is not felt that accessibility will decrease as a result. It is also noted that the crossing has low usage, especially by people from groups with protected characteristics.</p> <p>Therefore, it is felt that a DIA is not required.</p>	
S11 - Leggetts							
<p>This crossing is a pedestrian crossing between two areas of farmland between Haughley Green and Ward Green in Suffolk.</p> <p>Footpaths W-155/033/0 and W-419/006/0 connect run along field tracks connectin Ward Green via the existing level crossing south of Old Bells Farm. The nearest residential property is located approximately 170 m to the north of the crossing (Old Bell's Farm).</p>	<p>The accessibility of this crossing is poor as the site incorporates stiles to access the line from both sides. This excludes wheelchair users and people with limited mobility or visual impairments from using the crossing. The access routes to this crossing are also largely inaccessible to wheelchair users as the pathways are prone to mud and on uneven ground at the perimeter of farm fields. The alternative crossing is much more accessible as it uses flat and paved approach roads without stiles, steps or inclines to reach the crossing which is itself paved.</p>	<p>The overall risk rating of this crossing is C7 with the high frequency of trains and sun glare identified as key risk drivers and signage noted as key protection at this site. There are approximately 86 trains using this line each day, travelling at speeds of up to 100mph. There have been no reported accidents, near misses or incidents of user misuse at this site.</p> <p>A pedestrian user census undertaken in 2016, recorded no users of the crossing over the nine-day period.</p>	<p>There is an alternative crossing less than 600m south west of this crossing which is a traffic signal controlled level crossing with half barriers. This alternative crossing connects roads that serve all houses and farms in the area that may have used this crossing.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. Additionally, there are no community facilities in the area that this crossing provides access to.</p>	<p>This level crossing will be closed to all users. The crossing users will make use of Wassicks level crossing to the south. The local network will be used to access Wassicks with the use of W-297/013/0 to the west and W-297/048/0 to the east. The section of W-419/006/0 on the west side of Leggetts crossing will be extinguished to prevent a dead end path being formed. Crossing infrastructure at shall be removed and type F7 fencing installed to prevent trespass onto the railway.</p>	<p>The proposed diversion takes users over Wassicks level crossing, which is a half barrier controlled crossing. Wassicks level crossing has a higher ALCRM score (C3) compared to Leggetts (C7), this seriously limits the safety benefits associated with the closure of Leggetts level crossing.</p> <p>The diversion route also requires users to walk use existing highways, such as Wassicks Lane. This may potentially reduce pedestrian safety, as users would be required to walk in the carriageway on a narrow road. This route potentially also includes stretches with gradients between 5.6 and 8.3% along Wassicks Lane. This is steeper than the current route and may be challenging for older people, wheelchair users, or parents with pushchairs.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>Although there are problems with the accessibility of the diversion route, notably direction to another crossing, significant increases in walking distances and in parts in the carriageway, the problems seen at the current crossing (such as step, stiles and uneven pathways on the approaches) mean that pedestrian accessibility and safety will not be reduced.</p>	

Existing configuration	Future configuration					
Users may also struggle to negotiate this route on account of the significant increases in walking distances – an increase of 926m from 305 to 1,231m.						<i>In addition, as usage of the crossing is very minimal it is felt that no DIA is required.</i>
S12 - Gooderhams						
This crossing is a pedestrian and vehicle crossing that connects the farm of Gooderham CC and Son with an area of farmland just outside Bacton, Suffolk.	The accessibility of this crossing is poor as the use of stiles at the pedestrian crossing prevents access to wheelchair users and those with limited mobility to access the crossing. The ground surface is unpaved and uneven with grass and railway ballast forming the majority of the surface at this crossing. This would make the crossing even more difficult for wheelchair users and those with limited mobility.	<p>The pedestrian crossing is rated as C7 while the vehicle crossing has a rating of C5, showing a marginally greater risk for the vehicle crossing. Sun glare, the high frequency of trains and the low sighting time are identified as the key risk drivers at this site. The safety precautions at the site are signage, gates and the telephones for vehicle drivers. There are approximately 90 trains that use this crossing each day at speeds of up to 100mph, operating both freight and passenger services. There have been two reported incidents of user misuse at this site since the assessment in February 2014. Aside from this, there have been no accidents, near misses or further incidences of user misuse at this crossing.</p> <p>A pedestrian user census undertaken in June / July 2016 recorded eight adults users of the crossing over the nine-day period.</p>	<p>There are no community facilities that this crossing provides access to, except to travel between fields. There are approximately two vehicles that use this crossing each day and a further two pedestrians - it is likely that these are farm vehicles and workers.</p> <p>The closest listed building to these diversion routes is approximately 50m north (Kerry's Farmhouse) therefore no impact to setting is anticipated from potential increased foot traffic on existing paths.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>	This level crossing will be closed to all users, with private crossing rights to be maintained. Public users will be diverted to Cow Creek level crossing to the north of the crossing via the existing public rights of way and highway network. To the west of the railway users will make use of public footpaths W-115/018/0#2 and W-115/018/0#1. To the east of the railway, users will use existing Kerry's Farm Lane and the B1113. Public footpath W-115/019/0 would be extinguished to prevent a dead end path being formed up to the railway. Crossing infrastructure shall be removed and type F1 fencing installed to prevent trespass onto the railway.	<p>The proposed diversion route takes users to Cow Creek level crossing, an uncontrolled crossing with the same ALCRM score (C7) as Gooderhams level crossing. This limits the safety benefits associated with closure of the crossing.</p> <p>User would also be forced to walk in the carriageway on the B1113 and Kerry's Farm Lane. This is likely to reduce pedestrian safety, particular on the busy B1113.</p> <p>This diversion route is likely to increase walking distances by only 67m, from 1,439 to 1,506m. This is unlikely to prove challenging for users.</p> <p>The entire proposed diversion route has a gradient of under 5%. This is not steeper than the current route and should not pose any problems in terms of accessibility.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>Although there are potential problems with the proposed diversion route (particularly the use of an uncontrolled crossing and walking in the carriageway), the current problems with the crossing, such as stiles and unpaved / uneven walking routes to reach the crossing, means that pedestrian accessibility is unlikely to be reduced further. Walking distances are also not significantly increased. In addition, usage of the crossing is low likely due to the rural nature of the crossing.</p> <p>Therefore, no DIA is required.</p>
S13 - Fords Green						
The level crossing at Fords Green is a rural pedestrian crossing point approximately 300m west of Fords Green, a hamlet in Suffolk.	The approach to the pedestrian crossing on both sides is through fields, culminating in stiles on both sides just before the railway. As such, it is highly unlikely that any users with mobility issues, people with pushchairs or in wheelchairs/mobility scooters currently use the crossing.	<p>Approximately 90 trains travelling at 100 mph use this part of the network daily. In the twelve month period prior to June 2014, no near misses or incidents of misuse were recorded at the site. Due to the risks of sun glare and frequent trains, Fords Green level crossing has acquired a risk rating of C8. Safety features of the crossing include signage.</p> <p>A pedestrian user census was undertaken in July 2016 and recorded six adults using the crossing over the nine-day period.</p>	<p>There are no businesses or community facilities within the immediate vicinity of the crossing, as it is surrounded by farmland.</p> <p>There are numerous listed buildings within 1km of the study area including two grade II* and two grade I listed buildings. All but one of the listed buildings are over 500m from the footpath creation works.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>	This level crossing will be closed to all users. Crossing infrastructure will be removed and type F7 and F4 fencing installed to prevent trespass onto the railway. Users shall make use of Cow Creek to the south. A new 2m wide public footpath following on the west side of the railway will be created in field margins to connect footpath W-115/022/0#2 and W-115/018/0#1. The new footpath will be constructed to an appropriate standard with new wayfinding signs with details to be discussed and agreed with the local authority.	<p>The proposed diversion route takes users to Cow Creek level crossing, an uncontrolled crossing with the same ALCRM score (C7) as Gooderhams level crossing. This limits the safety benefits associated with closure of the crossing.</p> <p>The proposed diversion also forces users to walk along existing highways and make use of new 2m wide footpaths. This may restrict accessibility for users who require even footways.</p> <p>Walking distances though are going to be significantly reduced due to use of the proposed diversion route. The diversion route will result in a total walking distance of 175m, a reduction of 1,331m.</p> <p>The diversion route potentially includes very short stretches with gradients between 5 and 8%. This is not steeper than the current route and should not pose any problems for people who may struggle with steep gradients.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>As accessibility at the current crossing is limited (by the presence of stiles and field paths to reach the crossing), it is felt that pedestrian accessibility will reduce as a result of the proposed diversion route. Walking distances will also be significantly improved as a result of the closure and redirection of the crossing.</p> <p>Therefore, it is felt that a DIA is not required.</p>
S16 - Gislingham						
The level crossing at Gislingham is a pedestrian crossing point linking farm buildings at Eastlands farm to nearby fields.	The approach to the crossing on the eastern side is along a level, gravel road and does not pose any restriction for any users. On the western side, the path is covered with vegetation and leads along a field. There are also	Approximately 90 trains, travelling at 100 mph, use this part of the network daily. In the twelve month period prior to November 2014, no incidences of misuse were recorded at the site. Due to the risks of sun glare for	The village of Finningham is 600m south-east of the crossing, but as there is a railway bridge on Wickham Road (approximately 300m to the south), it is unlikely that the residents of Finningham actively rely on the	This level crossing will be closed to all users and a new 3m wide bridleway to the south will be provided. It will provide a link to an existing public byway. This diversion makes use of the existing underpass on byway W-	The proposed diversion route makes use of an existing underpass, which appears to have an uneven surface that may make it difficult for some people with mobility problems to navigate.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these

Existing configuration

manually operated gates on either side of the crossing. The crossing itself is level with a smooth surface.	pedestrians and frequent trains, Gislingham level crossing has acquired a risk rating of C9. Safety features of the crossing include signage, manually operated wooden gates and a telephone for users. A pedestrian user census undertaken in 2016, recorded five adults (including two railway personnel) using the crossing over the nine-day period. No children, elderly or impaired people used the crossing during this period. This indicates that the crossing is infrequently used.	Gislingham level crossing. Aside from the village, there are several farms within a 1km radius, and the village of Gislingham just over 1km to the north of the crossing. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. There are numerous listed buildings and the Finningham Conservation Area within 1km of the works, all but two of these are located within the village of Finningham approximately 400m from the works and the conservation area is approximately 350m west.	246 022 to allow users to cross the railway – resulting increasing walking distances by up to 1.2km. The new bridleway will be constructed to an appropriate standard with new wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure shall be removed and type F4 fencing installed to prevent trespass onto the railway. A short length of the bridleway W-246 010/0 will be extinguished as it would form a dead end.	Using this route will also increase walking distances by 1.2km. This is likely to be challenging for people who struggle to walk long distances. Most of the proposed diversion route has a gradient of less than 5%. There are however periods with a sustained gradient of over 5%, particularly on the western side of the line. ³¹ This is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs.	groups will be improved by the closure of the crossing. Due to the long diversion, A DIA is considered to be required.
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S17 - Paynes

<p>This crossing is a footpath crossing that connects two areas of farmland, between Star House farm and Red House farm south west of Gislingham, Suffolk.</p> <p>Footpath W-267/027/0#1 leads from the High Street in Gislingham to agricultural fields and a number of connecting footpaths to the south east of the settlement. The existing Footpath W-267/022/0 connects Starhouse Farm, 600 m south east of the level crossing to Gislingham approximately 540m to the north-east.</p>	<p>The accessibility of this crossing is poor as the approach route consists of narrow and uneven pathways along farmer's fields that reduce the ability of wheelchair users and people with limited mobility to access the crossing. This is exacerbated by the presence of steps to reach the line. These have a significant impact on people with limited mobility or wheelchair users who will not be able to navigate these obstacles to use the crossing. This is also the case for users with visual impairments.</p>	<p>The overall risk rating for this site is C6 with the high frequency of trains and the sun glare identified as key risk drivers with signage as the key protection. At this section of the line there are approximately 90 passenger and freight trains each day, travelling at speeds of up to 100mph. It is estimated that there is an average of four users of this crossing each day. There have been no reported accidents, near misses or incidents of user misuse at this site.</p> <p>A pedestrian user census undertaken in 2016, recorded 14 adults using the crossing over the nine-day period.</p>	<p>The closest residential properties are at Gislingham, approximately 500 m east of the level crossing. There are numerous listed buildings within 1km of the works. The closest of these to the works is 200m and is visually screened from the works by modern farm buildings.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>	<p>This level crossing will be closed to all users. Users will make use of an existing bridge to the north. A new 2m wide public footpath approximately 350m to the east of the railway will be created to connect footpath W-267/022/0 and W-267/021/0. This footpath shall be constructed to an appropriate standard with new wayfinding signs, the details of which are to be discussed and agreed with the local authority. The existing public right of way network to the west of the railway will be used to link to the existing bridge. Crossing infrastructure shall be removed and type F4 fencing installed on the west side of the railway and type F7 on the east side to prevent trespass onto the railway.</p>	<p>The diversion route takes users to an existing bridge to the north of the crossing. The bridge appears to be accessed via evenly tarmacked roads, although the bridge requires pedestrians to share the road with vehicles.</p> <p>Most of the proposed diversion route has a gradient of less than 5%. There are however periods with a sustained gradient of over 5% (and some above 15%), particularly on the approaches to the bridge north of the crossing. This is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs.</p> <p>The route also requires users to make use of existing paths and a new path that will be created in the field margin. This may restrict accessibility for some users who struggle to manage uneven surfaces.</p> <p>The proposed diversion route also increases walking distances by 968m, an increase from 537 to 1505m. This is likely to be challenging for some users who struggle with walking longer distances.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>As pedestrian accessibility is compromised at the current location (due to the approach route consisting of narrow and uneven pathways), it is felt that the diversion route has the potential to improve access, as the negotiation of steps will no longer be required. Although, it is noted that there is likely to be a significant increase in walking distances and the potential for steep gradients, it is not felt that accessibility will decrease as a result. It is also noted that usage of the crossing by pedestrians is limited, largely due to its remote nature.</p> <p>Therefore, a DIA is not required.</p>
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S18 - Cow Pasture Lane

<p>The level crossing is a byway open to all traffic crossing located in rural Suffolk.</p>	<p>The approach to the level crossing, from both directions, is along Cow Pasture Lane, a natural, relatively level footpath. The level crossing furniture does not span the entire length of the crossing; therefore the crossing has been partially levelled off with gravel. This may impede accessibility for some users – such as those with mobility or visual impairments, or parents with pushchairs.</p>	<p>An estimated 90 trains, travelling at speeds of 100 mph, use this part of the network daily. Due to the frequency of trains and risks of sun glare, the level crossing has acquired a risk rating of C6.</p> <p>Safety features of the crossing include manually operated picket gates and signage. To date, no incidents of misuse, near misses or accidents have been recorded at the site.</p> <p>A pedestrian user census was undertaken in June / July 2016 and</p>	<p>The crossing is completely surrounded by agricultural fields and provides access to farm houses located approximately 400m to the north-west (on Mellis Road) and 720m south-east of the crossing. A church is located on Mellis Road, a total walking distance of approximately 950m away from the level crossing. It is therefore unlikely that residents in the south-east will use this route to access this facility. Consequently, it is unlikely that</p>	<p>This level crossing will be downgraded to a bridleway. There is already an existing traffic regulation order prohibiting vehicle movements north of Locks Cottage along Cow Pasture Lane which extends to the north side of the level crossing. Therefore, this legal downgrade will not affect existing users and formalises the existing use.</p>	<p>As the crossing will be downgraded to bridleway status, no change in pedestrian accessibility will occur.</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>As the current route will remain open and no diversion route will be implemented, it is not felt that a DIA is required – pedestrian access will be retained at the current level.</p>
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³¹ The diversion includes stretches with a gradient of over 15%, however after assessing the data against the terrain this is likely to be due to an error in the available data. See section 1.5 for more detail.

Existing configuration		Future configuration				
		recorded 67 adults using the crossing over the nine-day period.	community severance impacts will occur as a result of the closure.			
			There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.			
S21 - Abbotts						
Abbots level crossing is a private footpath crossing located in Mellis Parish connecting residential properties on Earlsford Road to some farm houses and agricultural land on the opposite side of the railway.	The approach to the pedestrian gate on the eastern side is along the side of a field, culminating in a stile fence just before the railway. On the western side, the approach is over a patch of grass, again with a stile just before the crossing. As such, people with mobility impairments or parents with pushchairs are currently unable to use this crossing.	No incidences of misuse, near misses or accidents have been recorded at the site. However, due to the risks of sun glare for pedestrians and frequent trains, Abbots level crossing has acquired a risk rating of C6. Safety features of the crossing include signage and stiles on either side of the crossing. A pedestrian census was undertaken in July 2016 and recorded 26 users of the crossing over the nine-day period – including 24 adults and two accompanied children.	The crossing is on the outskirts of the village of Mellis, and is located in close proximity to community facilities which are of importance to equality groups, such as a church and a primary school. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.	This level crossing will be closed to all users. Users will need to cross the railway by using the Mellis automatic half barrier road level crossing to the north. This diversion uses the footway on Mellis Road as well as rural roads without footways and existing footpaths. Crossing infrastructure will be removed and type F4 fencing installed to prevent trespass onto the railway.	The diversion route takes users to a controlled crossing, Mellis level crossing, which somewhat limits the safety benefits of closing the crossing. There are also no designated footpaths on either Mellis Road or Earlsford Road, meaning that users would have to walk in the carriageway. Walking distances along this diversion route increase to 1,006m, which is an increase of 866m. This is likely to pose significant challenges for people who struggle to walk long distances. The proposed diversion route has a maximum gradient of 1.4%, which is very similar to the existing route and suggest that no impact will be felt by people who may struggle with steep gradients.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Despite accessibility problems at the current crossing, the proposed diversion routes raises significant problems. Walking distances are significantly increased and users would have to walk in the carriageway along parts of the route. Therefore, it was felt that further investigation was required and a DIA was undertaken.
S22 - Weatherby						
The level crossing at Wetherby is a pedestrian crossing point in the town of Newmarket, Suffolk.	On the northern side, the crossing is accessed via Granary Road. There is a pedestrian crossing linking the level crossing to the pavement on the opposite side of Granary Road. On the southern side, the level crossing is accessed via Willow Crescent, with a pavement leading up to the crossing. On both sides, the approach is paved, level and accessible for any users with mobility issues and people with pushchairs or in wheelchairs/mobility scooters. There are also gates on either side of the crossing.	Approximately 34 trains travelling at 40mph use this part of the network daily. In the twelve month period prior to June 2014, one near miss and no incidents of misuse were recorded at the site. Due to the risks of sun glare, user misuse and the high number of users, Weatherby level crossing has acquired a risk rating of D2. Safety features of the crossing include signage and a gate. A pedestrian user census undertaken in June / July 2016 recorded 3,732 pedestrians, including 291 accompanied children, 119 unaccompanied children, six older people, 17 impaired users, one wheelchair user and 119 pushchairs / prams.	The crossing is in an urban area, with houses, a football club and allotments within 150m. Consequently, the crossing is frequently used (on average 454 pedestrians a day) and it is likely that people from different equality groups use it to access employment, education and community resources frequently. There is a low to moderate density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.	The proposal is to close the level crossing to all users and divert pedestrians to an existing underpass on The Avenue / New Cheveley Road, 200m south west of the current crossing. Current crossing infrastructure would be removed and fencing installed to prevent trespass onto the railway.	The proposed diversion route takes users to an existing underpass, which may restrict use for some people due to the steepness and poor lighting of the route. Parts of the diversion route, particularly Cricket Field Road, also only have narrow footways on one side of the road, meaning that some users may be forced to walk in the carriageway. Sections of this route also include stretches with a gradient between 5 and 7.5%, particularly along Green Road, New Cheveley Road and Cricket Field Road. This is steeper than the current route gradient and may be challenging for older people, wheelchair users, or parents with pushchairs. Walking distances along this route are likely to increase to 907m, an increase of 891m. This will pose significant challenges for people who struggle to walk long distances – notably those users with mobility problems.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Despite accessibility problems at the current crossing, the proposed diversion routes raises significant problems. Walking distances are significantly increases and users would have to walk in the carriageway along parts of the route. There may also be some issues with steep gradients along the route. Therefore, it was felt that further investigation was required and a DIA was undertaken.
S23 – Higham						
The level crossing is located in rural Suffolk and is surrounded by agricultural fields. The crossing has currently been closed for safety reasons due to the condition of the approach to the railway.	The accessibility of this crossing is severely limited by the approach roads being through uneven and occasionally muddy farmland that would pose a significant challenge to many wheelchair users and people with limited mobility. The uneven surfaces and obstacles to reach the crossing effectively exclude	The overall risk rating of this site is C9 with the high frequency of trains using the line and the risk of sun glare identified as key risk drivers at this site. The presence of signage is identified as the key safety feature at the crossing. There are approximately 104 trains using this line each day, travelling at speeds of up to 75mph.	This crossing connects a small area of farmland secluded from the surrounding area by the A14, the railway line and Higham Road to another area of farmland. Higham Road, which runs parallel to the pathway from this crossing, approximately 300m east, allows access to the surrounding area, while	This level crossing will be closed to all users. Crossing infrastructure shall be removed and type F7 fencing installed to prevent trespass onto the railway. Users shall be diverted via existing rural roads, to cross over the railway at the road bridge on Higham Road to the east of the existing level crossing.	The proposed diversion route directs users to Higham Road to the east of the crossing – there is no footpath on either side of the road or over the bridge. This means people will be forced to walk in the carriageway, potentially causing a detrimental effect on pedestrian safety.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.

Existing configuration

	wheelchair users from accessing the crossing.	<p>There have been no reported accidents, near misses or incidents or user misuse at this site, this may partly be attributable to the infrequency with which the crossing is used.</p> <p>A pedestrian user census was undertaken in June / July 2016 did not record any users of the crossing.</p>	<p>the pathway from the crossing leads to the edge of the A14 which pedestrians should not try to cross. These may contribute to the infrequency with which this crossing used.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>		<p>The diversion also requires users to walk along grassy verges along the A14. This is likely to pose problems in terms of both pedestrian accessibility and safety.</p> <p>The route also proposes the creation of steps and a timber footbridge on Coalpit Lane, which may restrict access for some users.</p>	<p>Although there is the potential for problems with pedestrian accessibility along the proposed diversion route, as the crossing has already been closed for safety reasons due to the condition of the approach to the railway, closure and redirection is not likely to reduce pedestrian accessibility and safety.</p> <p>Therefore, no DIA is required.</p>
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S24 - Higham Ground Frame

<p>The level crossing is a public footpath in rural Suffolk, completely surrounded by agricultural fields.</p>	<p>The accessibility of this crossing is limited by the approaching roads being through uneven and muddy farmland that would pose a challenge to many wheelchair users and people with limited mobility. The uneven surfaces may serve to exclude some wheelchair users from accessing the crossing.</p>	<p>The overall risk rating of this site is C7 with the high frequency of trains using the line and the risk of sun glare identified as key risk drivers at this site. The presence of signage is identified as the key safety feature at the crossing. There are approximately 104 trains using this line each day at speeds of up to 75mph. There have been no reported accidents, near misses or incidents or user misuse at this site, this may partly be attributable to the relative infrequency with which the crossing is used.</p> <p>A pedestrian census undertaken in 2016, recorded 50 adults using the crossing over the nine-day period. However, it must be noted that all 50 were recorded on one day, suggesting that overall usage of the crossing is relatively minimal.</p>	<p>It connects a small area of farmland secluded from the surrounding area by the A14, the railway line and Higham road to another area of farmland. This crossing is used approximately twice a day, this is likely to be for recreational walking or cycling as there is reason to use this crossing to access any specific destination.</p> <p>The level crossing is located approximately 140m south of the A14 connecting footpaths W-316/003/0 to W-127/006/01 running north to south. Footpath W-316/003/0 is currently intersected by the A14. There is a small area of woodland and dense vegetation immediately north east of Higham Ground Frame and arable land to the south.</p> <p>The closest residential properties are located approximately 560m south west of the level crossing.</p> <p>There is an area of historic landfill approximately 120m north of the level crossing and Breckland Farmland SSSI and SPA are located approximately 1.4km from the level crossing. Breckland Farmland SSSI and SPA are located approximately 150m north of proposed bridleway creation works.</p> <p>There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.</p>	<p>Existing public rights of way over the level crossing will be extinguished. Users south of the railway will be diverted along a new 2m wide type P1 footpath from footpath W-127/006/01 heading either west towards Higham Road bridge.</p> <p>Crossing infrastructure will be removed at Higham Ground Frame level crossing and type F7 fence to be installed to prevent trespass to the railway.</p>	<p>The proposed diversion route takes users to an existing bridge to the east of the crossing. Higham bridge does not have a pedestrian footway on either side of the bridge and the route requires users to walk in the carriageway on existing highways. This is likely to cause a significant problem to the north of the crossing, as the road looks busy and has warning signs for soft verges, potentially reducing pedestrian accessibility and safety.</p> <p>It is also proposed that steps and a timber footbridge will form part of the route. This may restrict access for some people who may potentially struggle to negotiate the new infrastructure.</p> <p>The majority of the proposed diversion route also has a gradient under 5%, there are the potential for some sustained stretches between 5 and 6.3%.³² This may be challenging for older people, wheelchair users, or parents with pushchairs.</p> <p>The proposed diversion route increase walking distances fby 1km..</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>Although current accessibility at the crossing is not especially inclusive, the presence of steps as part of the route means that pedestrian accessibility is likely to be reduced. Walking distances are also likely to increase as a result of the proposed diversion.</p> <p>Therefore, it is felt that a DIA is required.</p>
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S25 - Cattishall

<p>This crossing is a relatively popular pedestrian level crossing connecting a small area of housing with a large housing estate in Cattishall, east of Bury St Edmunds in Suffolk.</p>	<p>The good level of accessibility is a strength of this crossing as it is fully paved, including the approaches and uses wide standard gates that would allow most standard width wheelchairs and mobility scooters to use the crossing.</p>	<p>Survey data shows that approximately 41 people use this crossing each day. The overall risk rating for the crossing is C4 with the large number of users, sun glare and high frequency of trains identified as key risk drivers at this site. The presence of signage is identified as the key protection against these risks.</p> <p>This site sees approximately 110 trains each day, travelling at speeds of up to 75mph. The risks at this site, including the increased risk brought</p>	<p>The level crossing connects a paved track running south-north Mount Road (Cherry Trees property) and Green Lane via Cattishall Farm. The agricultural fields south of the level crossing and west of Cattishall Farm are allocated for development. The closest residential properties are located at Cattishall Farm 120 m north of the level crossing and 200 m west at Great Barton.</p> <p>This crossing does not appear to provide vital access to community</p>	<p>This level crossing will be closed to all users. Crossing infrastructure will be removed and type F4 fencing installed to prevent trespass onto the railway. Users shall be diverted on a new public track in farm fields on the north side of the railway which provides a link to Mount Road via an existing railway underpass and the shared cycle/foot path. This will be suitable for use as a cycle trail.</p>	<p>The proposed diversion route takes users to an existing underpass, which could potentially restrict pedestrian accessibility. However, it is noted that work will be undertaken on the underpass to improve pedestrian access.</p> <p>Walking distances at this location will be significantly increased – by 1,013m from 233 to 1,246m. This is likely to be seriously challenging for people who struggle to walk long distances –</p>	<p>Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing.</p> <p>It appears likely that the proposed diversion route will not change pedestrian accessibility compared to the existing route (both appear fully accessible). However, the significant</p>
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³² The diversion includes stretches with a gradient of over 15%, however after assessing the data against the terrain this is likely to be due to an error in the available data. See section 1.5 for more detail.

Existing configuration			Future configuration			
		about by the approximately 41 users per day has resulted in there being one accident at this site, this was prior to the May 2014 assessment with none since. In addition to this, there have been two near misses at the site since May 2014 and one incident of user misuse which was prior to May 2014.	facilities but may provide easier access to the houses and several businesses directly to those who live on the north side of the crossing. For the houses north of the line, closure of this crossing would add approximately 4km onto a trip to the other side of the crossing if they were not using a car and around an additional 6km if they were using a car. There is a low to moderate density of all equality groups for which we have data in the immediate area, including under 1s, over 65s, people with a LLTI, and people from BAME groups. There is a high density of people under 16 living in the local area. As with national trends, there is a low proportion of people from minority faith groups.		especially people with mobility problems. All of the proposed diversion route has a gradient of under 5.6%, apart from two points which on closer inspection appear to be errors in the available data. Therefore, it is unlikely that the gradient of the new route will cause any problems in terms of accessibility.	increases in walking distances mean that further investigation should be undertaken at this location. Therefore, a DIA is required (it is noted that a DIA has been undertaken by Network Rail).
S27 – Barrels						
The crossing is located on a public footpath that runs from north to south through agricultural land from the end of Birds Road in the south to Barrels Road to the north.	The narrow, unpaved, pathways that lead to the crossing are uneven and overgrown in places and the use of both stiles and steps to reach the line makes this journey untenable for those with disabilities and parents with pushchairs. This crossing does not provide a connection between the two sides of the line that would otherwise be unreachable.	An estimated 98 trains, travelling at speeds of up to 75mph, use this part of the network daily. Due to the frequency of trains and additional risks of sun glare, this level crossing has acquired a risk rating of C6. Visibility along the line is generally good and safety features at the site include stiles and signage. It is important to note that no accidents, near misses or incidents of misuse have been reported for this site. A pedestrian census undertaken in 2016, recorded 23 adults (including one older person) using the crossing over the nine-day period.	There are a small number of dispersed properties in the vicinity of the crossing, the nearest of which are located 70m to the south, 120m to the north east and 150m to the north. The village of Thurston is located approximately 350 north west of the crossing at its nearest point. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. Therefore it is unlikely that community severance and / or disproportionate equality impacts will arise as a result of the closure.	This level crossing will be closed to all users. Crossing infrastructure will be removed and type F7 fencing installed to prevent trespass onto the railway. Users heading west will be diverted to Barrel's Road (west) and shall cross the railway at the existing road bridge. Users heading east will be diverted on new 1.5m wide footpath and existing public footpaths to Barrel's Road (east). The new footpath on the north side of the railway shall be in Network Rail land, will be fenced off from the railway and shall be constructed to an appropriate standard, including new wayfinding signs. Details will be discussed and agreed with the local authority.	The diversion route directs users to one of two proposed crossing points. The first is Barrell's Road to the west, which currently does not have a pedestrian footway on either side of the road. However, it is noted that pedestrian improvements will be implemented along this part of the route. Along other parts of the diversion route, there are no pedestrian footways along some of the existing roads. This may reduce pedestrian accessibility, as many (such as Birds Lane) are very narrow with poor visibility, meaning users may be forced into the carriageway. Although most of the proposed diversion route has a gradient of under 5%, the approaches to Barrell's Road bridge potentially has gradients that are significantly above this. These gradients are steeper than the existing route. There is therefore the potential for negative impacts for people who struggle with steep gradients. ³³ To the east users would be directed to Barrell's Road east, which also does not have a footpath meaning that users would have to share the space with vehicles. Walking distances along this route will be increase be 972m – from 321 to 1,293m. This is likely to significantly increase walking distances and pose problems to users with mobility problems.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. As pedestrian accessibility at the current location is restricted (due to the presence of steps, stiles and overgrown pathways), it is felt that pedestrian accessibility will not be reduced. Although, it is noted that there is likely to be a significant increase in walking distances and potential for steep gradients, it is not felt that accessibility will decrease as a result. It is also noted that the crossing is very remote and pedestrian usage is also limited. Therefore, no DIA is required.
S28 - Grove Farm						
This is a pedestrian crossing that connects an area of farmland to a small area of housing on Bird's Road near Bury St Edmunds.	The accessibility of this crossing is poor as the crossing has stiles and steps. This excludes wheelchair users, those with pushchairs and many with	This site has an overall risk rating of C6 with the high frequency of trains and sun glare identified as key risks. The presence of signage is noted as	The crossing is located on a public footpath that runs in a north-easterly direction through agricultural land from the end of Birds Road 180m to the	This level crossing will be closed to all users. Crossing infrastructure will be removed and type F4 fencing installed to prevent trespass onto the railway.	The diversion route directs users to one of two proposed routes. The first is Barrell's Road to the west, which currently does not have a	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level

³³ The diversion includes stretches with a gradient of over 15%, however after assessing the data against the terrain this is likely to be due to an error in the available data. See section 1.5 for more detail.

Existing configuration

limited mobility from using the crossing. The narrow and unpaved pathways along the edges of farm fields on either side also act to exclude these groups for whom the uneven surfaces and high chance of mud poses a significant challenge.	the key protection against this risk. Each day, approximately 109 freight and pedestrian trains use this section of the line, travelling at speeds of up to 75mph. There have been no reported accidents, near misses or incidents of user misuse at this site. A pedestrian user census undertaken in June / July 2016 and recorded 13 adults using the crossing over the nine-day period.	west to an unnamed public highway 400m to the east. There are a small number of dispersed properties in the vicinity of the crossing, the nearest of which are located 70m to north east and 100m to the north west. The footpath passes West Cottage, a Grade II listed building approximately 400m east of the crossing. The village of Thurston is located approximately 550 north west of the crossing at its nearest point. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. There are also no community facilities in the area that the crossing provides access to.	Users heading west will be diverted to Barrels Road (west) and shall cross the railway at the existing road bridge. Users heading east will be diverted on new 1.5m wide footpath and existing public footpaths to Barrels Road (east). The new footpath will be in Network Rail land, shall be fenced off from the railway and will be constructed to an appropriate standard, including new wayfinding signs. Details will be discussed and agreed with the local authority.	pedestrian footway on either side of the road. However, it is noted that pedestrian improvements will be implemented along this part of the route. Along other parts of the diversion route, there are no pedestrian footways along some of the existing roads. This may reduce pedestrian accessibility, as many (such as Birds Lane) are very narrow with poor visibility, meaning users may be forced into the carriageway. To the east users would be directed to Barrell's Road east, which also does not have a footpath meaning that users would have to share the space with vehicles. This proposed diversion route results in a total walking distance of 769m, this is 245m further than the current route. This may pose challenges to some users groups. Although most of the proposed diversion route has a gradient of under 5%, the approaches to the bridge to the east of the crossing potentially has gradients that are significantly above this (between 6 and 46%). This may pose challenges for people who struggle with steep gradients and represents a significant increase on the existing route.	crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. As pedestrian accessibility at the current location is restricted (due to the presence of steps, stiles and narrow and uneven pathways), it is felt that pedestrian accessibility will not be reduced. It is also noted that usage of the crossing is limited. Therefore, no DIA is required.
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S29 - Hawk End Lane

The crossing is a pedestrian only crossing that connects the back of a housing estate with an industrial estate on the other side of the railway line.	Accessibility is an issue for this crossing as there is a stile on each side of the track which would exclude wheelchair users and those with limited mobility from accessing the crossing. The narrow alley that is the approach to the crossing would also restrict wheelchair users and those with pushchairs or young children as the overgrown grass and dilapidated fencing may pose a challenge to mobility and a risk to young children.	The overall risk rating for this site is C7. Approximately 110 trains per day use this stretch of track and travel at speeds of up to 75mph. It is for this reason that the high frequency of trains is a key risk factor for this crossing, along with the risk of glare from the sun. Signage warns users of the general risk they face and this is the only safety feature. It is estimated that approximately two pedestrians or cyclists use this crossing each day. There have been no recorded accidents, near misses or incidents of user misuse at this site. The crossing is currently closed owing to adjacent construction work.	The crossing is located at the junction of two footpaths, one that runs north eastwards through an industrial area, and one the runs south and joins Hawk End Lane approximately 20m to the south. The land to the south of the railway is occupied by a densely populated residential area of Elmswell with the nearest properties within 10m of the crossing. There are also a number of listed properties in the vicinity, the nearest of which is on Hawk End Lane, approximately 50m south east. The land to the immediate north and north east of the crossing is occupied by a development site. There are agricultural fields 75m north west of the crossing and in the wider surrounding area. There is a low density of all equality groups for which we have data in the immediate area, including under 1s and people from BAME and minority faith groups. There is a moderate density of people with a LLTI and those over 65 living in close proximity to the crossing.	Close the level crossing to all users. Users walking on the north side of the railway would be diverted west on a new 2m wide public footpath, mostly along field margins, to an existing underbridge at Hall Farm. New wayfinding signs with details to be discussed and agreed with the local authority. Users on the south side of the railway would use the existing public footpath, W-234/013/0#2 to travel to the underbridge. In addition to this, users wishing to travel east would be able to cross the railway at Elmswell manned barrier and CCTV monitored level crossing on Station Road. To get to Elmswell level crossing users on the north side of the railway will use the existing public footpath, W-234/012/0 and the business park footways. Users on the south side of the railway would use the footways on Station Road and School Road to access Elmswell level crossing. Crossing infrastructure would be removed and type F4 steel fencing installed to prevent trespass onto the railway.	The proposed diversion route requires users to negotiate new footpaths to be created in field margins. This may restrict accessibility for some users who require even surfaces. To the west, users will also be diverted to an existing underbridge, which could potentially pose some problems for user groups. To the east, users would be diverted to Elmswell level crossing, which is a managed barrier controlled crossing. Although the crossing is flat with segregated pedestrian walkways, the use of another crossing somewhat limits the safety benefits associated with closing Hawks End level crossing. Walking distance at this crossing is likely to increase by 871m (from 70 to 942m). This is likely to pose significant challenges for people who struggle to walk long distances, especially people with mobility problems. Although most of the proposed diversion route has a gradient of under 5%, some sections particularly to the west of the crossing have sustained period of between 5 and 15%. This may be challenging for older people, wheelchair users, or parents with pushchairs and represents an	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. As accessibility at this crossing is already restricted (by the presence of stiles and natural tracks), meaning that closure and redirection would improve accessibility. Although, it is noted that there is likely to be a significant increase in walking distances and the potential for steep gradients, it is not felt that accessibility will decrease as a result. In addition, pedestrian usage of the crossing is likely to be low. The developer will be providing a new accessible footpath 'short cut' to Station Road, which will help to mitigate the increased walking distances created by the closure of the level crossing. Therefore, no DIA is required.
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Existing configuration	Future configuration					
						increase as compared to the current route.
S30 - Lords No. 29						
This is a pedestrian level crossing just outside Elmswell in Suffolk.	The accessibility of this crossing is poor as the approaches are narrow, uneven and muddy tracks that run along fields in dense farmland. This has the effect of making access difficult for many people with limited mobility or those who use wheelchairs. Similarly, the presence of stiles and steps to access the crossing itself also restrict and exclude users with limited mobility and those who use wheelchairs as well as people with pushchairs who would not realistically be able to navigate the stiles and steps.	The overall risk rating of this crossing is C6 with the high frequency of trains and sun glare noted as key risk drivers and the presence of signage identified as key mitigation of this risk. This site has approximately 109 freight and passenger trains travelling at speeds of up to 75mph along this line each day. Despite the risks, there have been no reported accidents, near misses or incidents of user misuse at this site. A pedestrian census, undertaken in June / July 2016, recorded 49 people using the crossing over the nine-day period. This included 44 adults, one unaccompanied child and four accompanied children.	This crossing is used an estimated six times a day and due to the surrounding area and its distance from community facilities, homes and businesses. It is likely that these uses are for recreational travel such as walking or cycling. There is an alternative route over the railway line via a footbridge approximate 220m west of this crossing that could take the additional capacity of this crossing were it to be closed. Both this crossing and the alternative one lead to the same field, so recreational users of this crossing would not be too severely impacted by its closure. The land surrounding the crossing comprises of agricultural fields. The town of Elmswell is located to the west, with the nearest residents located approximately 240m to the west. Mutton Hall, a Grade II listed building is located approximately 500m to the south east There is a low density of all equality groups for which we have data in the immediate area, including under 1s and people from BAME and minority faith groups. There is a moderate density of people with a LLTI and those over 65 living in close proximity to the crossing.	This level crossing will be closed to all users. Users will be diverted to the existing bridge to the west via a new 2m wide public footpath in field margins on the north side of the railway. An additional new 2m wide public footpath will be created parallel to the railway on the south side (to be confirmed with the landowner) to allow users to continue to utilise the existing network of permissive footpaths on the Mutton Hall estate. The new footpaths shall be constructed to an appropriate standard with new wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure shall be removed and type F7 fencing installed to prevent trespass onto the railway.	The alternative route via the footbridge is more accessible as it uses ramps rather than steps. Although, these ramps take the form of long and unpaved pathways that may be a significant challenge to people with limited mobility or wheelchair users. The majority of the diversion route has a gradient of under 5%, however the approaches to either side of the footbridge potentially have a gradient which exceeds 15%. This is significantly steeper than the existing route and may pose challenges for users who struggle with steep gradients. The creation of new footpaths in field margins may also potentially cause accessibility problems, especially for users who require even surfaces. Use of this route is likely to increase walking distances by 458m – an increase from 28 to 486m. This is likely to pose significant problems for people who struggle to walk long distances.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Although there is the potential for problems for some user groups along the proposed diversion route, it is felt that the replacement of steps and stiles with ramps will help to improve pedestrian access. Moreover, the approaches to the current route are along narrow, muddy and uneven track meaning that the alternative route via a footbridge and new footpaths is likely to improve pedestrian safety. Although it is noted that walking distances are going to be significantly increased and there is the potential for steep gradients. Safety benefits are also likely to be important for the children using the crossing. Overall, it is felt that a DIA is not required.
S31 - Mutton Hall						
This crossing is a pedestrian crossing at Base Green, east of Elmswell in Suffolk.	The accessibility of this site is limited by the narrow, uneven and overgrown pathways from which the crossing is reached and the presence of stiles, which collectively exclude wheelchair users, people with pushchairs and those with impaired vision or mobility who would be at an unduly great risk from attempting to cross.	The overall risk rating for this site is C6 with the high frequency of trains and sun glare identified as key risk drivers with signage noted as key protection against some of this risk. This crossing sees approximately 109 passenger trains per day, travelling at speeds of up to 75mph. There have been no reported accidents, near misses or incidents of user misuse at this site. A pedestrian user census undertaken in June / July 2016 recorded 38 people using the crossing over the nine-day period. This included 34 adults, two accompanied children and two impaired users.	The crossing is located at the junction of three footpaths, one the runs west along the north side of the railway, one that runs west along the south side of the railway before turning south to follow the course of a stream, and one that runs east along the north of the railway. The area surrounding the crossing is predominantly agricultural with a small number of dispersed farm buildings and residential properties in the vicinity. The nearest is Batts Farm, also a listed building, approximately 200m to the north east. An unnamed stream is located approximately 120m west of the crossing. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.	This level crossing will be closed to all users. Users will be diverted via existing public footpath W-554/020/0 to the north of the railway and via a new 2m wide public footpath to the south of the railway to the existing road bridge on Westerden Street. The new footpath will be constructed to an appropriate standard with new wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure shall be removed and type F7 fencing installed to prevent trespass onto the railway.	The proposed diversion route requires users to walk in the carriageway on Westerden Street, which may reduce pedestrian safety. However, it is noted that route improvement measures are under consideration. Although the majority of the route has a gradient of below 5%, there is the potential for gradients (of up to 45%) on the approaches to the existing road bridge on Westerden Street. The proposed route increases walking distances by 499m, an increase from 24 to 525m. This is likely to pose significant challenges for people who struggle to manage long distances.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Although walking distances are significantly increased and there is the potential for steep gradients along the proposed diversion route, pedestrian accessibility is likely to be improved by closure and redirection of crossing users (as stiles will no longer form part of the route and the pathways will not be overgrown, narrow and uneven). In addition, pedestrian usage of the crossing is also limited. Therefore, a DIA is not required.
S33 - Westerfield						
This crossing is part of the East Suffolk Line Walks route between the Westerfield and Castle Hill areas of north Ipswich.	The accessibility of this site is severely limited by the presence of stiles, steps and uneven pathways through which the crossing is accessed. This	The overall risk rating for this site is C6 with the high frequency of trains and sun glare highlighted as key risk drivers and the presence of signage	The closest residential properties are at Westerfield, approximately 180m to the east of the level crossing.	This level crossing will be closed to all users. Crossing users would make use of Westerfield Road level crossing to the east. Westerfield Road and E-	The proposed diversion route takes users to a controlled crossing, Westerfield level crossing, somewhat	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level

Existing configuration

Fonnereau Way (Footpath E-014 018/0#1), an unpaved path, leads along treeline bordering fields from The Grove at the north-east border The Dales/Ipswich to Lower Road in Westerfield, approximately 1.3km north-east. The path crosses the railway approximately 210 m west of the Westerfield Rd crossing.	crossing connects two pathways with mud or grass surfaces that are too narrow to reasonably allow wheelchair users access to the crossing itself. These pathways would also cause difficulty for users with limited mobility or visual impairments, for whom the uneven ground and various obstacles would likely cause a significant challenge and have major safety implications, given that this is a level crossing with trains travelling in either direction on both tracks. The stiles and steps effectively exclude wheelchair users and those with pushchairs and the presence of exposed, rusted ironwork poses a hazard to users, especially young children.	noted as a key safety feature. There are approximately 133 trains per day that use this section of the line, travelling at this crossing at speeds of up to 60mph. Despite the risks at this site, there have been no reported accidents, near misses or incidents of user misuse. A pedestrian user census undertaken in June / July 2016 recorded 45 users over the nine-day period. This included 39 adults and six accompanied children.	There is a low to moderate density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups. There are also no community facilities, businesses or homes that area accessed solely by this crossing.	014/018/01 will be connected with a new 2m wide footpath alongside the south of the railway. To the north of the railway E-14/018/0#1 will be linked to Westerfield Road along a new 2m wide footpath on an existing track. Type F9 fencing will be installed between the new footpath and the railway. Users shall make use of the footway along the west side of the Westerfield Road to connect the two new footpaths. New wayfinding signs with details to be discussed and agreed with the local authority. Crossing infrastructure at shall be removed and type F4 fencing installed to prevent trespass onto the railway.	limiting the benefits of closing crossing. The proposed diversion route increases total walking distance to 329m – an increase from 241 to 570m. This may pose challenges for people who struggle to walk long distances, especially those with mobility problems. Apart from three points which appear to be errors with the available data, the diversion route has a gradient of under 5%. This is less steep than the existing route and is unlikely to result in challenges for people who struggle with steep gradients.	crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Due to the current accessibility problems (due to steps, stiles and inaccessible walking route to access the crossing), it is felt that the new route will improve pedestrian access for all user groups. The gradient of the proposed diversion route is also less steep than the existing route, which may potentially benefit some users. Therefore, no DIA is required.
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S69 – Bacton

Bacton level crossing lies directly to the south of the small village of Bacton. Arable farmland lies on both sides of the railway track. The existing Footpaths run along the boundaries of agricultural fields. W-115/022/0#2 leads to a number of footpaths along agricultural field connecting to Church Road Bacton, approximately 900m north-west of the level crossing. To the east, the Footpath leads to Finningham Road in Fords Green (approximately 550 m).	The approach to the level crossing is uneven with a gravel path and requires the use of stiles. It is unlikely therefore that the crossing is currently used by people with mobility issues, or with wheelchairs and pushchairs.	Bacton level crossing is a ‘Stop, Look and Listen’ crossing, where the user determines whether it is safe to cross. The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of C6. The individual risk rating for crossing users is ‘C’ (where ‘A’ is highest risk and ‘M’ is lowest) and the collective risk rating for this crossing is ‘6’ (where ‘1’ is highest risk and ‘13’ is lowest), making Bacton a high-risk crossing. Key issues relate to frequent trains and sun glare. Approximately 100 trains (both passenger and freight) use it daily, and a line speed of 100mph. Between 2011 and 2015, there weren't any incidents of misuse, near misses or accidents at the crossing. 28 pedestrians were recorded using the crossing over the nine-day survey period (undertaken in June/July 2016).	The nearest residential property is located approximately 450 m to the east of the crossing (Fords Green). There are numerous listed buildings within 1 km of the works including two grade I and two grade II* listed buildings. There is a low density of all equality groups for which we have data in the immediate area, including under 1s, under 16s, over 65s, people with a LLTI, and people from BAME and minority faith groups.	The proposal involves diverting users to an existing underbridge on Pound Hill, which is 150m from the current crossing (via Broad Road to the east and Birch Avenue to the west). Users would connect to the existing public right of way network to the west via an existing track and the addition of a new 2m wide footpath and a proposed timber footbridge over an existing drainage ditch which currently provides an obstruction. In addition, a second 2m wide footpath will run down the eastern side of the railway to connect to S13 Fords Green. The new footpaths and footbridge will be constructed to an appropriate standard and will include new wayfinding signs.	The diversion route takes users under Pound Hill underbridge which does not have a designated footpath. There is also no footpath on Broad Road B1113, meaning that pedestrian safety may be reduced. It was noted that Pound Hill underbridge was used by 22,531 vehicles during the nine-day survey period. This proposed diversion route will increase walking distances by 1,028m, from 95 to 1,123m. This is likely to pose serious problems for people who struggle to walk long distances, particularly those with mobility problems. The entire proposed diversion route has a gradient of under 5%. This is not steeper than the current route and so should not pose any problems in terms of accessibility.	Safety is especially relevant as children, older people, disabled people and men are more likely to be involved in accidents at level crossings than other groups in society. In general, personal safety for these groups will be improved by the closure of the crossing. Although the approach to the current crossing is restricted, due to the potential for safety issues associated with users having to walk significant distances, and for some distance in the carriageway on a busy road, it is felt that further investigation is required. Therefore, Bacton was subject to a more detailed DIA.
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4.3 Recommendations

In light of the evidence presented, the following crossings were recommended (in earlier versions of this report) for further DIA analysis:

- S24 – Higham Ground Frame
- S21 – Abbotts
- S22 – Weatherby
- S69 – Bacton
- S25 – Cattishall

All DIAs recommended above had been undertaken at the time of updating this report to revision C.



M. Diversity Impact Assessments

Diversity Impact Assessment (DIA)

Guidance for completing each section is provided in the
Everyone Guide to Diversity Impact Assessments

Name of policy, programme or project: S16 – Gislingham - Anglia Level Crossing Reduction Strategy

Your Name: TBC

Your Job Title: Scheme Project Manager

Your Email: TBC

Department: Level crossings

Document Ref: TBC

Version No: 1

Step 1: Clarifying aims

Q1. What are the aims of this project/piece of work?



Anglia Level Crossing Reduction Strategy (Strategy)

Network Rail has committed to achieving a 25% reduction in level crossing system risk nationally as part of a programme of works undertaken within Control Period 5 (CP5), which runs from 2014-19.

Network Rail has been working hard to better manage its level crossings and the risks they pose. It has developed proposals for the possible closure or change to public rights of way at around 130 level crossings within the counties of Suffolk, Cambridgeshire, Essex, Hertfordshire, and the unitary authorities of Thurrock,

Havering, and Southend-on-Sea. Closing or modifying level crossings can help to bring about a number of benefits. It can:

- improve the safety of level crossing users;
- deliver a more efficient and reliable railway, which is vital in supporting the regional and UK economy;
- reduce the ongoing operating and maintenance cost of the railway;
- reduce delays to trains, pedestrians and other highway users; and
- improve journey time reliability for railway, highway and other rights of way users.

S16 – Gislingham level crossing

Gislingham level crossing is located in the parish of Finningham, Suffolk. The crossing spans the two track Great Eastern Main Line (running from Norwich to London).

Gislingham is a 'Stop, Look and Listen' bridleway level crossing, where the user determines whether it is safe to cross. Access to the crossing on both sides is via uneven track and crossing gates.

The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of C9. The individual risk rating for crossing users is 'C' (where 'A' is highest risk and 'M' is lowest) and the collective risk rating for this crossing is '9' (where '1' is highest risk and '13' is lowest), making Gislingham a high-risk crossing. Approximately 90 trains use this part of the network daily at a line speed of 100mph. Key issues at the crossing include frequent trains and sun glare. Between 2011 and 2015 there were no incidents of misuse, no near misses and no accidents recorded at this location.

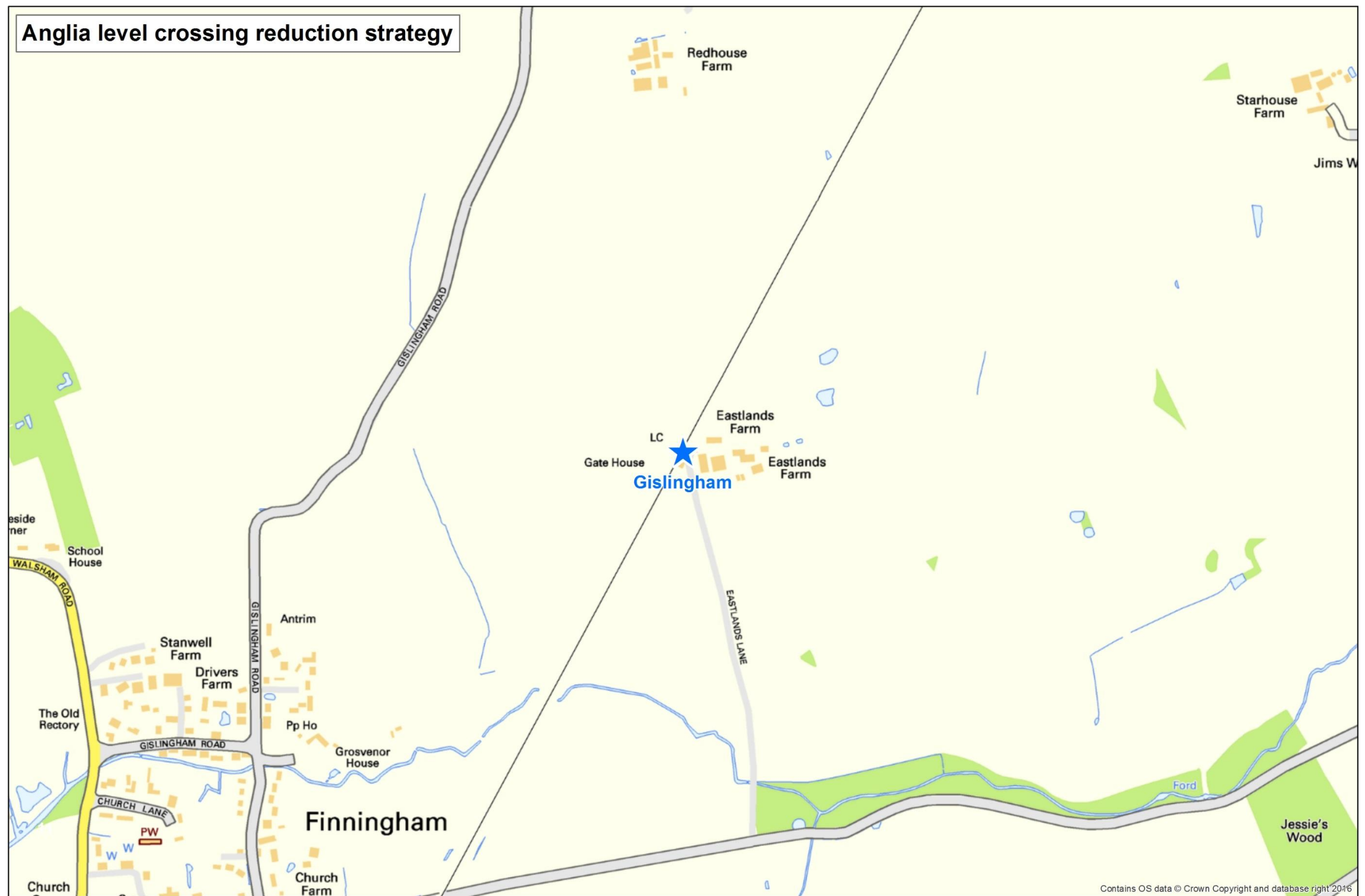
Network Rail aims to ensure the most viable option for continued access across the line based on the need to ensure public safety, meet local needs, and ensure compliance with its duties under the Equality Act 2010.

Project location

Gislingham level crossing is located north east of the village of Finningham. To the east of the crossing is a small collection of buildings associated with Eastlands Farm. Agricultural land surrounds the crossing at all other directions. The nearest railway station on the Great Eastern Main Line in Diss, approximately 11km north of the level crossing.

Appendix A contains site photographs and the below map shows the location of the level crossing.

Anglia level crossing reduction strategy



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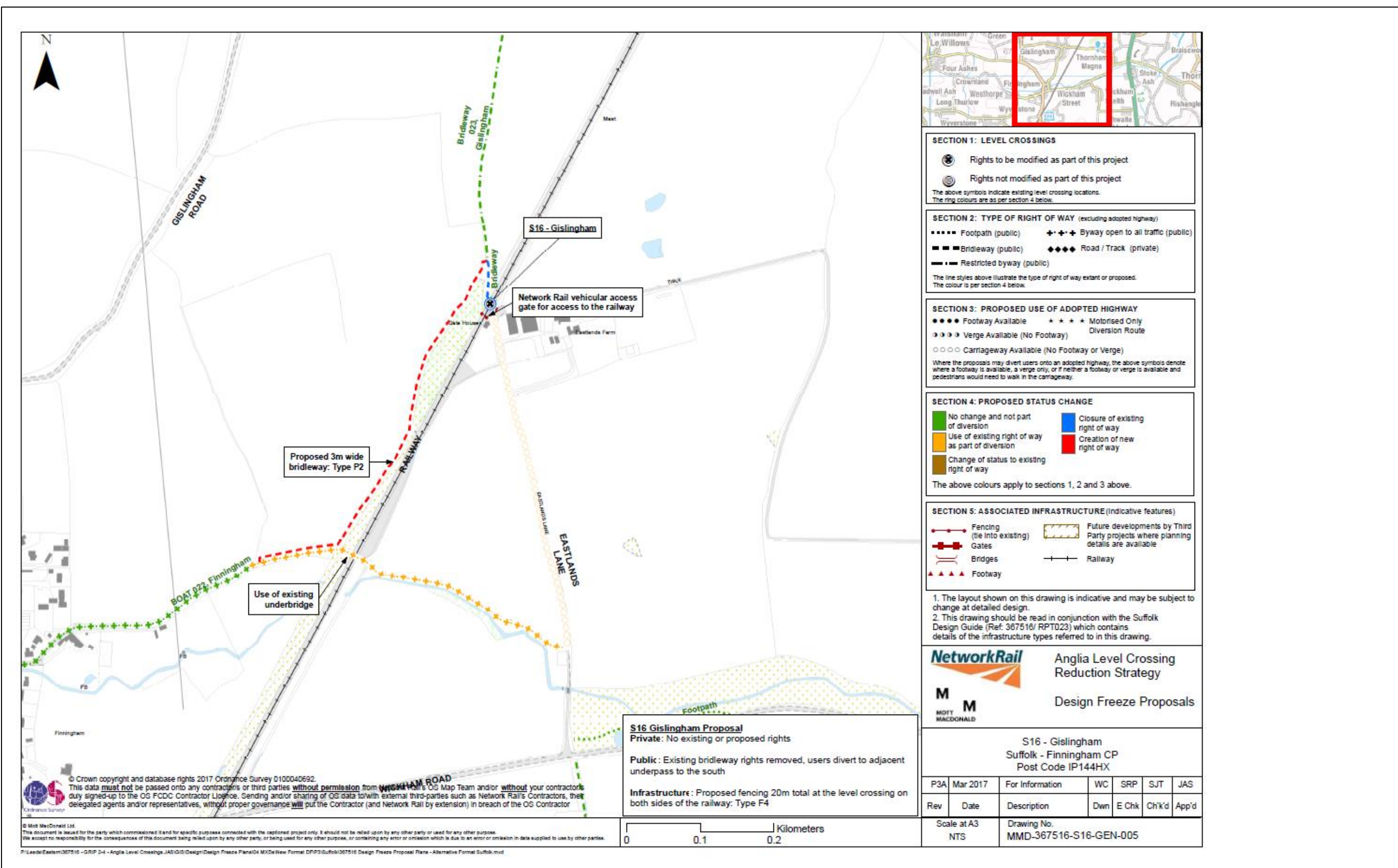
Proposals for the project

Network Rail has conducted two rounds of public consultation regarding Gislingham level crossing - the first was to obtain feedback on initial options for all level crossings in the programme (in June 2016), and the second was to obtain feedback on the preferred options (in September 2016). Following the receipt of this feedback, consideration was given as to how any proposed closure of the level crossing and implementation of an alternative route might best be progressed and managed.

Following feedback on the round two of public consultation, the proposal is to close Gislingham level crossing to all users and remove the crossing infrastructure. The preferred proposal is to divert users to an existing underbridge located 380m south of the level crossing (as detailed in the figure below).

On the western side of the railway, the underbridge would be accessed via a new 3m wide bridleway, linking to the existing public byway open to all traffic (BOAT 022) and the underbridge. Similarly, access to the underbridge from the eastern side of the railway would be via Eastlands Lane and BOAT 022. This diversion would add 250m to the route for those wishing to access the Wickham Road/Eastlands Lane junction. Users from Eastlands Farm wishing to access the bridleway west of the level crossing would have an additional length of 1.2km to the route as a result of the level crossing closure.

The figure below shows the preferred diversion route following feedback at Round 2 of public consultation. This is also available in **Appendix B**, along with initial options for diversions, taken to Round 1 and 2 public consultations.



Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, the work could impact on people.

Potential positive impacts: Without the closure of Gislingham level crossing, there is a risk of a future incident at this location. The closure of the crossing will separate people from the railway line, thereby improving safety for all users. Safety benefits are more likely to be experienced by some protected characteristic groups – such as children, older people, males, and disabled people (see below).

Potential negative impacts: The proposals for Gislingham level crossing and its associated diversion are likely to impact accessibility, walking distances, and journey times for people using the crossing.

Step 2: The evidence base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics:

- Disability including carers¹
- Pregnancy/maternity
- Religion or belief
- Sexual orientation
- Gender reassignment
- Age
- Race
- Gender
- Marriage/Civil Partnership

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

User profile

The nine-day census carried out over June and July 2016 indicated that a total of five people (including two railway personnel) used the level crossing over the survey period – an average of less than one person per day. All users were adults. No children, older people, impaired people, wheelchair or scooter users, or people with pushchairs / prams were recorded using the level crossing.

A breakdown of the census data can be found in **Appendix C**.

Population profile

In order to gain a better insight into the local community and potential users of the level crossing, existing statistical data was reviewed to establish the composition of the local population – here taken as Mid Suffolk.² These are as follows:

- Children (under 16 years of age) make up 18% of the Mid Suffolk population, which is in line with the national average of 19%.
- Younger people (16-24 years old) make up 9% of the population of Mid Suffolk, which is slightly lower than the national figure (12%).
- The proportion of older people (here described as people of retirement age – 65 and over) in Mid Suffolk is 20%, which is slightly higher than the national figure of 16%.

¹ Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support

² Source: ONS Population estimates taken from nomis. Available at:
[https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid suffolk](https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid%20suffolk)

- 17% of the Mid Suffolk population is living with a long-term illness or disability that limits their daily activities. This is in line with the national average (18%).
- 4% of the population of Mid Suffolk is from Black, Asian or minority ethnic (BAME³) groups. This is considerably lower than the national figure of 20%.
- The figure for people belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) in Mid Suffolk is 1%, which is much lower than the national average of 9%.

The above demographic analysis suggests that the populations of all of the protected characteristics (for which there is demographic data) are broadly in line with national proportions. There are two exceptions: Mid Suffolk has a considerably lower proportion of people from BAME and minority faith groups.

Local amenities

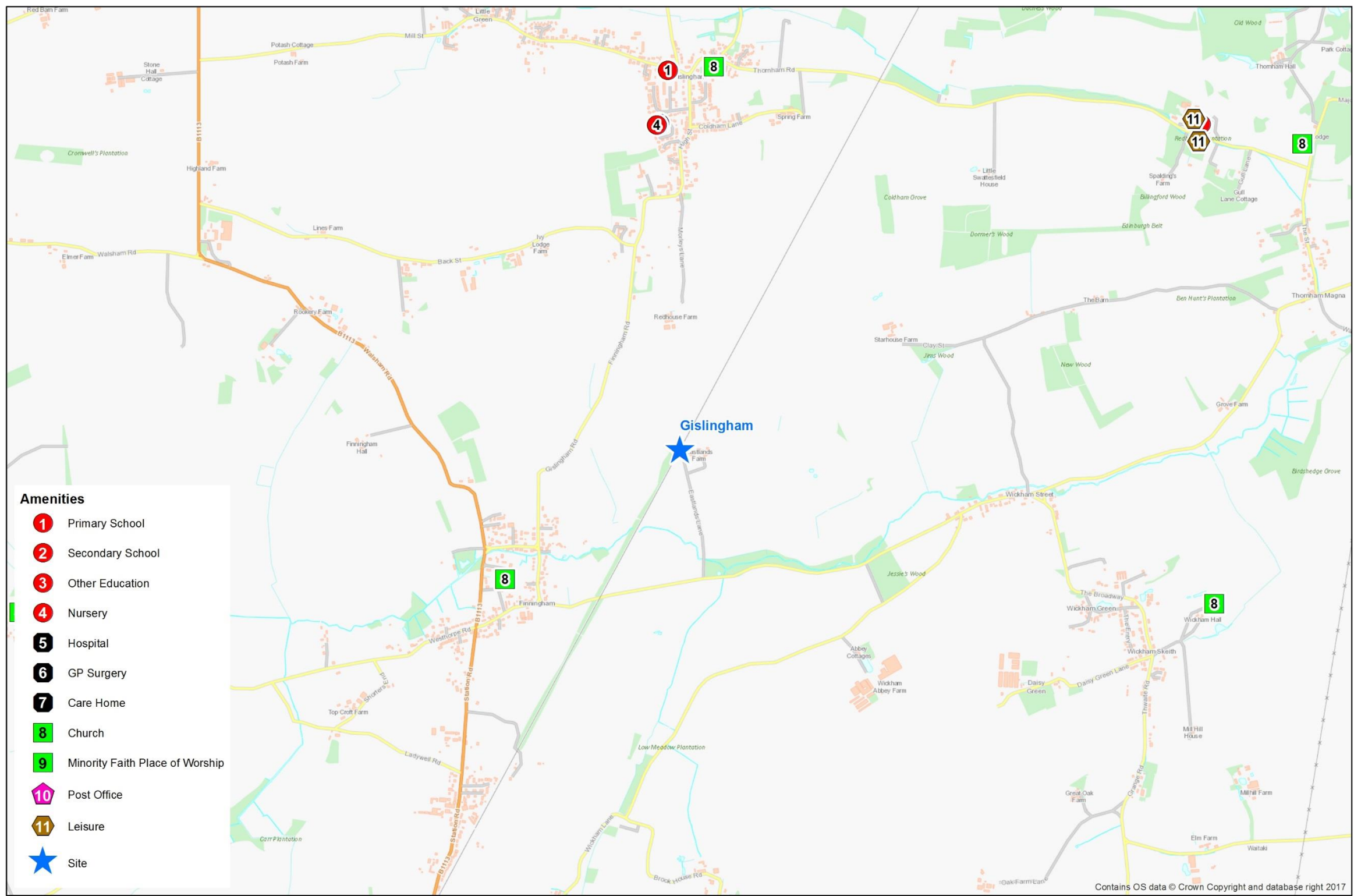
An analysis of local planning applications in May 2017 highlighted that there are currently no plans for development in the area local to the crossing.⁴

An analysis of local amenities indicates that there are very few amenities of importance to equalities groups within 2km of Gislingham level crossing. These include two churches, one in Gislingham and one in Finningham, a nursery school and a primary school.

The map below shows local amenities.

³ Including white Irish, Gypsy and Irish travellers and other white ethnic population groups.

⁴ Mid Suffolk Council: <http://planningpages.midsuffolk.gov.uk/online-applications/simpleSearchResults.do?action=firstPage>.



Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially negative impacts could this work have on people with protected characteristics?

The below table assesses the potential impacts of the proposed work at Gislingham level crossing on the protected characteristic groups as outlined in the Equality Act 2010 (disability, age, pregnancy / maternity, race, religion / belief, gender, sexual orientation, marriage / civil partnership and gender reassignment).

Protected Characteristic	Impact	Explain the potential negative impact
Disability	Y	<p>The permanent closure of Gislingham level crossing will remove pedestrian access at this point.</p> <p>Safety issues related to level crossings can disproportionately impact disabled people, older people, children and men. This is because:</p> <ul style="list-style-type: none"> Crossing speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may also be less able to cross safely because of these factors. People with visual or hearing impairments can also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.⁵ Older people have potentially slower walking speeds and their field of vision tends to decline over time. Studies have shown that this can be at a rate of 1° and 3° per decade.⁶ Older pedestrians (aged 65 or over) walk more slowly than other pedestrian users (the mean walking speed achieved by over-65s in controlled studies was 0.9 metres per second (m/s) in men and 0.8 m/s in women, compared to the mean for the population as a whole of 1.2m/s⁷), placing older people at greater risk. Children and younger people have potentially slower walking speeds and can have difficulties correctly processing the speed of oncoming vehicles.⁸
Age	Y	
Pregnancy / maternity	N	
Race	N	

⁵ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁶ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

⁷ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

⁸ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

Religion or belief	N	<ul style="list-style-type: none"> Male pedestrians dominate accidents at level crossings they are associated with 70% of all train strikes. Given that males represent approximately 50% of the population as a whole, this would suggest male pedestrians are more at risk at level crossings than female pedestrians.⁹
Gender	Y	<p>Reduced interaction with the railway at this point may potentially result in a reduced crossing risk for these groups. However, due to the lack of recorded usage by older people, disabled people and children, there will be no considerable change to baseline safety.</p> <p>There will be a permanent increase in walking distance of between 250m and 1.2km for those following the diversion route. Increases in walking distances, as a result of the proposed permanent diversion route, typically affect some protected characteristic groups more than the general population, notably disabled and older people (particularly those with reduced mobility).</p>
Sexual orientation	N	<ul style="list-style-type: none"> Older and disabled people are more likely to have difficulties walking long distances and experience pain or discomfort in doing so.¹⁰ Of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.¹¹ Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and are more likely to struggle to climb stairs.¹²
Marriage/Civil Partnership	N	
Gender reassignment	N	<p>However, due to the lack of recorded usage by these two groups, there will be no change to baseline accessibility. It should be noted that there are no amenities in close proximity to the site that would be used disproportionately by disabled and older people. As such, it is highly unlikely that any impacts would be experienced disproportionately.</p>

⁹ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

¹⁰ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹¹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹² NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway' Diversity and inclusion 31032015

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- Commitment 1: Get everyone home safe every day.
Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary route.
- Commitment 2: Deliver reliable infrastructure.
The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- Commitment 6: Being a customer focused organisation.
The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.
- Commitment 9: A railway fit for the future.
The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

The below are views received through public consultation events. As such, views expressed are not necessarily received from or relevant to those who share a protected characteristic.

List the groups you have consulted or reference previous relevant consultation? ¹³	What issues were raised in relation to one or many of the protected characteristics?
Public consultation Round 1 (June 2016)	As part of round 1 of public consultation, one questionnaire response was received for Gislingham level crossing. The sole respondent stated that they would have no objection to the proposal to permanently close the level crossing providing the new red route provided is constructed as a bridleway to the point where it joins Eastlands Lane (see Appendix B.1).
Public consultation Round 2 (September 2016)	As part of public consultation round 2, five questionnaire responses were received. Four respondents either agreed

¹³ This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

	<p>or strongly agreed with the proposals to permanently close the crossing, and one strongly disagreed.</p> <p>Questionnaire responses received during the second round of public consultation identified the following comments / issues:</p>
Landowner response	<ul style="list-style-type: none"> • If more traffic is likely to use the existing underbridge the bridleway may need more maintenance, with any additional costs being met by Network Rail. • There is currently very little use of the level crossing by vehicles other than rail work, but it does have pedestrian use.
Stowmarket Ramblers Footpath Secretary response	<ul style="list-style-type: none"> • No objection to the proposal providing the new red route provided (see Appendix B2) is constructed as a bridleway to the point where it joins Eastlands Lane.
Public responses	<ul style="list-style-type: none"> • Gislingham level crossing currently acts as a barrier to horse riders as it is too dangerous to be used. The enhancement of the bridleway network avoiding would therefore benefit this group. • If the crossing is closed then the new bridleway must be recorded on the Suffolk County Council definitive map and statement. • Wayfinding signs should be installed on the same day that the crossing is closed – this has been weeks in other closure instances e.g. Symonds level crossing. • Eastlands Farm has recently been purchased and is being set up to accommodate equestrian facilities. The proposed diversion route adds a return journey of 2.4km, and the section of the diversion westwards from the south end of Eastlands Lane is badly affected by wet conditions. • Future plans to develop an equestrian business here will be adversely impacted if Gislingham level crossing is closed. The proposed closure of the level crossing is therefore objected to.

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

N/A

Step 5: Informed decision-making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).

1. Change the work to mitigate against potential negative impacts found	
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	<p>✓</p> <p>Due to the current user profile and availability of alternative routes, closure and redirection along the proposed diversion route is considered an appropriate solution.</p> <p>Route improvements should be considered for the proposed diversion to ensure accessibility.</p>
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	

Step 6: Action planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By who
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and other benefits of the scheme, including user safety.	Ongoing	Network Rail project team
Explore improvements to diversion routes including: signage to support way finding; and ensuring level surfaces. This will ensure that pedestrian accessibility is maintained along the route. Ensure that measures to improve the permanent diversion route meet guidelines in the Equality Act 2010 wherever possible to ensure that the	Prior to implementing works	Network Rail liabilities team

route is as accessible as can be for all groups.		
At detailed design, measures should be considered to improve pedestrian safety in the underbridge, so that standards and DfT guidelines can be met wherever possible and practicable. Within the underbridge, consideration should be given for the provision of handrails set at 1000mm above the walking surface on both sides. There should be a clear view from one end to the other and appropriate levels of light. Where security is a concern, CCTV cameras should also be considered in underbridges. Notices to the effect that CCTV is in operation should deter vandals and provide a measure of comfort to pedestrians. ¹⁴	Detailed design	Network Rail project team
Review the DIA at every GRIP stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team

Step 7: Sign off

Name	Position	Signed	Date
DIA Owner TBC	Scheme Project Manager		
Superuser ¹⁵	Liability Negotiations Mgr	<i>Steve Day</i>	05/02/2018
Senior Manager ¹⁶			

If you don't have a local superuser please send your DIA for quality assurance to DiversityImpactAssessment@networkrail.co.uk

To help us respond more quickly please make sure you have;

1. Sent your DIA as a Word document not a PDF
2. Used this naming convention '**Name of project-Draft DIA**'
3. Used the correct DIA form with no additional pages e.g. 'not for circulation cover-sheets'
4. Included any relevant maps / diagrams needed to understand your project
5. Completed all sections of the DIA in line with guidance and training

¹⁴ Department for Transport (2005): 'Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'.

¹⁵ Quality assurance check.

¹⁶ Sign-off should be by someone who can approve policy, programme or budget changes.

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

Appendix A: Site photographs

Existing level crossing

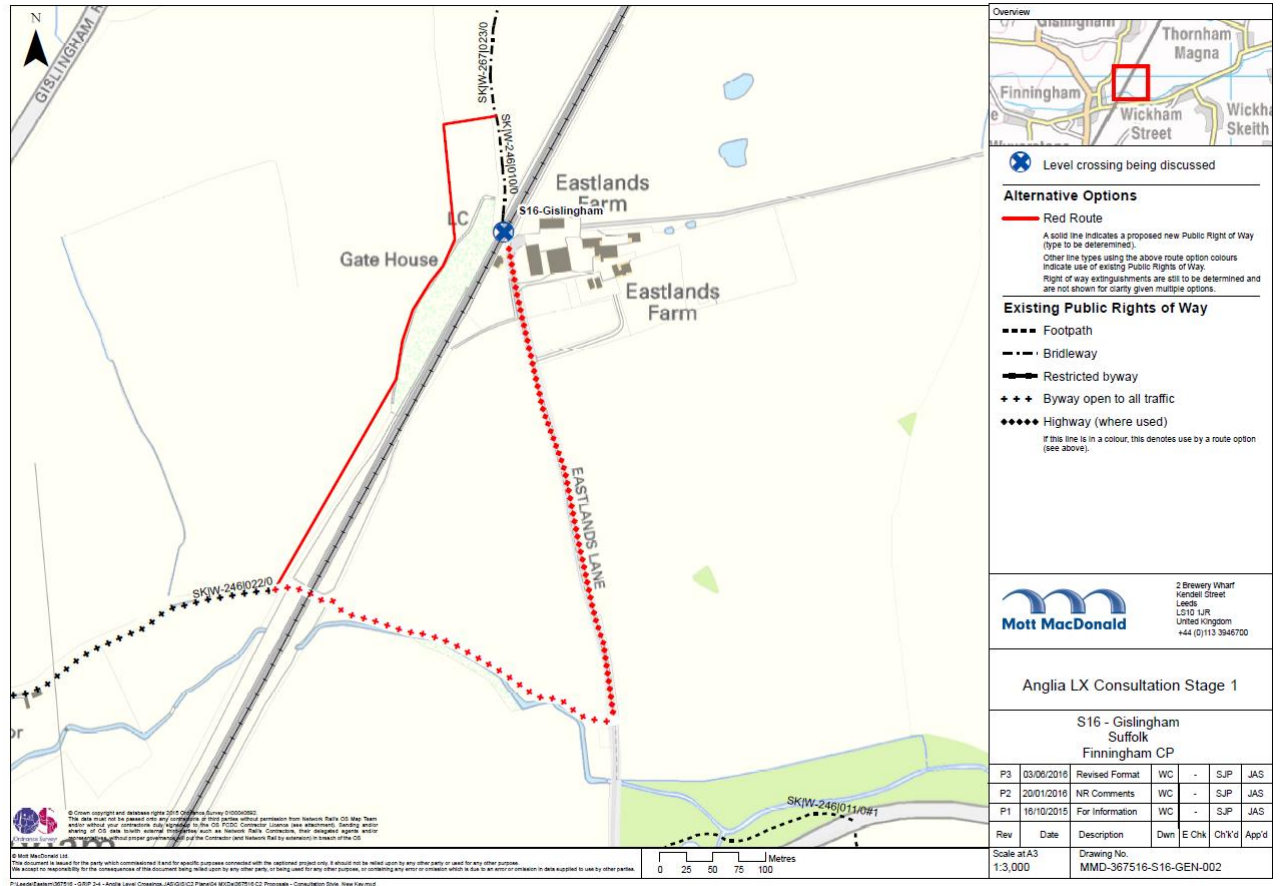


Alternative railway crossing – existing underbridge

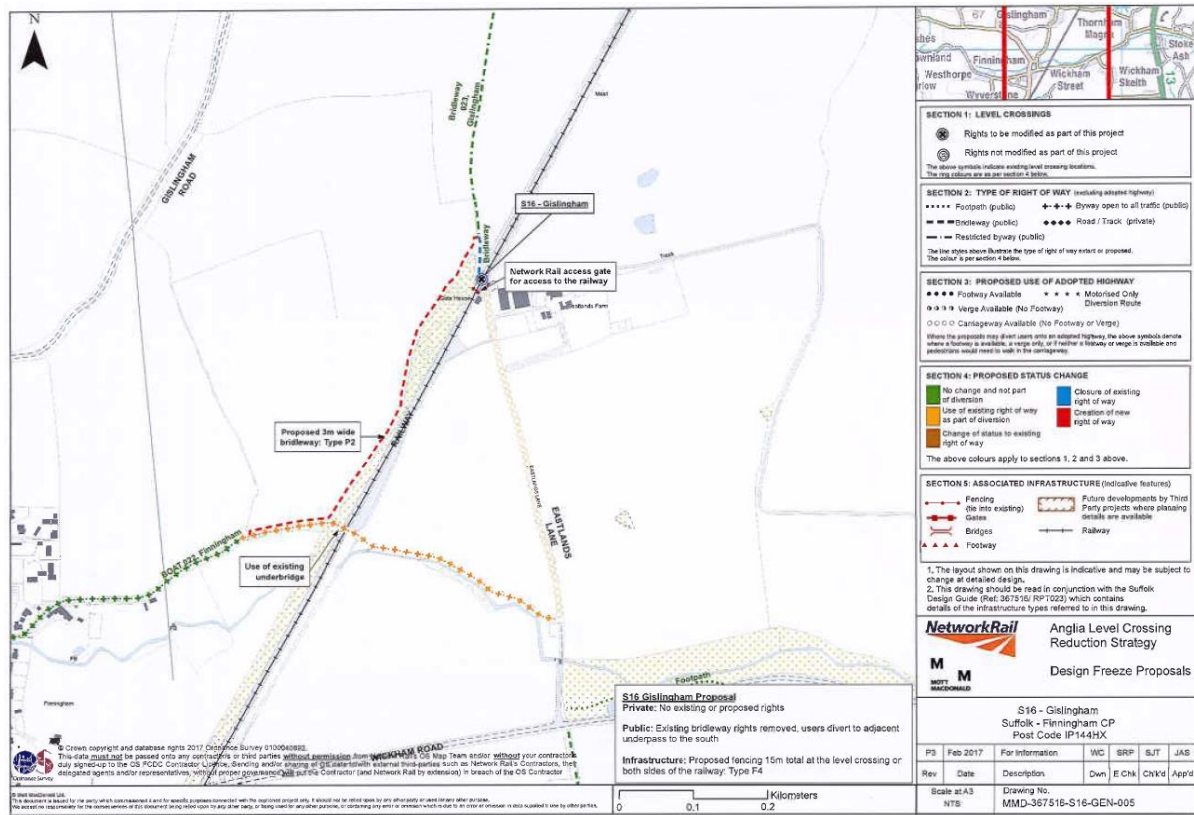


Appendix B: Scheme drawings

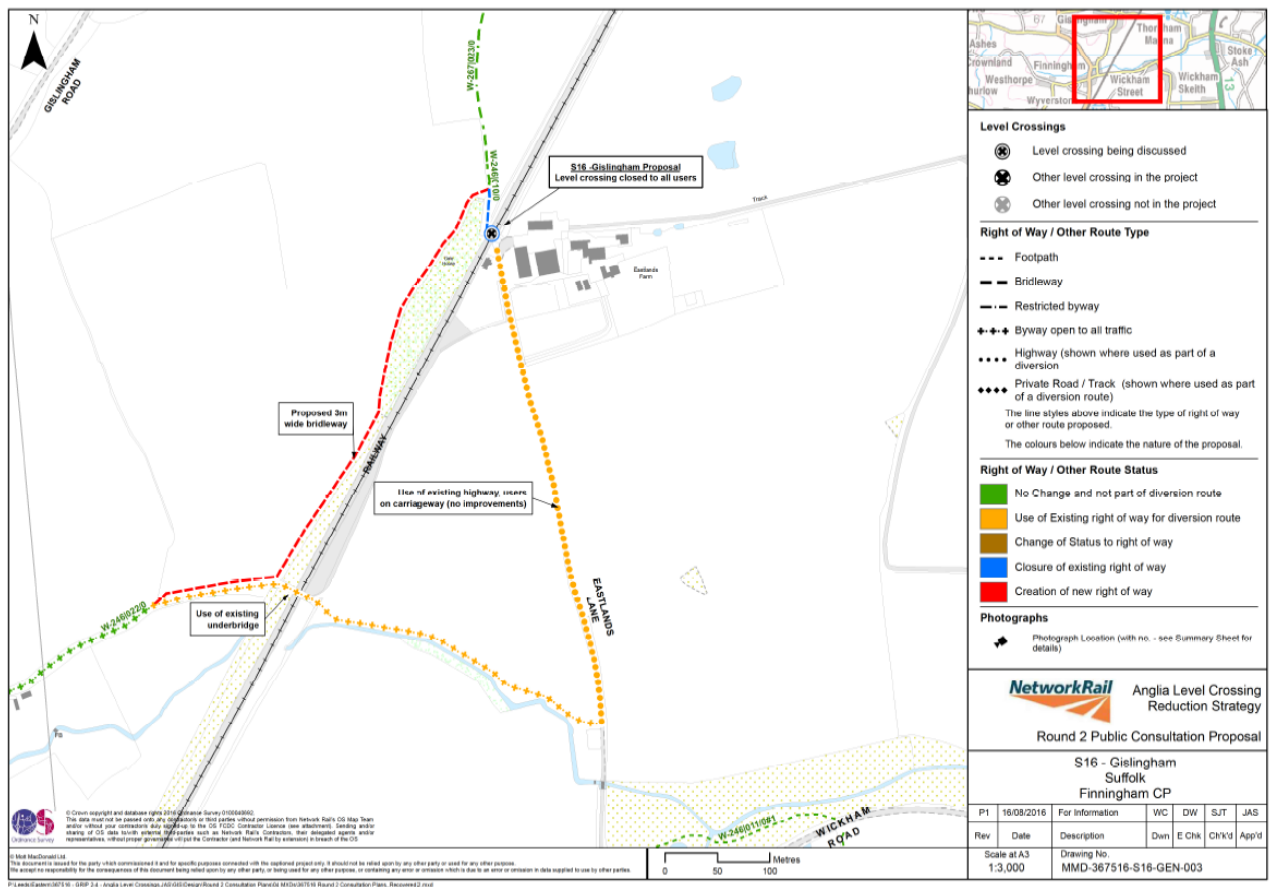
B1. Round 1 consultation – proposed diversion (initial option)



B2. Round 2 consultations – preferred option (September 2016):



B3. Following Round 2 consultations – preferred option (at time, April 2017)



Appendix C: Nine-day pedestrian census report

Summary

The survey was successfully completed in accordance with the Network Rail specification.

The data is summarised below:

Pedestrians		Adult	Accompanied	Unaccompanied	Elderly	Impaired	Wheel-	Pushchair /	Mobility	Railway	Total
Saturday	25/06/2016	0	0	0	0	0	0	0	0	0	0
Sunday	26/06/2016	0	0	0	0	0	0	0	0	0	0
Monday	27/06/2016	0	0	0	0	0	0	0	0	0	0
Tuesday	28/06/2016	0	0	0	0	0	0	0	0	0	0
Wednesday	29/06/2016	0	0	0	0	0	0	0	0	2	2
Thursday	30/06/2016	0	0	0	0	0	0	0	0	0	0
Friday	01/07/2016	1	0	0	0	0	0	0	0	0	1
Saturday	02/07/2016	0	0	0	0	0	0	0	0	0	0
Sunday	03/07/2016	2	0	0	0	0	0	0	0	0	2
		3	0	0	0	0	0	0	0	2	5

Diversity Impact Assessment (DIA)

Guidance for completing each section is provided in the
Everyone Guide to Diversity Impact Assessments

Name of policy, programme or project: S21 Abbotts – Anglia Level Crossing Reduction Strategy

Your Name: TBC

Your Job Title: Scheme Project Manager

Your Email: TBC

Department: Level crossings

Document Ref: TBC

Version No: 1

Step 1: Clarifying aims

Q1. What are the aims of this project/piece of work?



Anglia Level Crossing Reduction Strategy

Network Rail has committed to achieving a 25% reduction in level crossing system risk nationally as part of a programme of works undertaken within Control Period 5 (CP5), which runs from 2014-19.

Network Rail has been working hard to better manage its level crossings and the risks they pose. It has developed proposals for the possible closure or change to public rights of way at around 130 level crossings within the counties of Suffolk, Cambridgeshire, Essex, Hertfordshire, and the unitary authorities of Thurrock,

Havering, and Southend-on-Sea. This is referred to as the Anglia Level Crossing Reduction Strategy ('the Strategy'). Closing or modifying level crossings can help to bring about a number of benefits:

- Improve the safety of level crossing users
- Deliver a more efficient and reliable railway, which is vital in supporting the regional and UK economy
- Reduce the ongoing operating and maintenance cost of the railway
- Reduce delays to trains, pedestrians and other highway users
- Improve journey time reliability for railway, highway and other rights of way users

S21 – Abbotts level crossing

Abbotts level crossing is located in the parish of Mellis, Suffolk. The crossing spans the double track Great Eastern Main Line (running from Norwich to London).

The crossing deck is wooden with anti-slip boards. The use of stiles is required to access the crossing. Appendix A contains site photographs.

Abbotts level crossing is a 'Stop, Look and Listen' crossing, where the user determines whether it is safe to cross. Between 2011 and 2015, no incidents of misuse, near misses or accidents were recorded at the site. Stakeholders identified that key issues relate to poor visibility due to sun glare and a high volume of trains. Approximately 100 trains (both passenger and freight) use this part of the network daily, and the line speed is 100mph.

The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of C6. The individual risk rating for crossings is 'C' (where 'A' is the highest risk and 'M' is lowest) and collective risk rating for this crossing is '6' (where '1' is the highest risk and '13' is the lowest), making Abbotts a relatively high risk crossing.

Network Rail aims to ensure the most viable option for continued access across the line based on the need to ensure public safety, meet local needs, and ensure compliance with its duties under the Equality Act 2010.

Project location

As the railway line bisects Mellis, there are residential properties in close proximity on either side of the crossing. The level crossing provides access to Mellis Common. It is not a public right of way.

The map below shows the project location, as well as the nearby private crossing that was initially part of the programme, Beecroft.

Anglia level crossing reduction strategy



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Proposals for the project

Network Rail has conducted two rounds of public consultation regarding Abbots level crossing; the first was to obtain feedback on its initial options for level crossings in the programme (in June 2016), and the second to obtain feedback on its preferred options (in September 2016). As part of the Round 1 public consultation, nine responses were received, with two people preferring the red route and one respondent preferring the blue route (see Appendix B for details). Following the receipt of this feedback, consideration was given as to how any proposed closure of the level crossing and implementation of an alternative route might best be progressed and managed.

Following feedback from the first public consultation, the preferred proposal for Abbots level crossing is to close the route for all users and divert them via existing roads (as detailed below in Figure 1, and as presented at the second round of public consultation). Crossing infrastructure would be removed and fencing installed to prevent trespass onto the railway.

It is proposed that all users will be diverted to the Mellis Road level crossing (see Figure 1 below), which is located approximately 115m north of Abbots level crossing.

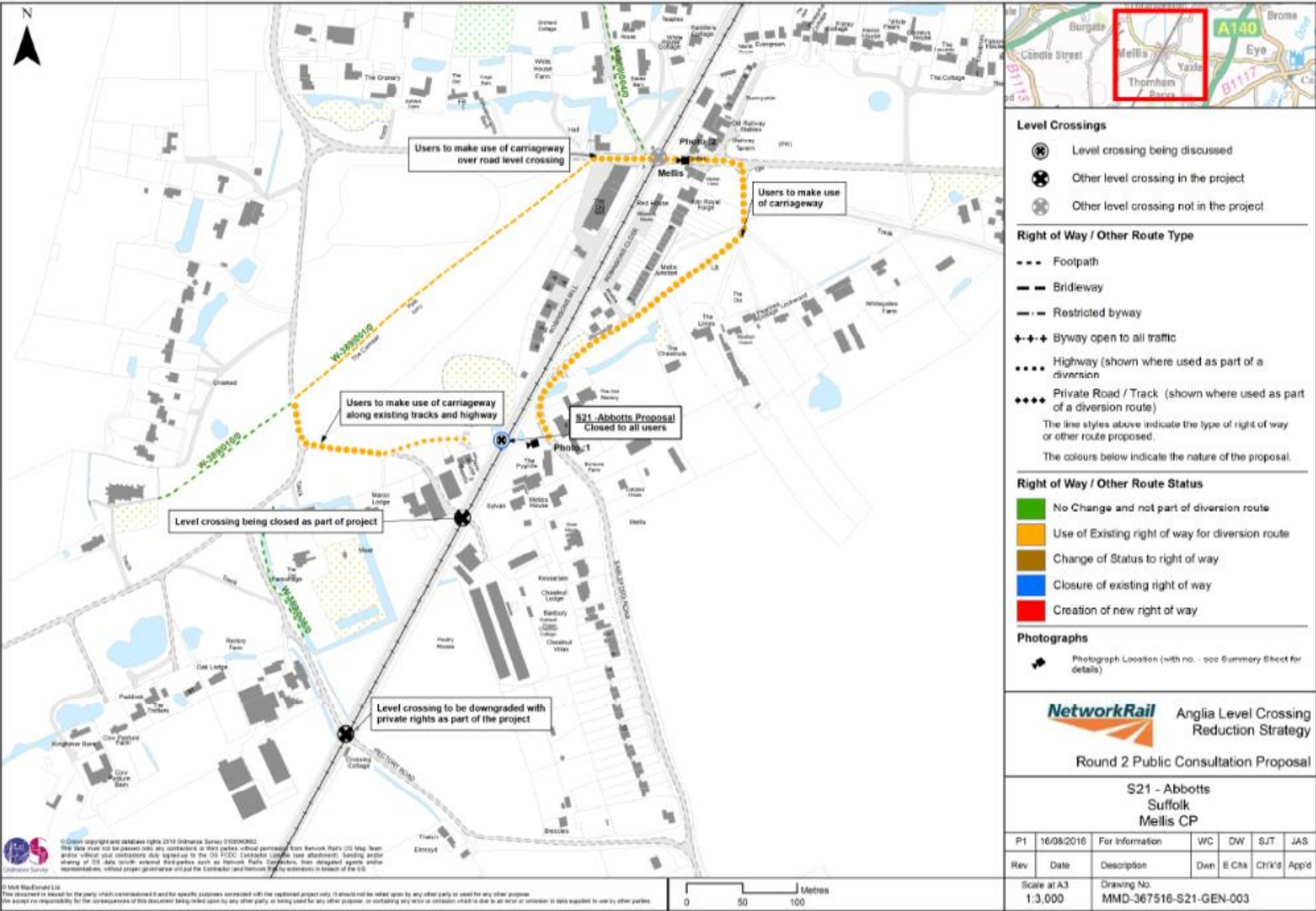
Stakeholders raised concerns about the safety of Mellis Road level crossing, which has an ALCRM score of D2 – also making it a high risk crossing (albeit with a slightly lower risk ALCRM score than Abbots). Mellis Road level crossing is an automatic half barrier crossing, meaning that it has road traffic signals and a lifting barrier on both sides of the railway. Audible warning for pedestrians is also in place.

The diversion route would increase walking distances, adding 620m to the route. There are no designated footways on either Mellis Road or Earlsford Road, meaning that users would have to walk in the carriageway. In addition to this, stakeholders raised concerns about pedestrian safety, due to the narrow width and blind bends on Earlsford Road, which makes it difficult for pedestrians to see and avoid oncoming vehicles. It is noted however that Abbots level crossing currently joins Earlsford Road, so users are already currently required to walk in the carriageway to some extent. Concerns have also been raised about the surface of both roads, as they are in a poor state of repair and flood regularly.

As part of the Round 2 public consultation, three responses were received to the questionnaire, with one agreeing and two disagreeing with the proposals.

The drawing below shows the preferred diversion route suggested at public consultation Round 2. This is also available in Appendix B, along with the proposed diversion taken to the Round 1 public consultation.

Figure 1



Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, without the closure of Abbots level crossing, there is a risk of a future incident at this location. The closure of the crossing will separate people from the railway line at a passive crossing, thereby improving the safety of users.

The proposals for Abbots level crossing will impact accessibility, walking distances, and journey times for people using the crossing.

The implementation of a permanent diversion via Earlsford Road and Mellis Road level crossing may disproportionately affect certain sections of the population who find walking long distances difficult and may struggle to negotiate the new route terrain.

It is noted that this proposal involves diversion from a passive to an active crossing. Mellis Road level crossing provides greater warning of approaching trains and is not dependent on users making their own decisions about the safety of crossing the line.

Step 2: The evidence base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics:

- | | |
|--|------------------------------|
| - Disability including carers ¹ | - Age |
| - Pregnancy/maternity | - Race |
| - Religion or belief | - Gender |
| - Sexual orientation | - Marriage/Civil Partnership |
| - Gender reassignment | |

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

User data

The nine-day census carried out in July 2016 indicated that a total of 24 people used the crossing, an average of three people per day. 22 out of the 24 users of the crossing were adults, with the remaining 2 being accompanied children. There were no recorded uses of the crossing by the following groups: unaccompanied children, older people, impaired or wheelchair users, or people with a pushchair / pram.

A breakdown of the census data can be found in Appendix C.

Population profile

In order to gain a better insight into the local community and potential users of the level crossing, existing statistical data was reviewed to establish the composition of the local population – here taken as the Mid Suffolk district.² The data is as follows:

- Children (under 16 years of age) make up 18% of the Mid Suffolk population, which is in line with the national average of 19%.
- Younger people (16-24 years old) make up 9% of the population of Mid Suffolk, which is slightly lower than the national figure (12%).
- The proportion of older people (here described as people of retirement age – 65 and over) in Mid Suffolk is 20%, which is slightly higher than the national figure of 16%.
- 17% of the Mid Suffolk population have a long-term illness or disability that limits their daily activities. This is the same as the national average.
- 4% of the population of Mid Suffolk is from Black, Asian or ethnic minority (BAME) groups. This is considerably lower than the national figure of 20%.

¹ Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support

² Source: ONS Population estimates taken from nomis. Available at:
[https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid suffolk](https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid%20suffolk)

- The figure for people belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) in Mid Suffolk is 1%, which is much lower than the national average of 9%.

The above demographic analysis suggests that the population proportions for many of the groups with protected characteristics (and for which there are demographic data) are broadly in line with national proportions. There are two exceptions: the proportion of people from BAME and minority faith groups is significantly lower in Mid Suffolk than nationally.

Local amenities

An analysis of the local area indicates that there is only a small number of amenities in the local area that are of particular importance to people from equalities groups, such as a care home (154m away), a church (approximately 400m away) and a primary school (760m away). Children living on the western side of the railway line may have the desire to use Abbots level crossing to access the primary school located to the east. However, due to the location of the school, the closure of the level crossing will not result in an increase of walking distance. Similarly, congregants living immediately to the east of the railway line may use the level crossing to reach the church. Following the proposed diversion route would double the distance required to attend church. It is, however, understood from stakeholder comments that the level crossing is not part of a key route used by the local community to access these facilities. It should also be noted that the crossing is not a public right of way; it provides access to the common for commoners only.

These presumed desire lines are based on the identified location of residential areas and community facilities within the immediate vicinity of the crossing. The development of a more substantive picture of local desire lines for the crossing and associated routes could be achieved through cordon survey interviews with users at fixed locations and times.

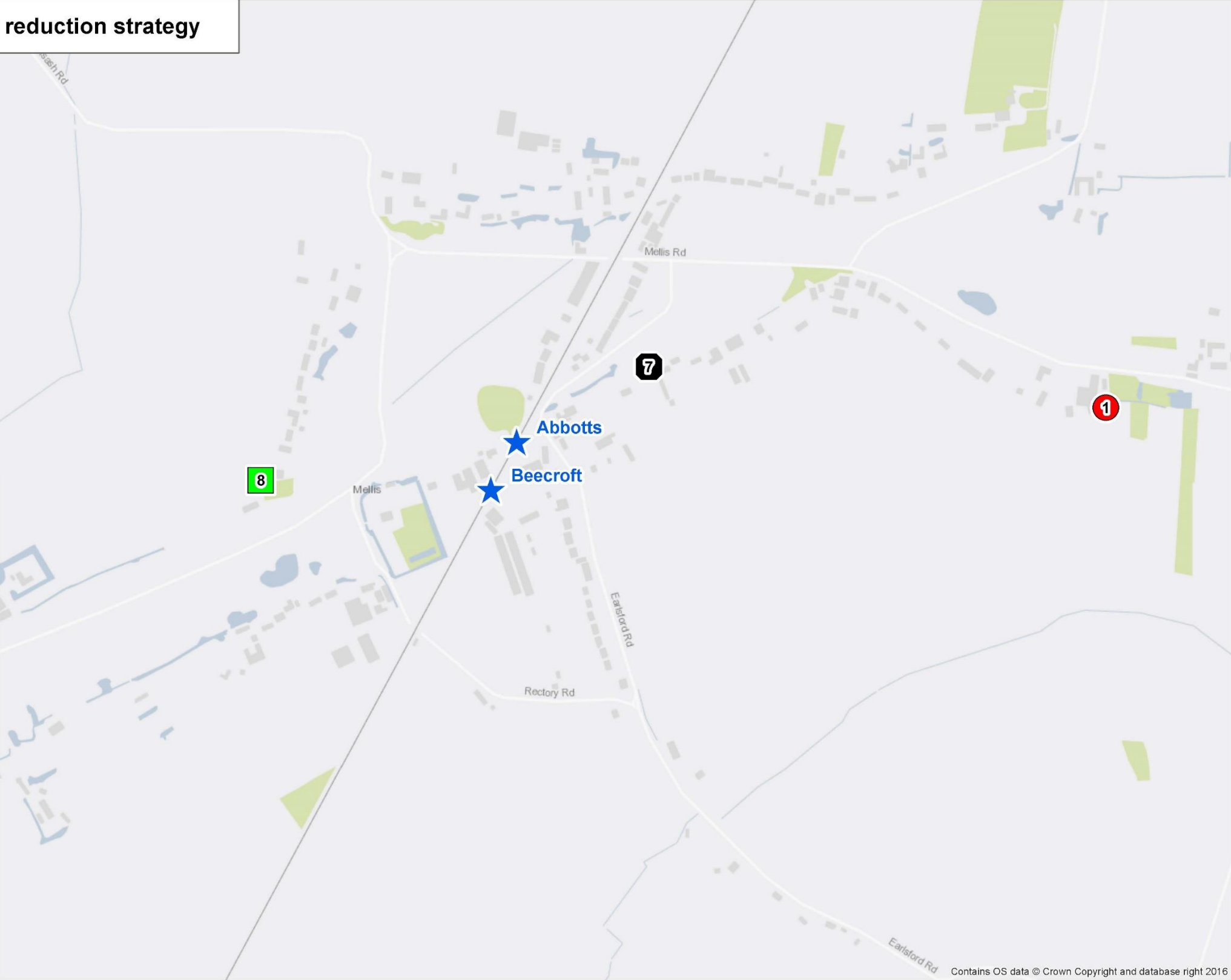
According to a review of local authority planning applications (in December 2016), there are no plans for future development in the local area.³

The map below shows local amenities.

³ Mid Suffolk Planning Applications: <http://www.midsuffolk.gov.uk/planning-and-building/planning/view-an-existing-application/>.

Anglia level crossing reduction strategy

- Amenities**
- 1 Primary School
 - 2 Secondary School
 - 3 Other Education
 - 4 Nursery
 - 5 Hospital
 - 6 GP Surgery
 - 7 Care Home
 - 8 Church
 - 9 Minority Faith Place of Worship
 - 10 Post Office
 - 11 Leisure
 - ★ Site



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0 50 100 150 200 250 Meters



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Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially negative impacts could this work have on people with protected characteristics?

The below table assesses the potential impacts of the proposed work at Abbotts level crossing on the protected characteristic groups as outlined in the Equality Act 2010 (disability, age, pregnancy / maternity, race, religion / belief, gender, sexual orientation, marriage / civil partnership and gender reassignment).

Protected Characteristic		Explain the potential negative impact
Disability	Y	<p>The permanent closure of Abbotts level crossing will remove pedestrian access at this point, potentially having a disproportionate impact on disabled people (including people with mobility, sensory and respiratory conditions) compared to non-disabled people.</p> <p>Following the nine-day census, no impaired or wheelchair users were documented using the crossing. The use of stiles to access the crossing means that the crossing is not currently accessible for wheelchair users and people with mobility difficulties. The closure of the level crossing is therefore likely to have a limited impact on disabled people with mobility difficulties. The below text refers to disabled people (including people with cognitive impairments, ambulant disabilities etc.) who are able to manage the current crossing infrastructure.</p> <p>Permanent increased walking distances due to length of the diversion</p> <p>Increases in walking distances, as a result of the permanent diversion routes proposed, are likely to disproportionately impact upon some disabled people (such as those with mobility impairments, or those using a wheelchair). Disabled people are more likely to have difficulties walking long distances and many experience pain and discomfort in doing so.</p> <p>A Department for Transport (DfT) study has shown that of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.⁴</p> <p>Walking distances will be permanently increased as a result of the level crossing closure, with the proposed diversion route adding up to 620m to the route, though actual increases in distances travelled may be less than this.</p> <p>Permanent reduced pedestrian accessibility due to suitability of the diversion route</p> <p>During consultation, stakeholders noted that pedestrian accessibility could be permanently reduced due to the proposed diversion route.</p>

⁴ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

		<p>There are no designated footways on either Mellis Road or Earlsford Road, meaning that all users, including people in wheelchairs or with mobility impairments, would be required to walk in the carriageway to cross the railway line. The narrow width of both roads and poor lighting were also raised by stakeholders as issues that may discourage disabled people, particularly those with visual or sight impairments, mobility difficulties or those in wheelchairs, from using the new route.</p> <p>It is noted however that Abbotts level crossing currently joins Earlsford Road, so users are already currently required to walk in the carriageway to some extent and that existing routes include unlit sections.</p> <p>Permanent impacts on user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings can disproportionately impact disabled people. Walking speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may be less able to cross safely because of these factors.⁵ People with visual or hearing impairments can also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.⁶</p> <p>While access to the crossing for many disabled users, particularly those with mobility difficulties, is likely to be limited at present (as reflected in the lack of usage by this protected characteristic group), reduced interaction with the railway means potentially reduced crossing risk for this group.</p> <p>However, stakeholders raised concerns about the safety of the proposed diversion route via Mellis Road level crossing, which has an ALCRM score of D2 – also making it a high risk crossing (albeit with a slightly lower risk ALCRM score than Abbotts). It is noted though that this proposal involves diversion from a passive to an active crossing, as Mellis Road level crossing provides greater warning of approaching trains and is not dependent on users making their own decisions about the safety of crossing the line.</p> <p>The lack of pedestrian footways (as noted above) and the inclusion of an alternative level crossing along part of the diversion route may potentially reduce the safety benefits of the closure of Abbotts level crossing. Further consideration for measures to improve the safety of the route for all users, including those with mobility and sensory impairments, should be considered as part of the Action Plan and the detailed design phase.</p>
Age	Y	The permanent closure of Abbotts level crossing will remove pedestrian access at this point, potentially having a disproportionate

⁵ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁶ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

	<p>impact on certain age groups – particularly children and older people – when compared with other sections of the population.</p> <p><u>Children</u></p> <p>There is a primary school in the village of Mellis (where the crossing is located). However, the nine-day census only documented two children (both accompanied) using the crossing over the full survey period, suggesting that impacts on children are likely to be limited.</p> <p>Permanent impacts on user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings can disproportionately impact children. This is due to their potentially slower walking speeds and because children and younger people can have difficulties correctly processing the speed of oncoming vehicles. Research conducted on behalf of the House of Commons Transport Select Committee, showed that children perceive vehicles moving towards them at more than 20 mph as stationary.⁷</p> <p>As such, reduced interaction with the railway (due to the use of a safe diversion as an alternative) is likely to lead to reduced crossing risk for this group.</p> <p>However, stakeholders raised concerns about the safety of the proposed diversion route via Mellis Road level crossing, which, as noted above, has an ALCRM score of D2, making it a high risk crossing. It is noted though that this proposal involves diversion from a passive to an active crossing. Mellis Road level crossing provides greater warning of approaching trains and is not dependent on users making their own decisions about the safety to cross the line.</p> <p>The need to use an alternative level crossing, albeit one that is automatically controlled with enhanced safety features, means that the reduced risk to children is likely to be more limited. The lack of pedestrian footways along the diversion route will also limit the positive safety impacts of closing Abbots level crossing for this group.</p> <p><u>Older people</u></p> <p>The nine-day census did not document any older people using the crossing, suggesting that any impacts of permanent closure will be minimal. The use of stiles to access the crossing means that the crossing is not currently accessible for people with mobility difficulties (which includes many older people). The closure of the level crossing is therefore likely to have a limited impact on older people.</p> <p>Permanent increased walking distances due to length of the diversion</p> <p>The closure of Abbots level crossing will be accompanied by a proposed diversion route, which will increase walking distances by a maximum of 620m (though, in practice, actual increases in walking</p>
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⁷ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

	<p>distances may be less than this due to the availability of alternative routes and crossing points in the area).</p> <p>Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and are more likely to struggle to climb stairs.⁸ Therefore, increased walking distances as a result of the diversion could disproportionately impact older people, especially those with mobility problems.⁹</p> <p>Permanent reduced pedestrian accessibility due to nature of the diversion route</p> <p>During consultation stakeholders raised concerns about the accessibility of the diversion route, due to the lack of a footway on either Mellis or Earlsford Road. This will require users to walk in the carriageway in order to cross the line. Concerns have also been raised about the surface of both roads, as they are in a poor state of repair and flood regularly.</p> <p>It is noted however that Abbotts level crossing currently joins Earlsford Road, so users are already currently required to walk in the carriageway to some extent.</p> <p>Permanent improved user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings disproportionately impact older people, largely due to their potentially slower walking speeds. Research by University College London has shown that older pedestrians (aged 65 or over) walk more slowly than other pedestrian users (the mean walking speed achieved by over-65s in controlled studies was 0.9 metres per second (m/s) in men and 0.8 m/s in women, compared to the mean for the population as a whole of 1.2m/s¹⁰), placing older people at greater risk.</p> <p>Older people are also particularly at risk as their field of vision declines over time, making them more vulnerable to moving vehicles. Studies have shown that this can be at a rate of 1° and 3° per decade¹¹, meaning that older people are particularly at risk.</p> <p>Level crossing closures, therefore, can improve the safety for older users by reducing interaction with the railway.</p> <p>However stakeholders raised concerns about the safety of the proposed diversion route via Mellis Road level crossing, which has an ALCRM score of D2 – making it a high risk crossing. It is noted though that this proposal involves diversion from a passive to an active crossing. Mellis Road level crossing provides greater warning of</p>
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⁸ NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway'

⁹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹⁰ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

¹¹ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

		<p>approaching trains and is not dependent on users making their own decisions about the safety to cross the line.</p> <p>In addition to this, stakeholders raised concerns about pedestrian safety along the proposed diversion route, due to the narrow width, blind bends and poor visibility which could all make it difficult for pedestrians to see and avoid oncoming vehicles.</p> <p>Therefore, the lack of pedestrian footways and the inclusion of an alternative level crossing along part of the diversion route may potentially reduce the safety benefits of the closure of Abbotts level crossing.</p>
Pregnancy / maternity	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Race	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Religion or belief	N	Although there is a church in the village of Mellis (where the crossing is located), the availability of alternative routes means that no disproportionate impacts are anticipated on the basis of this protected characteristic because of the project.
Gender	Y	<p>Improved user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings can disproportionately impact men. Male pedestrians dominate accidents at level crossings, associated with 70% of all train strikes. Given that males represent approximately 50% of the population as a whole, this would suggest male pedestrians are more at risk at level crossings than female pedestrians.¹² Reduced interaction with the railway (due to the diversion onto the bridge) would lead to reduced crossing risk for men.</p> <p>As noted above, the lack of pedestrian footpaths and the inclusion of an alternative level crossing along part of the diversion route may potentially reduce the safety benefits of the closure of Abbotts level crossing.</p>
Sexual orientation	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Marriage/Civil Partnership	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Gender reassignment	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

¹² Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

- Commitment 1: Get everyone home safe every day.
Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary routes.
- Commitment 2: Deliver reliable infrastructure.
The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- Commitment 6: Being a customer focused organisation.
The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.
- Commitment 9: A railway fit for the future.
The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

List the groups you have consulted or reference previous relevant consultation? ¹³	What issues were raised in relation to one or many of the protected characteristics?
Public consultation Round 1 – June 2016	<p>Questionnaire responses received during the first round of public consultation identified the following comments / issues regarding the proposals for Abbotts level crossing:</p> <ul style="list-style-type: none"> • There is poor visibility of oncoming trains (due to overhanging trees and line gradients) so support is high for this closure. • This crossing is currently only rarely used, and closure would increase safety for local people. • There was a suggestion that adequate research on S18-21 had not been undertaken. • There were suggestions that the level crossing be kept open and converted to a gated crossing. • Flooding potential on Earlsford Road was raised as an issue. • There is no footpath on Earlsford Road and it is only wide enough for a single car. • Some respondents were unsure about how the closure would help achieve the objectives of the programme. • Concerns were raised about the proposed diversion route. Stakeholders were particularly concerned about the narrow widths and lack of footways on the main diversion roads (Earlsford and Mellis). This means that there is insufficient room for pedestrians and farm machinery. • Both of the above road surfaces are in poor condition and flood regularly. • Lighting was also highlighted as a problem along the proposed alternative routes.
Public consultation Round 2 – September 2016	<p>Questionnaire responses received during the second round of public consultation identified the following comments / issues (outlined below) regarding the proposals for Abbotts level crossing:</p> <ul style="list-style-type: none"> • Although usage of the crossing is not significant, it forms part of an important walking route in the local area. • A request was made to provide a footbridge in the location or due to long-term development in the

¹³ This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

	local area could be the potential to build a proper road bridge to replace the current Mellis Road level crossing.
--	--

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

N/A

Step 5: Informed decision-making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).

1. Change the work to mitigate against potential negative impacts found	
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	<p>✓</p> <p>Due to the current low usage of the crossing and the availability of alternative routes, closure and redirection along the proposed diversion route is considered an appropriate solution.</p> <p>However, Network Rail should consider route improvement measures along the proposed diversion (as outlined below in the Action Plan) to ensure that the route is fully accessible for all users.</p>
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	


Step 6: Action planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By who
The installation of footways, drainage and rest points on both Earlsford Road and Mellis Road should be considered by the design team at the detailed design stage, in order to improve pedestrian safety. Reducing the speed limit on these sections of road (from 30 to 20mph) should also be considered.	Detailed design	Design team
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and other benefits of the scheme, including user safety.	Ongoing	Network Rail project team
Review the DIA at every GRIP stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team

See **Appendix D** for Design Team responses to the proposed actions above.

Step 7: Sign off

Name	Position	Signed	Date
DIA Owner TBC	Scheme Project Manager		
Superuser ¹⁴	Liability Negotiations Mgr		29/01/2018
Senior Manager ¹⁵			

If you don't have a local superuser please send your DIA for quality assurance to DiversityImpactAssessment@networkrail.co.uk

To help us respond more quickly please make sure you have;

1. Sent your DIA as a Word document not a PDF
2. Used this naming convention '**Name of project-Draft DIA**'

¹⁴ Quality assurance check.

¹⁵ Sign-off should be by someone who can approve policy, programme or budget changes.

3. Used the correct DIA form with no additional pages e.g. 'not for circulation cover-sheets'
4. Included any relevant maps / diagrams needed to understand your project
5. Completed all sections of the DIA in line with guidance and training

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

Appendix A: Site photographs

Abbotts level crossing

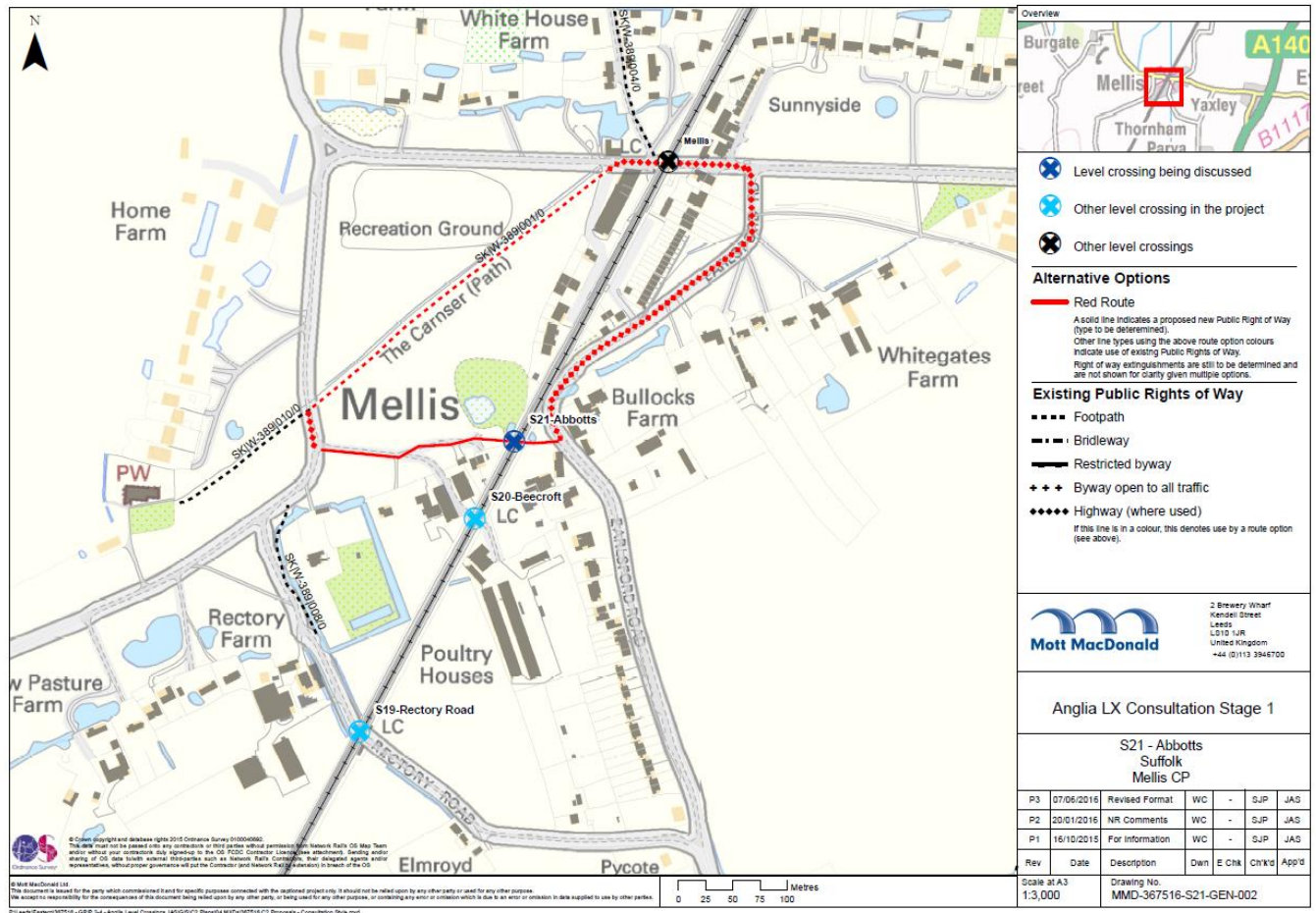


Alternative crossing – Mellis level crossing



Appendix B: Site drawings

Round 1 consultation – proposed diversion (initial option):



Appendix C: Nine-day census data

Summary

The survey was successfully completed in accordance with the Network Rail specification.

The data is summarised below:

			Combined			
			Horse riders	Riding Cycles	Walking Cycles	Total
Day 1	Saturday	16/07/2016	0	0	0	0
Day 2	Sunday	17/07/2016	0	0	0	0
Day 3	Monday	18/07/2016	0	0	0	0
Day 4	Tuesday	28/06/2016	0	0	0	0
Day 5	Wednesday	20/07/2016	0	0	0	0
Day 6	Thursday	21/07/2016	0	0	0	0
Day 7	Friday	22/07/2016	0	0	0	0
Day 8	Saturday	23/07/2016	0	0	0	0
Day 9	Sunday	24/07/2016	0	0	0	0
			0	0	0	0

Direction : Combined										
Adult	Accompanied Child	Unaccompanied Child	Elderly	Impaired	Wheelchair	Pushchair/ Pram	Scooter	Railway Personnel	Total	
3	0	0	0	0	0	0	0	0	3	
1	0	0	0	0	0	0	0	2	3	
2	0	0	0	0	0	0	0	0	2	
2	0	0	0	0	0	0	0	0	2	
3	0	0	0	0	0	0	0	0	3	
3	0	0	0	0	0	0	0	0	3	
0	0	0	0	0	0	0	0	0	0	
4	2	0	0	0	0	0	0	0	6	
4	0	0	0	0	0	0	0	0	4	
22	2	0	0	0	0	0	0	2	26	

Appendix D: DIA Design Team Responses to Action Planning

Action	By when	By who	Design Team comment	NR Response	Design Team Response
The installation of footways, drainage and rest points on both Earlsford Road and Mellis Road should be considered by the design team at the detailed design stage, in order to improve pedestrian safety. Reducing the speed limit on these sections of road (from 30 to 20mph) should also be considered.	Detailed design	Design team	<p>The village of Mellis is a rural one with no footways throughout. Those existing users of the S21 level crossing must approach by walking on the carriageway or grass verges. For the majority of the diversion route, wide grass verges are available to walk on, or act as points for pedestrians to step off the road at the approach of a vehicle.</p> <p>There is no accident record in the village and the Road Safety Audit did not raise any issues with the diversion route.</p> <p>The provision of footways and positive drainage along the diversion route would be a significant cost and potentially impact on the rural character of the village. Given the low usage (3 people per day on average), the costs and potential impacts cannot be justified. There has been no request from SCC or the Parish Council for this level of infrastructure</p> <p>Rest points in the form of benches at points along the route could be</p>	These have not been requested thus far, anything to be provided now must be at the discretion of the highway authority as NR will not have the powers.	Noted

			<p>investigated further with the parish council and highway authority at detailed design stage.</p> <p>Observations on site do not point to need for a reduction in speed limits, ATC surveys show an average speed of 21mph and 85% speed of 25mph. SCC could progress this separately if desired by locals.</p>		
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and other benefits of the scheme, including user safety.			NR to undertake at detailed design / implementation stage.	Agreed	no action
Review the DIA at every GRIP stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team	NR to undertake at detailed design / implementation stage.	Yes, but this is not to 'ensure equality of access is maintained for all' it is to ensure that any changes to the design do not worsen the access and they improve where appropriate.	NR to take appropriate actions

Diversity Impact Assessment (DIA)

Guidance for completing each section is provided in the
Everyone Guide to Diversity Impact Assessments

Name of policy, programme or project: S22 Weatherby – Anglia Level Crossing Reduction Strategy

Your Name: TBC

Your Job Title: Scheme Project Manager

Your Email: TBC

Department: Level crossings

Document Ref: TBC

Version No: 1

Step 1: Clarifying aims

Q1. What are the aims of this project/piece of work?



Anglia Level Crossing Reduction Strategy

Network Rail has committed to achieving a 25% reduction in level crossing system risk nationally as part of a programme of works undertaken within Control Period 5 (CP5), which runs from 2014-19.

Network Rail has been working hard to better manage its level crossings and the risks they pose. It has developed proposals for the possible closure or change to public rights of way at around 130 level crossings within the counties of Suffolk, Cambridgeshire, Essex, Hertfordshire, and the unitary authorities of Thurrock, Havering, and Southend-on-Sea. This is referred to as the Anglia Level Crossing Reduction Strategy ('the Strategy'). Closing or modifying level crossings can help to bring about a number of benefits:

- Improve the safety of level crossing users;

- Deliver a more efficient and reliable railway, which is vital in supporting the regional and UK economy;
- Reduce the ongoing operating and maintenance cost of the railway;
- Reduce delays to trains, pedestrians and other highway users; and
- Improve journey time reliability for railway, highway and other rights of way users.

S22 – Weatherby level crossing

The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of D2. The individual risk rating for crossing users is 'D' (where 'A' is highest risk and 'M' is the lowest) and the collective risk rating for this crossing is '2' (where '1' is highest risk and '13' is lowest), making Weatherby a high risk crossing. Key issues at the crossing include the large numbers of users, sun glare, and deliberate user error. Between 2011 and 2015, eight near misses, one accident and no incidents of misuse were recorded at this crossing.

The crossing is on the single track Cambridge to Ipswich line and is located 400m north east of Newmarket station. Approximately 34 trains use this part of the network daily at a line speed of 40mph.

Weatherby level crossing is a 'Stop, Look and Listen' crossing, where the user determines whether it is safe to cross. The level crossing is not a public right of way; it is a private facility which is used by the public. The level crossing has a non-slip wooden deck with tarmac approaches and kissing gates on either side of the railway. Appendix A contains site photographs.

Network Rail aims to ensure the most viable option for continued access across the line based on the need to ensure public safety, meet local needs, and ensure compliance with its duties under the Equality Act 2010.

Project location

Weatherby level crossing is located in the town of Newmarket, Suffolk. The level crossing is in a highly urbanised area with residential properties and local amenities located in close proximity to the railway line, on either side of the line.

The map below shows the location of the level crossing.

Anglia level crossing reduction strategy



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Proposals for the project

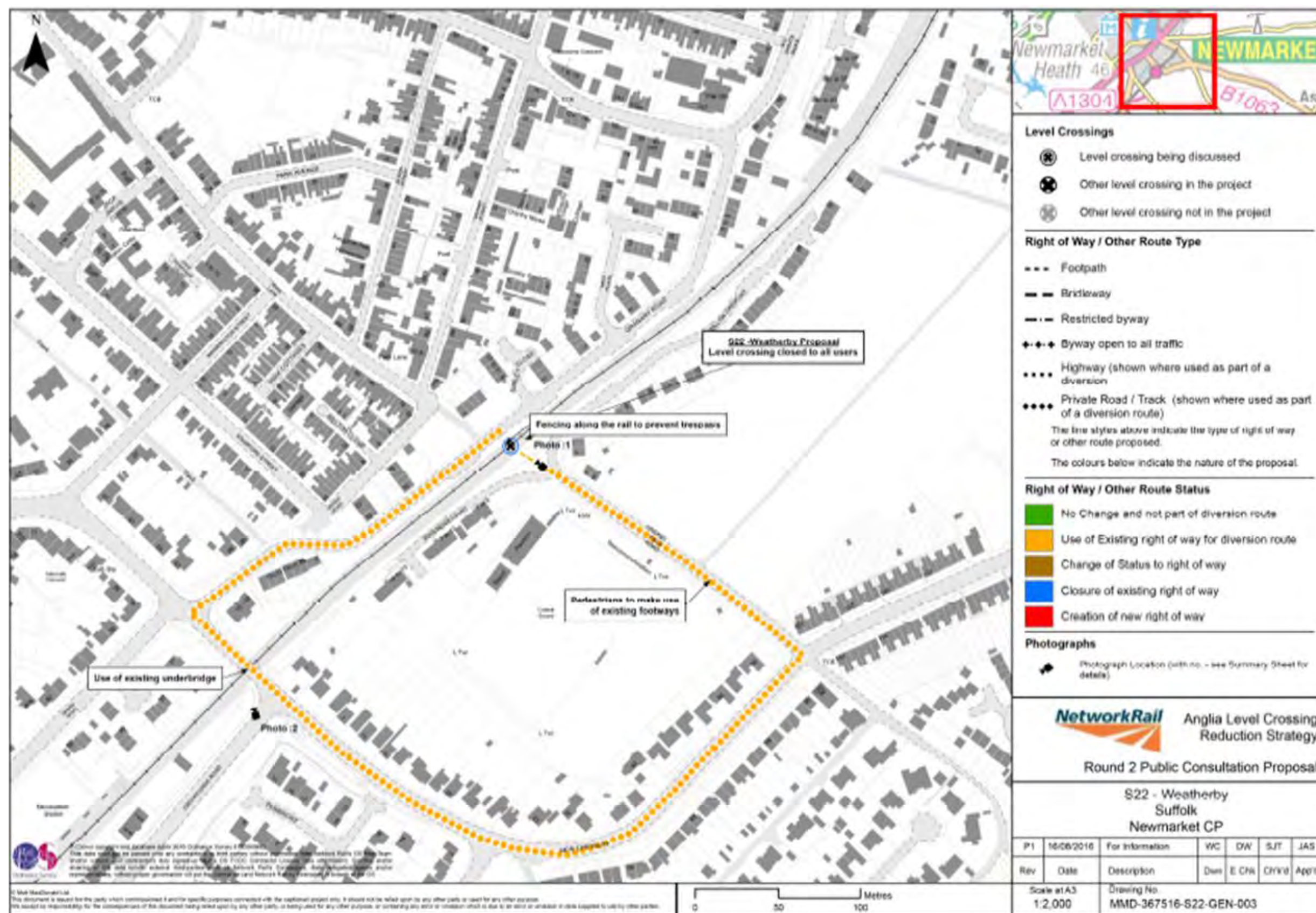
Network Rail has conducted two rounds of public consultation; the first was to obtain feedback on its initial options for level crossings in the programme (in June 2016), and the second to obtain feedback on its preferred options (in September 2016). Following the receipt of feedback, consideration was given as to how any proposed closure of the level crossing and implementation of an alternative route might best be progressed and managed.

The Round 2 public consultation for this level crossing received 33 questionnaire responses, with 29 people disagreeing with the proposals and 4 people supporting the planned diversion.

The current preferred option for the site (following feedback received as part of Round 1 public consultation), is to close the level crossing to all users and divert pedestrians to an existing underpass on The Avenue/New Cheveley Road, 200m south west of the current crossing. Level crossing infrastructure would be removed and fencing installed to prevent trespass onto the railway.

This route would add a maximum additional 870m in walking distance for those living on one side of the level crossing and wishing to access amenities on the other side. Practically, however, the diversion would not require users to walk the full 870m in most cases. Stakeholders additionally raised concerns about the suitability of the proposed route, on account of the increased walking distances, steepness and poor lighting along the diversion route.

The drawing below shows the proposed diversion route (as shown during the Round 2 consultation). Plans shown at the first and second rounds of public consultation are available in Appendix B.



Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, the work could impact on people.

Without the closure of Weatherby level crossing, there is risk of a future incident at this location. The closure of the crossing will separate people from the railway line, thereby improving the safety of local residents and other users.

The proposal for Weatherby level crossing will impact on walking distances for all users. The diversion route will add a maximum of 870m to the route for residents living on one side of the crossing and accessing amenities located immediately on the other side of the crossing.

The implementation of a permanent diversion via the underpass at The Avenue/ New Cheveley Road may disproportionately affect certain sections of the population who find walking long distances difficult and may struggle with the gradients along the diversion route.

Step 2: The evidence base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics:

- Disability including carers¹
- Pregnancy/maternity
- Religion or belief
- Sexual orientation
- Gender reassignment
- Age
- Race
- Gender
- Marriage/Civil Partnership

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on those people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

User profile

A nine-day census, carried out in June/July 2016, indicates that the level crossing was used by 3,730 people during the survey period – an average of 414 people per day. The survey results show that adult pedestrians constituted 85% (³¹⁷⁸/₃₇₃₀) of level crossings users, six of whom were classified as older people. Of the 410 child users, 291 were accompanied by an adult and 119 were unaccompanied. 119 pushchairs/prams were also recorded using the crossing. In addition to this, 23 impaired users were recorded using the crossing, including one wheelchair and five scooter users.

Though cyclists are not a protected group under the Equality Act (and impacts on this group have therefore not been considered in this assessment), it is worth noting that 307 cyclists used this crossing during the survey period – highlighting the popularity of this route for various groups.

A breakdown of the census data can be found in Appendix C.

Population profile

In order to gain a better insight into the local community and therefore other potential users of the level crossing, existing statistical data was reviewed to establish the composition of the local population – here taken as the district of Forest Heath.² These are as follows:

¹ Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support

² Source: ONS Population estimates taken from nomis. Available at:
https://www.nomisweb.co.uk/reports/lmp/la/1946157240/report.aspx?pc=cb8_8bt

- Children (under 16 years of age) make up 19% of the Forest Heath population. This is equivalent to the national average.
- Younger people (16-24 years old) make up 12% of the population of Forest Heath, which is also comparable to the national figure of 12%.
- The proportion of older people (here described as people of retirement age – 65 and over) in Forest Heath is again the same as the national average (16%).
- 15% of the Forest Heath population have a long-term illness or disability that limits their daily activities. This is slightly lower than the national average of 17%.
- 23% of the population of Forest Heath is from Black, Asian or ethnic minority (BAME³) groups. This is slightly higher than the national figure of 20%.
- Forest Heath has a low proportion of its populations belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) - 2% compared with 9% for England.

The above demographic analysis suggests that the populations of all of the protected characteristics (for which there are demographic data) are broadly in line with national proportions with the exception of the lower proportion of people from minority faith groups.

[The level crossing is also very close to the boundary with the Parish of Woodditton in East Cambs. District.]

Local amenities

According to a review of local planning applications in November 2016, there are no development plans in the local area in the near future.⁴

The area around Weatherby level crossing is highly urbanised with a wide range of local facilities and residential properties on both sides of the line, creating desire lines for local people to use the crossing. It is understood that the level crossing forms part of a popular route used by the local community to access local facilities and resources.

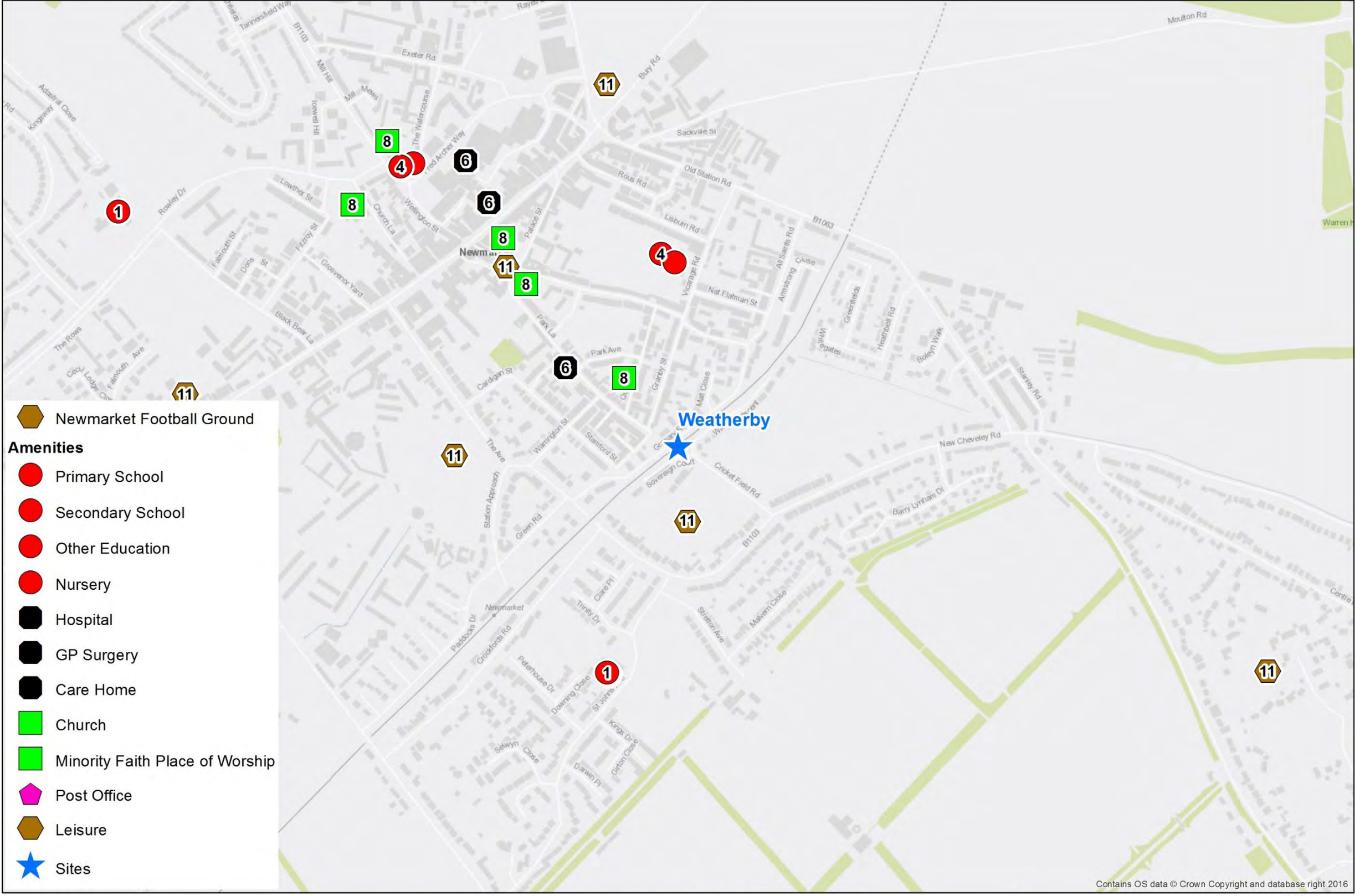
An analysis of local amenities indicates that there are many amenities located in close proximity to the level crossing. These include two primary and nursery schools, five churches, and GP surgeries. A number of leisure facilities are also located nearby. It is likely that those people living on the opposite side of the line to local amenities may wish to use the crossing, particularly to access the church and GP surgery (both to the north of the crossing) or the leisure area to the south, as Weatherby level crossing provides a direct route. Alternative routes, which are available in the local area, are likely to significantly increase travel distance and provide a less direct route to some local amenities.

These presumed desire lines are based on the identified location of residential areas and community facilities within the immediate vicinity of the crossing. The development of a more substantive picture of local desire lines for the crossing and associated routes could be achieved through cordon survey interviews with users at fixed locations and times.

The map below shows local amenities.

³ Including white Irish, Gypsy and Irish travellers and other white ethnic populations.

⁴ Newmarket Town Council: <http://www.newmarket.gov.uk/meetings/committees/development-and-planning/>.



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0 50 100 150 200 250 Meters



Note that Newmarket Football Club is south of the level crossing. Newmarket Town Council allotments are opposite the Football Club and are not shown on the above plan.

Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially negative impacts could this work have on people with protected characteristics?

The below table assesses the impact of the proposed work at Weatherby level crossing on the protected characteristic groups as outlined in the Equality Act 2010 (disability, age, pregnancy / maternity, race, religion / belief, gender, sexual orientation, marriage / civil partnership and gender reassignment).

Protected Characteristic		Explain the potential negative impact
Disability	Y	<p>The permanent closure of Weatherby level crossing will remove pedestrian access at this point, potentially resulting in disproportionate impacts on disabled people (including people with mobility, sensory and respiratory conditions) compared to non-disabled people.</p> <p>In total, 23 users with mobility and sensory impairments were recorded using the level crossing during the nine-day census period, including one wheelchair and five mobility scooter users. As such, the permanent closure of the level crossing may reduce pedestrian accessibility if the diversion route proposed is unsuitable – potentially resulting in community severance.</p> <p>Potential impacts on pedestrian accessibility due to suitability of diversion routes</p> <p>Even when routes are free from obstacles such as steps, as is the case with the proposed underpass diversion, diversions involving underpasses can act as a barrier for disabled people. Underpasses can be difficult for people with mobility impairments to manage unless they are designed with accessibility in mind.⁵</p> <p>The Department for Transport (DfT) states that underpasses should be as wide as possible to give sufficient room for disabled users, and ensure a sense of security. The current underpass is approximately 12m wide in total, with the footways being 1.56m and 2.30m on the north and south sides respectively (subject to confirmation at detailed design). The existing headroom for vehicles is 4.4m (as indicated by signage on-site). The DfT recommends that to achieve inclusive mobility for new or enhanced underpass infrastructure, designers should aspire to a total width of at least 4.8m and a headroom of 3m, or as close to these parameters as reasonably practicable/deliverable. The underpass is also light and has a clear view from one side to the other. Therefore, it is felt that the underpass currently adequately complies with the DfT guidelines.</p> <p>During consultation stakeholders also raised concerns about the steepness of the diversion route. Steep gradients can be challenging to manage for those in wheelchairs or mobility scooters (six of whom were recorded using Weatherby level crossing during the survey</p>

⁵ Highways England: 'Design Manual for Roads and Bridges – Assessment and Preparation of Road Schemes'

	<p>period). Gradients can also act as a barrier for those with sight and mobility impairments.⁶</p> <p>To comply with the Equality Act 2010, a gradient of no more than 5% (1 in 20) is preferred, with the maximum allowance being 8% (1 in 12).⁷ Gradients exceeding this are to be designed as ramps, requiring the provision of more frequent landings the steeper the incline. This are set out in the table below⁸:</p> <table><tr><th>Gradient</th><th>Maximum Length</th><th>Maximum Rise</th></tr><tr><td>1 in 20 (5%)</td><td>10m</td><td>500mm</td></tr><tr><td>1 in 15 (7%)</td><td>5m</td><td>333mm</td></tr><tr><td>1 in 12 (8%)</td><td>2m</td><td>166mm</td></tr><tr><td>More than 1 in 12 (>8%)</td><td>Not permitted</td><td>Not permitted</td></tr></table> <p>Even when infrastructure is designed to accessible standards, there is likely to be an imperfect relationship between the length of a ramp and its gradient – the longer the ramp the less severe the gradient that is acceptable. Although the preferred gradient is 5% (1 in 20), a steeper gradient of 10% (1 in 10) is acceptable over short distances of less than 1m. As a general rule, 8% (1 in 12) should be used as the absolute maximum, as this ensures pedestrian accessibility is maintained for all users.</p> <p>Assessment of LIDAR data has shown that the existing gradient on the approach to and departure from the underpass itself is approximately 1.0-1.5%. On the diversion route, the steepest section is to the north of the underpass on Green Road, which is approximately 5% – well within the DfT's maximum gradient of 8%. It is also noted that the pathways along all of the diversion route met recommended width standards (1.5m) – the pathways range in width from 1.5m to 2.3m.</p> <p>Stakeholders did raise safety concerns regarding the need for pedestrians to walk near busy roads when using the proposed diversion route. It was felt that concerns over pedestrian safety would discourage people from using the diversion route and encourage travel by motorised transport. Consideration should be given to route improvement measures along the diversion route wherever practical and appropriate to improve the safety of pedestrians. Overall, however, the diversion route is safe, secure and accessible.</p> <p>Permanent increased walking distance due to length of diversions</p> <p>Increases in walking distances, as a result of the permanent diversion of crossing routes over the line, are likely to disproportionately impact upon some disabled people. Disabled people (especially those with mobility impairments) are more likely to have difficulties walking longer</p>	Gradient	Maximum Length	Maximum Rise	1 in 20 (5%)	10m	500mm	1 in 15 (7%)	5m	333mm	1 in 12 (8%)	2m	166mm	More than 1 in 12 (>8%)	Not permitted	Not permitted
Gradient	Maximum Length	Maximum Rise														
1 in 20 (5%)	10m	500mm														
1 in 15 (7%)	5m	333mm														
1 in 12 (8%)	2m	166mm														
More than 1 in 12 (>8%)	Not permitted	Not permitted														

⁶ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'.

⁷ Transport Scotland (2013): 'Roads for All: Good Practice Guide for Roads'.

⁸ Transport Scotland (2013): 'Roads for All: Good Practice Guide for Roads'.

		<p>distances and many experience pain and discomfort in doing so. Additionally, during consultation stakeholders raised concerns about the additional length of the permanent diversion route and its manageability for disabled people.</p> <p>Studies have shown that of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.⁹</p> <p>The proposed diversion route via The Avenue / New Cheveley Road underpass adds a maximum 870m to the route.</p> <p>This may disproportionately impact disabled people who would struggle with the increased walking distance. Diversions should therefore be well signposted and accompanied by measures, such as widening of pavements and ensuring level surfaces, to support users who may struggle to walk the additional distance. It is also noted that not every user of the crossing would need to travel the full 870m due to the availability of existing routes in the surrounding area.</p> <p>Permanent improved user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings can disproportionately impact disabled people. Crossing speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may also be less able to cross safely because of these factors. People with visual or hearing impairments can also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.¹⁰</p> <p>As Weatherby level crossing is used by some disabled users to access local facilities, reduced interaction with the railway at this point may potentially result in a reduced crossing risk for this group.</p>
Age	Y	<p>The permanent closure of Weatherby level crossing will remove pedestrian access at this point, potentially having a disproportionate impact on particular age groups – namely children and older people – compared to the general population.</p> <p><u>Children</u></p> <p>Permanent improved user safety due to reduced interaction with the railway</p> <p>Weatherby level crossing is considered high risk primarily because of the very large number of users it accommodates every day. The nine-day census indicated that a large number of users – 410 of the total 3,730 level crossing users (11%) – were children, of which 119 (29%)</p>

⁹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹⁰ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

	<p>were not accompanied by an adult. This highlights the importance of the route for children.</p> <p>Safety issues related to level crossings are also disproportionately likely to impact children. This is due to their potentially slower walking speeds and because children and younger people can have difficulties correctly processing the speed of oncoming vehicles. Research conducted on behalf of the House of Commons Transport Select Committee, showed that children tended to perceive vehicles moving towards them at more than 20 mph as stationary.¹¹</p> <p>As such, reduced interaction with the railway (due to the use of a safe diversion as an alternative) is likely to lead to significantly reduced crossing risk for this group.</p> <p>Ensuring the diversion route is safe and appropriate will be essential to realising this positive impact.</p> <p><u>Older people</u></p> <p>Permanent increased walking distance due to length of diversion</p> <p>Increases in walking distances, as a result of the closure of Weatherby level crossing and the permanent use of a diversion route, are likely to disproportionately impact older people compared to other sections of the population.</p> <p>The proposed diversion route via The Avenue / New Cheveley Road underpass adds up to 870m to the route (though, in practice, it is likely to be less than this for trips starting or ending along the diversionary route). Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and may struggle to climb stairs.¹²</p> <p>As such, increased walking distances could disproportionately impact older people with mobility issues, as these people are more likely to have difficulties walking long distances and experience pain or discomfort in doing so.¹³</p> <p>Diversions should also be well signposted and accompanied by measures, such as widening of pavements and ensuring level surfaces, to support users who may struggle to walk the additional distance.</p> <p>Permanent reduced pedestrian accessibility due to nature of diversion routes</p> <p>Older people are more likely than other sections of the population to have mobility impairments and therefore require an accessible pedestrian environment and step-free infrastructure.¹⁴</p>
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¹¹ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

¹² NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway'

¹³ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹⁴ Highways Agency : 'Design Manual for Roads and Bridges – Assessment and Preparation of Road Schemes'

		<p>As with disabled people, slopes and gradients in particular can act as a barrier for older people, and can make routes more challenging to manage for those who are frail (even when designed to accessible standard specifications).</p> <p>As the proposed diversion route makes use of the nearby underpass, it could potentially reduce pedestrian accessibility on account of the gradients along the routes. In order to comply with the Equality Act 2010, a gradient of no more than 5% (1 in 20) is required along the route.</p> <p>Stakeholders raised concerns about the steepness of the proposed diversion route. There could be an impact if the gradient exceeds the DfT's preferred maximum gradient of 5%. However, assessment of LIDAR data has shown that the existing gradient on the approach to and departure from the underpass itself is approximately 1.0-1.5%. On the diversion route, the steepest section is to the north of the underpass on Green Road, which is approximately 5% – well within the DfT's absolute maximum gradient of 8%. It is also noted that the pathways along all of the diversion route meet recommended width standards (1.5m) – the pathways range in width from 1.5 – 2.3m.</p> <p>Consideration should be given to route improvement measures along the diversion route wherever practicable and appropriate to improve the safety of pedestrians. The diversion route however is, overall, safe, secure and accessible.</p> <p>Permanent improved user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings disproportionately impact older people, due to their potentially slower walking speeds. Research by University College London has shown that older pedestrians (aged 65 or over) walk more slowly than other pedestrian users, placing them at greater risk. The mean walking speed achieved by over-65s in controlled studies was 0.9 metres per second (m/s) in men and 0.8m/s in women, compared to the mean for the population as a whole of 1.2m/s.¹⁵ Older people are also particularly at risk as their field of vision declines over time, making them more vulnerable to moving vehicles. Studies have shown that this can be at a rate of 1° and 3° per decade.¹⁶</p> <p>Whilst use of Weatherby level crossing by older people is currently limited (with only six documented using the crossing over the nine-day survey period), reduced interaction with the railway means reduced crossing risk for this group.</p>
Pregnancy / maternity	Y	<p>Permanent reduced pedestrian accessibility due to nature of diversion route</p> <p>Inaccessible infrastructure can disproportionately impact upon people travelling with children in pushchairs. Underpasses and steep</p>

¹⁵ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

¹⁶ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

		<p>gradients can be difficult to access unless they are designed with people with pushchairs, prams or buggies in mind.</p> <p>Stakeholders raised concerns about the steepness of the diversion route. As discussed previously, standards are in place to ensure that gradients do not exceed inappropriate levels. Analysis of the current underpass in relation to these standards highlighted that the underpass adequately meets DfT guidelines.</p> <p>Consideration should be given to route improvement measures along the diversion route wherever practical and appropriate to improve the safety of pedestrians. The diversion route however is, overall, safe, secure and accessible.</p>
Race	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Religion or belief	N	Although there are a number of churches in the local area, due to the availability of alternative routes, it is not anticipated that any disproportionate impacts will be felt by this protected characteristic group.
Gender	Y	<p>Improved user safety due to reduced interaction with the railway</p> <p>Safety issues related to level crossings can disproportionately impact men. Male pedestrians dominate accidents at level crossings, associated with 70% of all train strikes. Given that males represent approximately 50% of the population as a whole, this would suggest male pedestrians are more at risk at level crossings than female pedestrians.¹⁷ Reduced interaction with the railway (due to the diversion onto the bridge) would lead to reduced crossing risk for men.</p>
Sexual orientation	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Marriage/Civil Partnership	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Gender reassignment	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- Commitment 1: Get everyone home safe every day.
Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary route.
- Commitment 2: Deliver reliable infrastructure.
The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- Commitment 6: Being a customer focused organisation.

¹⁷ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

<p>The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.</p> <ul style="list-style-type: none"> Commitment 9: A railway fit for the future. <p>The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.</p>
--

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

List the groups you have consulted or reference previous relevant consultation? ¹⁸	What issues were raised in relation to one or many of the protected characteristics?
Public consultation – Round 1 (August 2016)	<p>Questionnaire responses received during the first round of public consultation included the following issues concerning Weatherby Road level crossing:</p> <ul style="list-style-type: none"> Concerns were raised about the length of the diversion (stated as three times longer than the current route). Concerns were also raised over the steepness of the diversion route. Safety concerns over walking on and near busy roads were also seen as a potential problem. This will encourage more people to drive to the shops rather than walk, thus increasing the number of cars making short journeys around town and putting extra pressure on parking. This will impact on local businesses, as people will be more inclined to drive out of town to go shopping. Several requests were made for a footbridge. A request for better lighting, newer gates, a tidy up and potentially a flashing sign to inform when a train was approaching. A request for maglocks was made. Several suggestion of an underpass to be created at the current level crossing site. A request for self-locking gates and flashing lights instead of closure. Concerns raised over legal aspects of the proposed closure. Some dispute over how the scheme will achieve its objectives.

¹⁸ This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

Public consultation Round 2 (September 2016)	Questionnaire responses received during the Round 2 public consultation identified the following issues (outlined below) regarding Weatherby level crossing:
Local Councillor	<ul style="list-style-type: none"> There is not enough evidence to close the crossings.
Mid Anglia Rail Passengers Association (MARPA) Committee	<ul style="list-style-type: none"> A request was made for a footbridge to be implemented as this would solve problems for the whole community, including commuters and school children.
Secretary of Newmarket Town Football Club	<ul style="list-style-type: none"> The crossing is well used by staff and supporters of the club to access the stadium. The proposed diversion route is too long, especially for older people and young children. New Cheveley Road is a very busy road and is not suitable for pedestrians/cyclists.
Members of the public	<ul style="list-style-type: none"> The proposed solution is cutting off the people living south of the railway from the town centre. The diversion is too long particularly for children and the elderly. The route is regularly used by people shopping, going to/from schools and accessing the other amenities of the town centre.

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

N/A

Step 5: Informed decision-making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).

1. Change the work to mitigate against potential negative impacts found	
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	<p>✓</p> <p>Because there are a number of alternative routes available locally that would sufficiently service those wishing to cross the line, the closure of Weatherby level crossing will result in overall improvements in user safety.</p>

	Diversions should be signed and accompanied by measures to support users who may struggle to walk the additional distances.
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	

Step 6: Action planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By whom
Consideration should be given to developing a route improvement strategy along the diversion routes to help mitigate any negative impacts of increased walking distances and steeper gradients, signage to support wayfinding and ensuring level surfaces. This will enhance the user experience for all groups and increase a sense of safety.	Prior to implementing works	Network Rail project team
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and any other benefits of the scheme, particularly focussing on user safety at the site for children.	Ongoing	Network Rail project team
Review the DIA at every future GRIP stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team

See **Appendix D** for Design Team responses to the proposed actions above.

Step 7: Sign off

Name	Position	Signed	Date
DIA Owner TBC	Scheme Project Manager		
Superuser ¹⁹	Liability Negotiations Mgr	<i>Steve Day</i>	29/01/2018
Senior Manager ²⁰			

If you don't have a local superuser please send your DIA for quality assurance to DiversityImpactAssessment@networkrail.co.uk

To help us respond more quickly please make sure you have;

1. Sent your DIA as a Word document not a PDF
2. Used this naming convention '**Name of project-Draft DIA**'
3. Used the correct DIA form with no additional pages e.g. 'not for circulation cover-sheets'
4. Included any relevant maps / diagrams needed to understand your project
5. Completed all sections of the DIA in line with guidance and training

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

¹⁹ Quality assurance check.

²⁰ Sign-off should be by someone who can approve policy, programme or budget changes.
Diversity and inclusion 31032015

Appendix A: Site photographs

Existing level crossing:

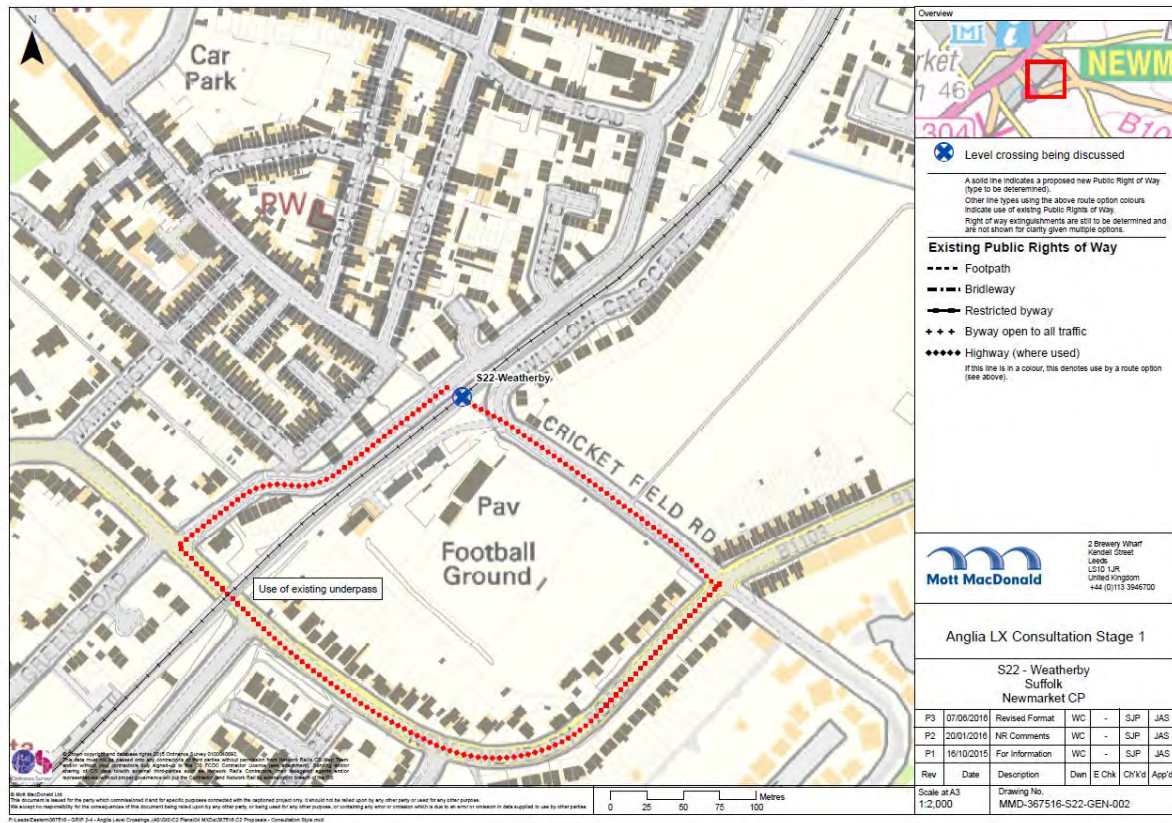


Proposed alternative railway crossing (underpass on the B1103 New Cheveley Road)

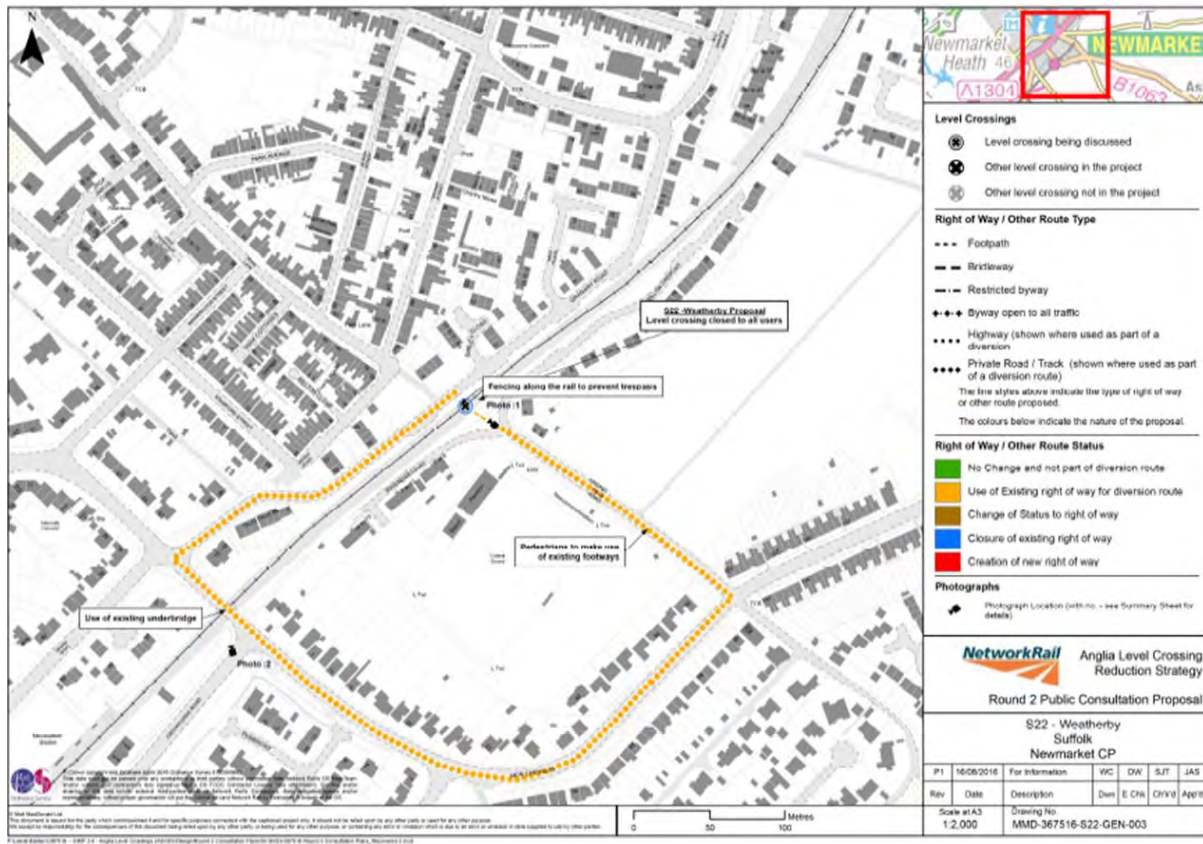


Appendix B: Site drawings

Round 1 consultation (June 2016) – Initial option for proposed diversion route



Round 2 consultation – Preferred option for diversion route, at September 2016)



Appendix C: Nine-day pedestrian census data

Summary

The survey was successfully completed in accordance with the Network Rail specification.

The data is summarised below:

Pedestrian								
	Adult	Accompanied child	Unaccompanied child	Older person	Impaired user	Wheelchair user	Pushchair / pram	Total
25th June	406	31	0	0	0	0	6	443
26th June	331	27	0	0	0	0	8	366
27th June	447	39	1	2	3	0	13	505
28th June	314	32	28	0	0	0	18	392
29th June	268	27	23	1	4	1	14	338
30th June	319	26	28	2	2	0	15	392
1st July	331	47	26	0	3	0	22	429
2nd July	429	36	8	0	1	0	10	484
3rd July	327	26	5	1	4	0	13	376
	3172	291	119	6	17	1	119	3725

Appendix D: DIA Design Team Responses to Action Planning

Action	By when	By who	Design Team comment	NR Response	Design Team Response
As the diversion route incorporates an underpass, measures should be considered to ensure the safety and usability of the route. The DfT states that where underpasses are provided, they should be as wide as possible to give a sense of security. Within the underpass, handrails set at 1000mm above the walking surface should be provided on both sides. There should be a clear view from one end to the other and a good level of lighting.	Detailed design	Network Rail project team	<p>The underbridge is an existing road bridge with footways to both sides which meet recommended width requirements. Lighting should be provided by the local highway authorities (SCC and CCC) to the appropriate standard.</p> <p>Guardrailing is already provided beneath the underbridge on the east side of the road which is associated with the diversion route (due to a level difference between footway and carriageway). However further handrails could be installed with the agreement of the highway authorities.</p> <p>The route through the underbridge is short and straight with good forward visibility.</p> <p>It is noted that SCC have not requested any improvements at this location.</p> <p>No further mitigation or improvement works are considered necessary</p>	No handrails are needed as the diversionary route under the bridge already has them.	Agreed

Consider measures along the diversion route to help mitigate any negative impacts of increased walking distance and steeper gradients, including: the widening of pavements; signage to support way finding; and ensuring level surfaces including dropped kerbs and tactile paving. This will enhance the user experience for all groups and increase a sense of safety.			<p>Footways are present for the full length of the diversion route and are of reasonable width for their current and proposed usage.</p> <p>Permanent and temporary signing after the LC closure will be discussed in further detail with the highway authorities at the detailed design stage. This can be incorporated within the adopted highway with the agreement of the highway authorities.</p> <p>Dropped kerbs and tactile paving already exist at the junction of Green Road and New Cheveley Road. The provision of new dropped kerbs and tactile paving could be provided at the junction of Cricketfield Road and New Cheveley Road and should be discussed further with the highway authority. This can be incorporated within the adopted highway with the agreement of the highway authority.</p>	No new dropped kerbs needed at junction of Green Road and New Cheveley Road, as at present there isn't an accessible dropped kerb route to use the current crossing. We aren't making it any worse	Agreed but it may be something that the local authority may still want to discuss
---	--	--	---	--	---

Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and any other benefits of the scheme, particularly focussing on user safety at the site for children.	Ongoing	Network Rail project team	NR to undertake at detailed design / implementation stage.	Agreed	NR to take appropriate actions
Review the DIA at every future GRIP stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team	NR to undertake at detailed design / implementation stage.	Yes, but this is not to 'ensure equality of access is maintained for all' it is to ensure that any changes to the design do not worsen the access and they improve where appropriate.	NR to take appropriate actions

Diversity Impact Assessment (DIA)

Guidance for completing each section is provided in the
Everyone Guide to Diversity Impact Assessments

Name of policy, programme or project: S24 Higham Ground Frame - Anglia Level Crossing Reduction Strategy

Your Name: TBC

Your Job Title: Scheme Project Manager

Your Email: TBC

Department: Level crossings

Document Ref: TBC

Version No: 1

Step 1: Clarifying aims

Q1. What are the aims of this project/piece of work?



Anglia Level Crossing Reduction Strategy (Strategy)

Network Rail has committed to achieving a 25% reduction in level crossing system risk nationally as part of a programme of works undertaken within Control Period 5 (CP5), which runs from 2014-19.

Network Rail has been working hard to better manage its level crossings and the risks they pose. It has developed proposals for the possible closure or change to public rights of way at around 130 level crossings within the counties of Suffolk, Cambridgeshire, Essex, Hertfordshire, and the unitary authorities of Thurrock,

Havering, and Southend-on-Sea. Closing or modifying level crossings can help to bring about a number of benefits. It can:

- improve the safety of level crossing users;
- deliver a more efficient and reliable railway, which is vital in supporting the regional and UK economy;
- reduce the ongoing operating and maintenance cost of the railway;
- reduce delays to trains, pedestrians and other highway users; and
- improve journey time reliability for railway, highway and other rights of way users.

S24 – Higham Ground Frame level crossing

Higham Ground Frame level crossing is located in Barrow Parish, Suffolk. The crossing spans the two track Ipswich – Ely line.

The level crossing is a stop, look and listen public footpath level crossing, where the user determines whether it is safe to cross. Access to the level crossing is limited due to the presence of crossing stiles on either side of the railway line and because access to the crossing is via footpaths within fields.

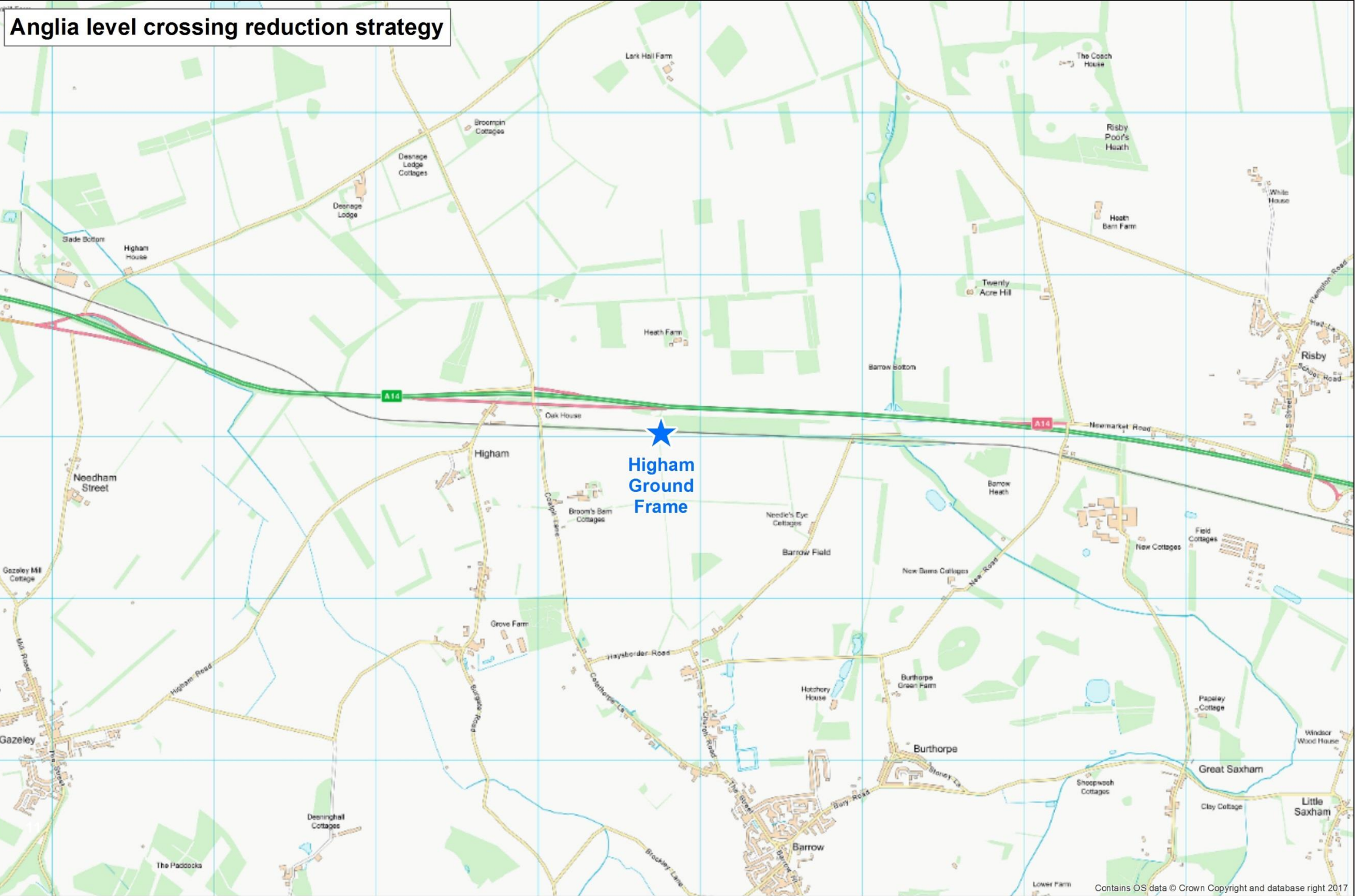
The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of C7. The individual risk rating for crossing users is 'C' (where 'A' is highest risk and 'M' is lowest) and the collective risk rating for this crossing is '7' (where '1' is highest risk and '13' is lowest), making Higham Ground Frame a high risk crossing. Key issues at the crossing include frequent trains and sun glare. Between 2011 and 2015, there were no incidents of misuse, near misses or accidents recorded at this location. Approximately 104 trains use this part of the network daily at a line speed of 75mph.

Network Rail aims to ensure the most viable option for continued access across the line based on the need to ensure public safety, meet local needs, and ensure compliance with its duties under the Equality Act 2010.

Project location

Higham Ground Frame level crossing is located 2.7km north of the village of Barrow. To the north and south, agricultural land and woodland border the crossing. The A14 dual carriageway is situated 150m north of the crossing and a small collection of properties belonging to a research institute are sited 550m south west. The nearest railway station is Kennet, approximately 5.9km west of the level crossing.

Appendix A contains site photographs and the below map shows the location of the level crossing.



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P:\Birmingham\TBM\Michael M GIS\2016\1118_Anglia_Level Crossing\GIS\County Amenities Maps\MXD\Higham_Ground_Zoom.mxd

Proposals for the project

Network Rail has conducted two rounds of public consultation regarding Higham Ground Frame level crossing - the first was to obtain feedback on initial options for all level crossings in the programme (in June 2016), and the second was to obtain feedback on the preferred options (in September 2016). Following the receipt of this feedback, consideration was given as to how any proposed closure of the level crossing and implementation of an alternative route might best be progressed and managed.

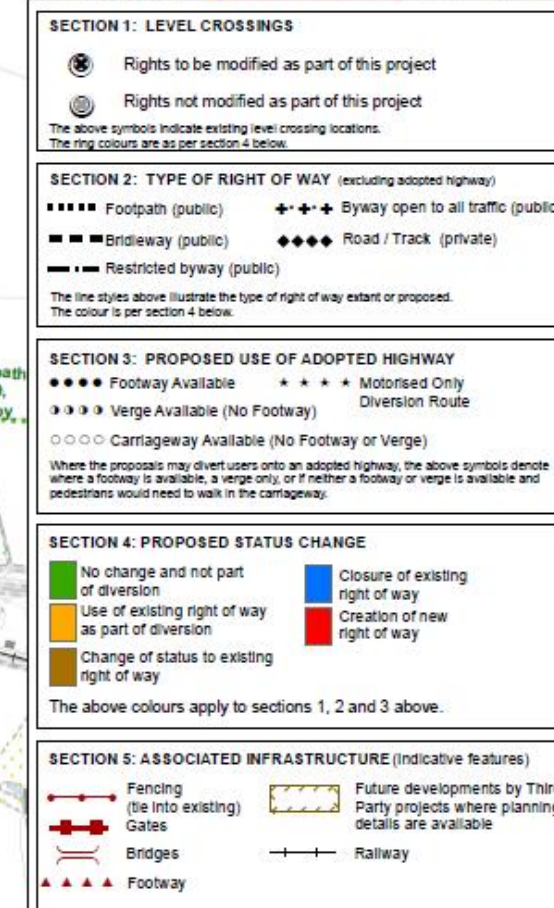
Following feedback on the second two of public consultation, the proposal is to close Higham Ground Frame level crossing to members of the public. The preferred proposal is to divert users to two alternative crossing points along the line: Higham Road¹ bridge located 1.1km west of the level crossing and The Needles Eye underbridge located 1.2km to the east.

On the southern side of the railway line, a new 2m wide footpath will be provided within adjacent field margins. This will link the level crossing to Coalpit Lane (west) and the underbridge (east). Due to the presence of a ditch, a stepped or ramped footbridge is proposed between Coalpit Lane and the adjacent field. Higham Road bridge would then be accessed via existing footpaths and carriageways from both the north and south. The Higham Road diversion would increase walking distances by up to 1km.

A second 2m wide footpath (within field margins) will be established on the southern side of the line, linking footpath 006 Barrow with Church Lane (the paved, single-track road leading to the underbridge (as detailed in the figure below)). It is noted that accessing the underbridge would only be possible from the southern side of the railway line. A new 3m wide bridleway will be established on the northern side of the line, linking the underbridge with rights of way to the east.

The figure below shows the preferred diversion route following feedback at Round 2 of public consultation. This is also available in **Appendix B**, along with initial options for diversions, taken to Round 1 and 2 public consultations.

¹ While Coalpit Lane offers a more direct diversion route, it was identified by road safety teams as a big safety risk to users. The road bridge on Coalpit Lane is narrow and the bends on either side make it difficult for drivers to see pedestrians. As such, Coalpit Lane was excluded as part of the diversion.



1. The layout shown on this drawing is indicative and may be subject to change at detailed design.
2. This drawing should be read in conjunction with the Suffolk Design Guide (Ref: 367516/ RPT023) which contains details of the infrastructure types referred to in this drawing.

Anglia Level Crossing
Reduction Strategy

Design Freeze Proposals

S24 - Higham Ground Frame
Suffolk - Barrow CP
Post Code IP286NS

P3A	Mar 2017	For Information	WC	SRP	SJT	JA
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App
Scale at A3 NTS		Drawing No. MMD-367516-S24-GEN-005				

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S24 Higham Ground
 Private: No existing or proposed rights
 Public: Existing footpath rights removed, users divert to adjacent Higham Road bridge to the west or The Needles Eye underbridge to the east
 Infrastructure: F4 fence to run west to the existing bridge along Network Rail boundary and to run east along Network Rail boundary to Needle's Eye underbridge; F7 fence for a maximum of 10m at the level crossing on the north side of the railway

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0 0.35 0.7 Kilometers

Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, the work could impact on people.

Potential positive impacts: Without the closure of Higham Ground Frame crossing, there is a risk of a future incident at this location. The closure of the crossing will separate people from the railway line and eliminate the need for users to navigate across the A14 traffic - thereby improving the safety of all users. Safety benefits are more likely to be experienced by some protected characteristic groups.

Potential negative impacts: The proposal for Higham Ground Frame level crossing will impact accessibility and walking distances for users of the crossing. Additionally, the proposed diversion route would potentially include a stepped footbridge and walking along field margins. This may disproportionately affect certain sections of the population who find additional walking distances, using steps and walking on uneven terrain difficult.

Step 2: The evidence base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics:

- | | |
|--|------------------------------|
| - Disability including carers ² | - Age |
| - Pregnancy/maternity | - Race |
| - Religion or belief | - Gender |
| - Sexual orientation | - Marriage/Civil Partnership |
| - Gender reassignment | |

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

User profile

The nine-day census carried out in July 2016 indicated that a total of 50 people used the level crossing over the survey period. All users were adults. No children, older people, impaired people, wheelchairs or scooters, or people with pushchairs / prams were recorded using the level crossing.

It should be noted that all 50 level crossing users accessed the crossing on the same day within a 45-minute period, suggesting that this may have been a walking, running or research group. A breakdown of the census data can be found in **Appendix C**.

Population profile

In order to gain a better insight into the local community and therefore other potential users of the level crossing, existing socio-demographic data was reviewed to establish the composition of the local population – here taken as the district of Forest Heath.³ These are as follows:

- Children (under 16 years of age) make up 19% of the Forest Heath population. This is equivalent to the national average.
- The proportion of older people (here described as people of retirement age – 65 and over) in Forest Heath is the same as the national average at 16%.
- 15% of the Forest Heath population is living with a long-term illness or disability that limits their daily activities. This is slightly lower than the national average of 18%.

² Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support

³ Source: ONS Population estimates taken from nomis. Available at:
https://www.nomisweb.co.uk/reports/lmp/la/1946157240/report.aspx?pc=cb8_8bt

- 23% of the population of Forest Heath is from Black, Asian or minority ethnic (BAME⁴) groups. This is slightly higher than the national figure of 20%.
- Forest Heath has a low proportion of its populations belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) - 2% compared with 9% for England.

The above demographic analysis suggests that the populations of all of the protected characteristics (for which there is demographic data) are broadly in line with national proportions. There is one exception, Forest Heath has a lower proportion of people from minority faith groups.

Local amenities

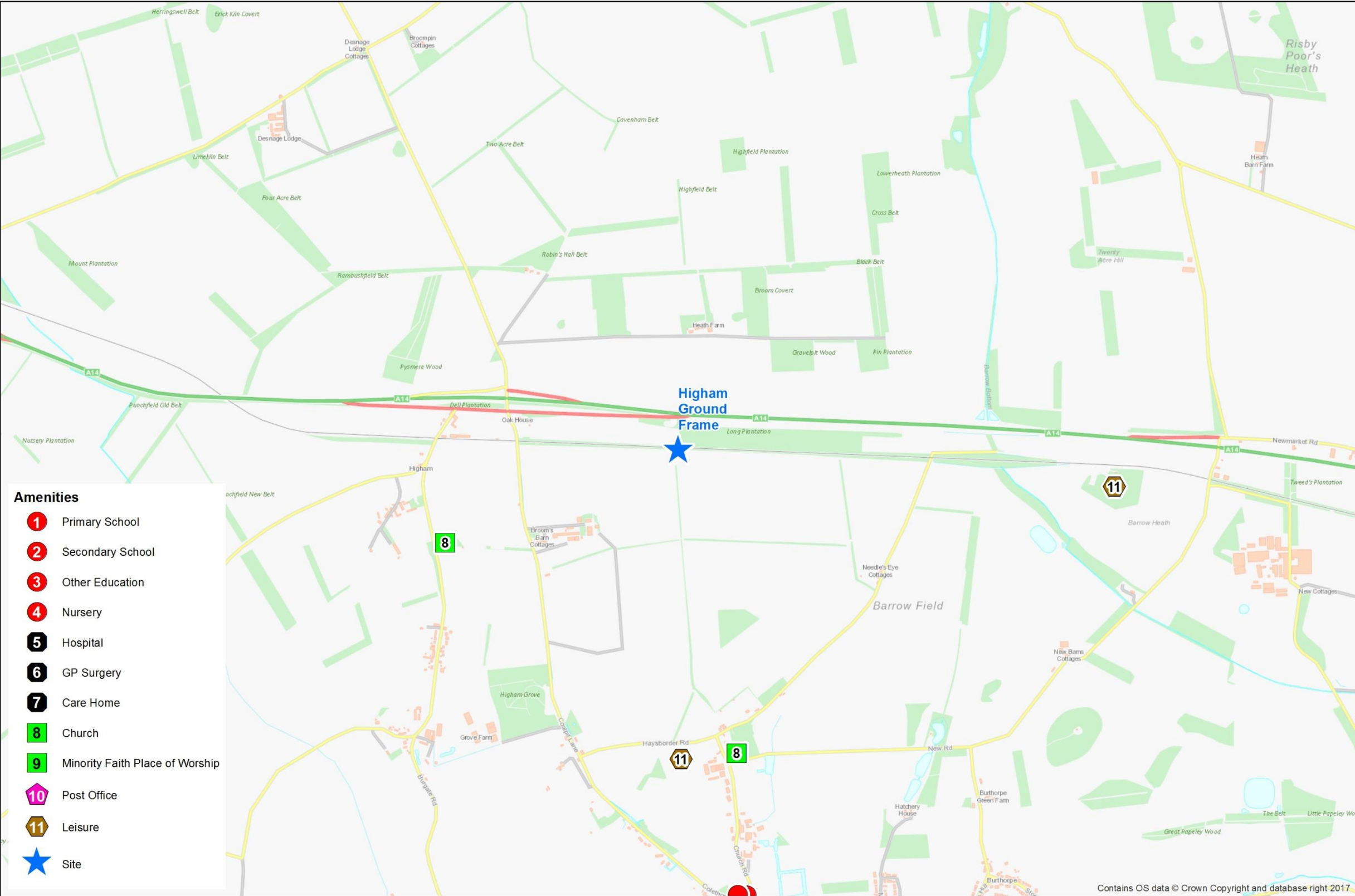
An analysis of local planning policies in May 2017 highlighted there are areas of land allocated for housing development in the village of Barrow⁵. However, as these are located 3.1km south of the level crossing, any development is unlikely to significantly impact upon the usage of the level crossing.

An analysis of the local area indicates that there are two churches and two leisure facilities within 2km of the level crossing. These are located in small settlements to the south of the crossing.

The map below shows local amenities.

⁴ Including white Irish, Gypsy and Irish travellers and other white ethnic populations.

⁵ St Edmundsbury Borough Council (2014): 'Rural Vision 2031'. Available at:
https://www.westsuffolk.gov.uk/planning/Planning_Policies/local_plans/upload/3-Rural-Vision-2031.pdf



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0 100 200 300 400 500 Meters



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Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially negative impacts could this work have on people with protected characteristics?

The below table assesses the potential impacts of the proposed work at Higham Ground Frame level crossing on the protected characteristic groups as outlined in the Equality Act 2010 (disability, age, pregnancy / maternity, race, religion / belief, gender, sexual orientation, marriage / civil partnership and gender reassignment).

Protected Characteristic	Impact	Explain the potential negative impact
Disability	Y	<p>The permanent closure of Higham Ground Frame level crossing will remove pedestrian access at this point.</p> <p>Safety issues related to level crossings can disproportionately impact disabled people, older people, children and men. This is because:</p> <ul style="list-style-type: none"> Crossing speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may also be less able to cross safely because of these factors. People with visual or hearing impairments can also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.⁶ Older people have potentially slower walking speeds and their field of vision tends to decline over time. Studies have shown that this can be at a rate of 1° and 3° per decade.⁷ Older pedestrians (aged 65 or over) walk more slowly than other pedestrian users (the mean walking speed achieved by over-65s in controlled studies was 0.9 metres per second (m/s) in men and 0.8 m/s in women, compared to the mean for the population as a whole of 1.2m/s⁸), placing older people at greater risk. Children and younger people have potentially slower walking speeds and can have difficulties correctly processing the speed of oncoming vehicles.⁹
Age	Y	
Pregnancy / maternity	N	
Race	N	
Religion or belief	N	
Gender	Y	
Sexual orientation	N	
Marriage/Civil Partnership	N	
Gender reassignment	N	

⁶ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁷ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

⁸ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

⁹ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

		<ul style="list-style-type: none"> Male pedestrians dominate accidents at level crossings they are associated with 70% of all train strikes. Given that males represent approximately 50% of the population as a whole, this would suggest male pedestrians are more at risk at level crossings than female pedestrians.¹⁰ <p>Reduced interaction with the railway at this point may potentially result in a reduced crossing risk for these groups. However, due to the lack of recorded usage by older people, disabled people and children, there will be no considerable change to baseline safety.</p> <p>There will be up to a 1km increase in walking distances for those following the diversion route, and the potential incorporation of a stepped footbridge along the route. These types of impacts typically affect some protected characteristic groups more than the general population, notably disabled and older people, (particularly those with reduced mobility).</p> <ul style="list-style-type: none"> Older and disabled people are more likely to have difficulties walking long distances and experience pain or discomfort in doing so.¹¹ Of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.¹² Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and are more likely to struggle to climb stairs.¹³ <p>However, due to the highly restrictive nature of the current level crossing and the lack of recorded usage by these two groups there will be no change to baseline accessibility. It should also be noted that there are no amenities in close proximity of the site that would be used disproportionately by disabled and older people. As such, it is highly unlikely that any impacts would be experienced disproportionately.</p>
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¹⁰ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

¹¹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹² Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹³ NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway' Diversity and inclusion 31032015

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- Commitment 1: Get everyone home safe every day.
Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary route.
- Commitment 2: Deliver reliable infrastructure.
The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- Commitment 6: Being a customer focused organisation.
The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.
- Commitment 9: A railway fit for the future.
The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

The below are views received through public consultation events. As such, views are not necessarily received from or relevant to those who share a protected characteristic.

List the groups you have consulted or reference previous relevant consultation? ¹⁴	What issues were raised in relation to one or many of the protected characteristics?
Public consultation Round 1 (June 2016)	<p>As part of round 1 of public consultation, one questionnaire response was received for Higham Ground Frame level crossing.</p> <p>The sole respondent stated that they were neutral towards the proposal to close the crossing, but that they would prefer another diversion route to be put in place. They were of the opinion that the blue route¹⁵ to the east was necessary to compensate for the loss of the level crossing.</p> <p>The red route¹⁶ to the north of the railway line was deemed unnecessary by the respondent, with the red route to the</p>

¹⁴ This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

¹⁵ See appendix B: Round 1 scheme drawing

¹⁶ See appendix B: Round 1 scheme drawing

	<p>south of the railway being the most sensible option from a maintenance point of view.</p> <p>It was felt that, to ensure user safety, the parts of the red route that follow existing roads should have footpaths made up (and maintained) along one of the verges, where these don't already exist. Where roads must be crossed, suitable traffic calming measures (e.g. signage, on-road marking) should be provided.</p>
Suffolk Local Access Forum response	<p>Closure of the crossing and use of the red route would move the footpath crossing of the A14 to the overbridge. The proposed blue route, if designated a bridleway, would be a valuable addition to the network.</p>
Public consultation Round 2 (September 2016)	<p>As part of public consultation round 2, two questionnaire responses were received. Both respondents agreed with the proposals to permanently close the crossing.</p> <p>Questionnaire responses identified the following comments / issues (outlined below) regarding the proposals for Higham Ground Frame level crossing:</p>
Landowner responses	<ul style="list-style-type: none"> • The crossing is not used by members of the public as it is considered to be very dangerous. The current footpath serving the level crossing involved pedestrians crossing the A14 dual carriageway as well as the railway line. • It was highlighted that footpath W-316002/0 (see Appendix B.2) is unused as it links only to the crossing which is to be closed. It is suggested that this footpath is closed too.
British Horse Society Access Officer responses:	<ul style="list-style-type: none"> • It would be beneficial to horse riders for the proposed footpath from Coalpit Lane to the underpass to be upgraded to a bridleway to connect with the new proposed bridleway north of the railway.
The Rambler's Association (Suffolk Group) response:	<ul style="list-style-type: none"> • The suggested creation of new routes is welcomed and provides good links to existing footpaths south of the A14. However, there are concerns that these new alternative routes may not be deliverable because of lack of landowner consent. • The diversion route to the west meets Higham Lane and then walkers have to progress north on the road across the existing railway bridge to the Round House which meets the slip road from the A14. It is absolutely essential that road safety measures are put into place for walkers to safely cross the road.

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

N/A

Step 5: Informed decision-making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).

1. Change the work to mitigate against potential negative impacts found	
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	<p>✓</p> <p>Due to the current user profile, poor connectivity of existing footpaths leading to Higham Ground Frame level crossing and the availability of alternative routes, closure and redirection along the proposed diversion route is considered an appropriate solution.</p> <p>Route improvements should be considered for the proposed diversion to ensure accessibility.</p>
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	

Step 6: Action planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By who
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and other benefits of the scheme, including user safety.	Ongoing	Network Rail project team

Explore improvements to diversion routes which could include: vehicular speed control measures along Coalpit Lane, Higham Road and the A14 slip road; signage to support way finding; and ensuring level surfaces. This will ensure that pedestrian accessibility is enhanced along the proposed route.	Prior to implementing works	Network Rail liabilities team
Ensure that measures to improve the permanent diversion route meet guidelines in the Equality Act 2010 wherever possible in order to ensure that the route is as accessible as can be for all groups. This includes installing a ramped footbridge on Coalpit Road, rather than a stepped structure.		
Review the DIA at every GRIP stage.	Ongoing	Network Rail project team

Step 7: Sign off

Name	Position	Signed	Date
DIA Owner TBC	Scheme Project Manager		
Superuser ¹⁷	Liability Negotiations Mgr	<i>Steve Day</i>	05/02/2018
Senior Manager ¹⁸			

If you don't have a local superuser please send your DIA for quality assurance to DiversityImpactAssessment@networkrail.co.uk

To help us respond more quickly please make sure you have;

1. Sent your DIA as a Word document not a PDF
2. Used this naming convention '**Name of project-Draft DIA**'
3. Used the correct DIA form with no additional pages e.g. 'not for circulation cover-sheets'
4. Included any relevant maps / diagrams needed to understand your project
5. Completed all sections of the DIA in line with guidance and training

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

¹⁷ Quality assurance check.

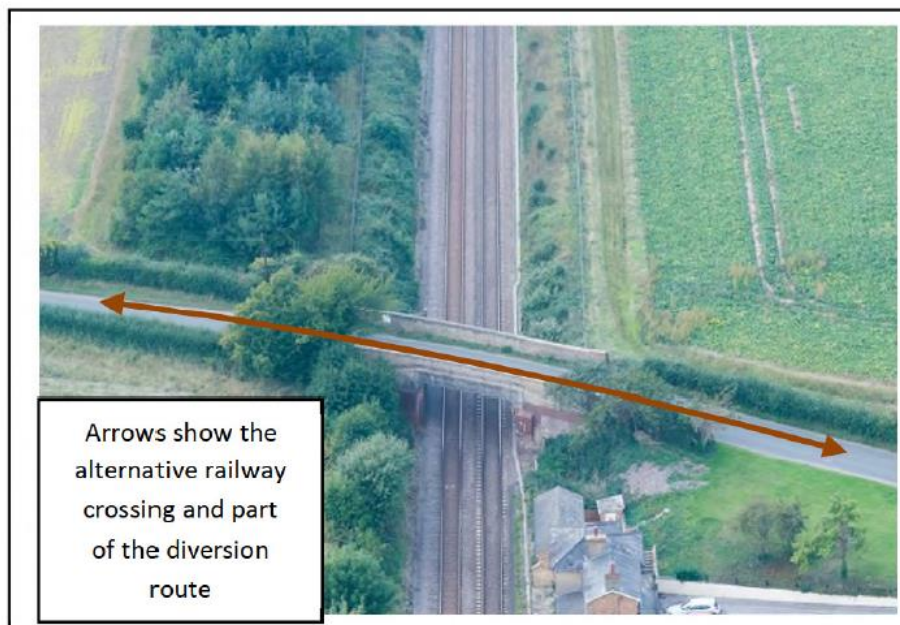
¹⁸ Sign-off should be by someone who can approve policy, programme or budget changes.

Appendix A: Site photographs

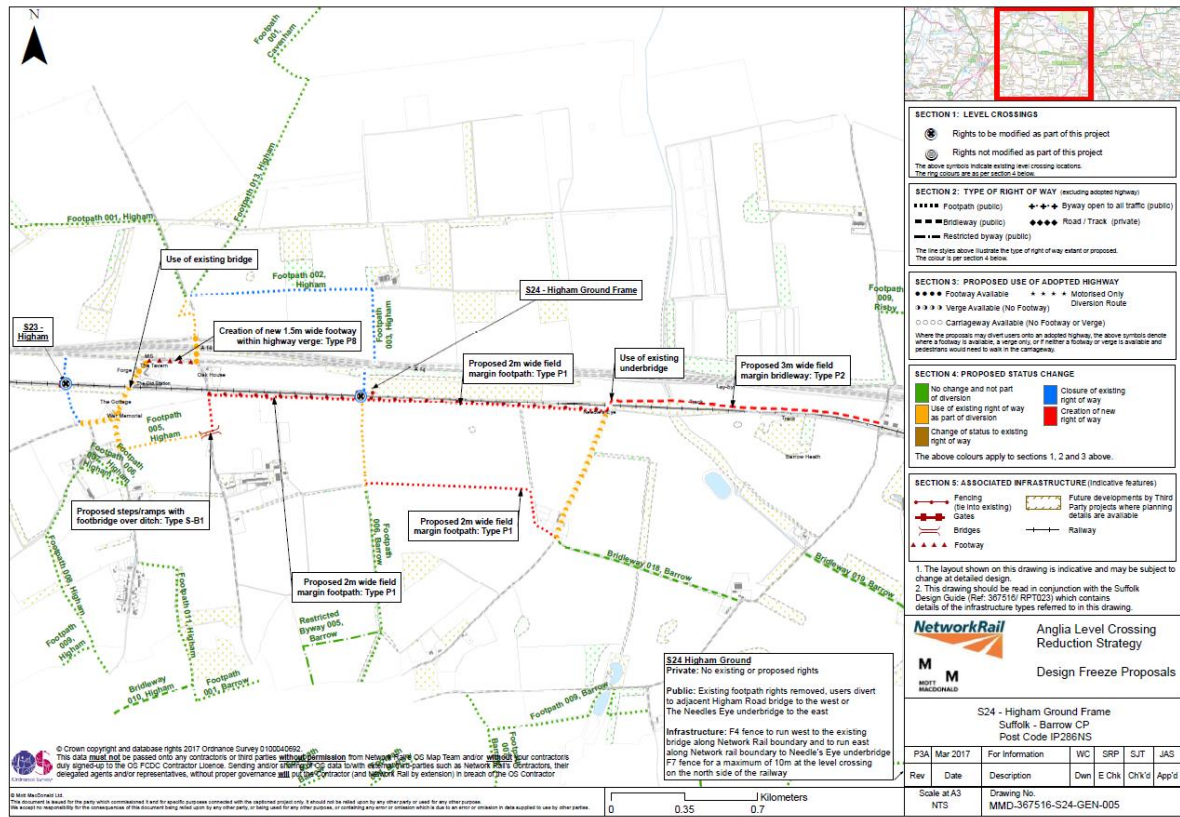
Existing level crossing



Alternative railway crossing – existing bridge



B.3. Following Round 2 consultations – preferred option (March 2017)



Appendix C: Census summary

Summary

The survey was successfully completed in accordance with the Network Rail specification.

The data is summarised below:

Pedestrians								
	Adult	Accompanied child	Unaccompanied child	Older person	Impaired user	Wheelchair user	Pushchair / pram	Total
25/06/2016	0	0	0	0	0	0	0	0
26/06/2016	0	0	0	0	0	0	0	0
27/06/2016	0	0	0	0	0	0	0	0
28/06/2016	0	0	0	0	0	0	0	0
29/06/2016	50	0	0	0	0	0	0	50
30/06/2016	0	0	0	0	0	0	0	0
01/07/2016	0	0	0	0	0	0	0	0
02/07/2016	0	0	0	0	0	0	0	0
03/07/2016	0	0	0	0	0	0	0	0
	50	0	0	0	0	0	0	50

Note that spike in usage on 29/06/2016 is attributable to a local running event.

Safety, Technical and Engineering

Health & Safety
Finance

Engineering
Business Management

Environment & Sustainable Development
Risk, Analysis & Assurance

Diversity Impact Assessment for closure of Cattishall Level Crossing, Great Barton, Suffolk



Introduction

Cattishall level crossing is a public footpath level crossing with wicket gates in the railway boundary fence. Users of the level crossing are instructed by signage placed on either side of the level crossing 2m from the nearest rail to 'Stop, Look, Listen: Beware of Trains' and must decide for themselves whether it is safe to cross.



The crossing is on the double track Coldham Lane Junction to Haughley Junction (Cambridge to Ipswich) Line and the maximum line speed is 75mph in either direction. The level crossing comprises the entire length of Public Footpath 17 in the parish of Great Barton.

From Network Rail's All Level Crossing Risk Model, the individual risk rating for crossing users is 'C' (where 'A' is highest risk and 'M' is lowest) and the collective risk rating for this crossing is '4' (where '1' is highest risk and '13' is lowest). A C4 level crossing is classed as high risk. Key safety issues identified in the assessment relate to frequent trains, sun glare, and large number of users.

Between 2011 and 2017, there were 2 reported near misses at the level crossing. There has been one suicide and one fatal accident.

The closest existing alternative crossing point of the railway line is a disused private vehicular underbridge, Denton's Bridge, reference CCH/1146, which is approximately 420m west of the level crossing:



Step 1: Clarifying Aims

Q1. What are the aims of this project/piece of work?

The aim of this project is to eliminate the risk of injury or death to users of the level crossing through closure of the level crossing and the diversion of the public footpath rights to a grade-separated crossing of the railway.

The proposal is two-fold:

1. As part of Network Rail's Level Crossing Risk Reduction Strategy, proposed to be delivered in 2019–2020 under powers being sought in a Transport and Works Act Order in 2017–2018: diversion of the public footpath to underbridge CCH/1146, with closure of the level crossing to all users. A 3m wide surfaced route would be provided along the red dashed line and through the underpass, to connect with existing tarmac cycle track heading south from the underpass.



2. Construction of a public footbridge at or near the site of the level crossing, to be contingent on funding provided by the developer of land to the north.

Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, this work could impact on people.

Proposals to change the way people cross the railway will have an impact on the people currently using the level crossing. Consideration should be given to factors such as whether the proposals cut the links between communities, increase the level of effort required to make a journey, increase journey times, and whether the needs of people with protected characteristics have been catered for in the proposals.

Step 2: The Evidence Base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics;

- | | |
|--|------------------------------|
| - Disability including Carers ¹ | - Age |
| - Pregnancy/maternity | - Race |
| - Religion or belief | - Gender |
| - Sexual orientation | - Marriage/Civil Partnership |
| - Gender reassignment | |

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on those people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

Level crossing environment

Cattishall level crossing is located in the parish of Great Barton. The footpath level crossing is reached by way of lightly trafficked public roads from the north or south. The nearest residential property is 200m away, to the north of the crossing, and the nearest substantial housing area begins 500m away, to the south west of the crossing. The village of Great Barton is 2km north of the level crossing along existing highways.

The Ordnance Survey map below shows the public rights of way and roads in the area. Cattishall level crossing is at the centre of the map.

¹ Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support



National Cycle Route 13 is signposted over the level crossing. However, as a public footpath, cycling is not permitted on the railway. Provision of a facility for cyclists, or impact on their journeys, is outside the scope of this Assessment.

Population profile of the area

In order to gain a better insight into the local community and potential users of the level crossing, existing statistical data were reviewed to establish the composition of the local population – here taken as Great Barton Ward. These are as follow:

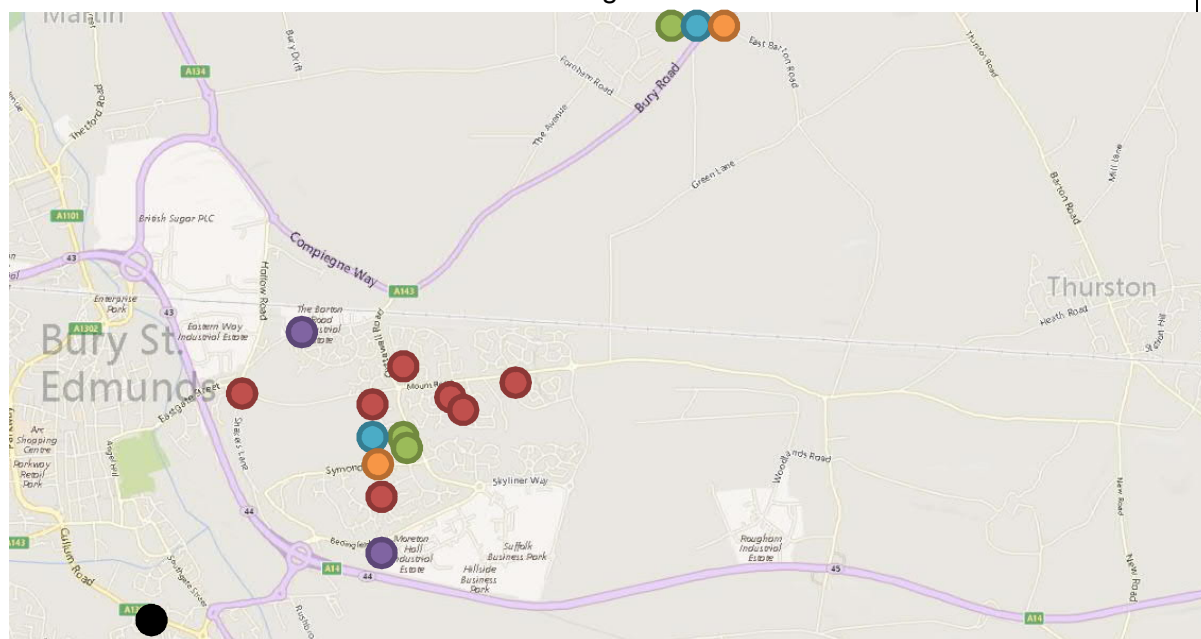
- Children (under 16 years of age) make up 16% of the Great Barton population, which is broadly in line with the national average of 19%.
- The proportion of older people (here described as people of retirement age – 65 and over) in Great Barton is 28%, which higher than the national figure of 16%.
- 17% of the Great Barton population have a long-term illness or disability that limits their daily activities. This is the same as the national average.
- 1% of the population of Great Barton is from Black, Asian or ethnic minority (BAME) groups. This is considerably lower than the national figure of 20%.
- The figure for people belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) in Great Barton is less than 1%, which is also much lower than the national average of 9%.

The above demographic analysis suggests that the populations of all of the protected characteristics (for which there are demographic data) are broadly in line with national

proportions. There are two exceptions to this. Great Barton has a significantly lower proportion of people from both BAME and minority faith groups.

Local amenities

An analysis of local amenities indicates that there are a number of amenities of importance to equality groups within 1km of the level crossing. These include several nurseries, schools, churches and convenience stores. The surrounding area comprises small villages (Great Barton and Thurston), which have a similar range of amenities. The closest urban centre is Bury St Edmunds, approximately 4km away from the crossing. The map below shows local amenities. Cattishall level crossing is at the centre.



Key:

- Bury St Edmunds Hospital (2 miles)
- Schools
- Places of Worship
- Supermarkets
- Pharmacies
- Post Offices

Level Crossing Usage

A video census of usage was undertaken in June/July 2016. The census hours were 0000–2359. A summary of the usage of the level crossing is presented below:

Pedestrians		Adult	Accompanied Child	Unaccompanied Child	Elderly	Impaired	Wheelchair	Pushchair / Pram	Mobility Scooter	Railway Personnel	Total
Saturday	25/06/2016	36	0	0	0	0	0	0	0	0	36
Sunday	26/06/2016	39	0	0	0	0	0	0	0	0	39
Monday	27/06/2016	19	0	0	0	0	0	0	0	0	19
Tuesday	28/06/2016	18	1	0	0	0	0	0	0	0	19
Wednesday	29/06/2016	11	0	0	0	0	0	0	0	0	11
Thursday	30/06/2016	13	0	0	0	0	0	0	0	0	13
Friday	01/07/2016	3	0	0	0	0	0	0	0	0	3
Saturday	02/07/2016	29	0	0	0	0	0	2	0	0	31
Sunday	03/07/2016	52	5	0	0	0	0	2	0	0	59
		220	6	0	0	0	0	4	0	0	230

Equestrians and Cyclists

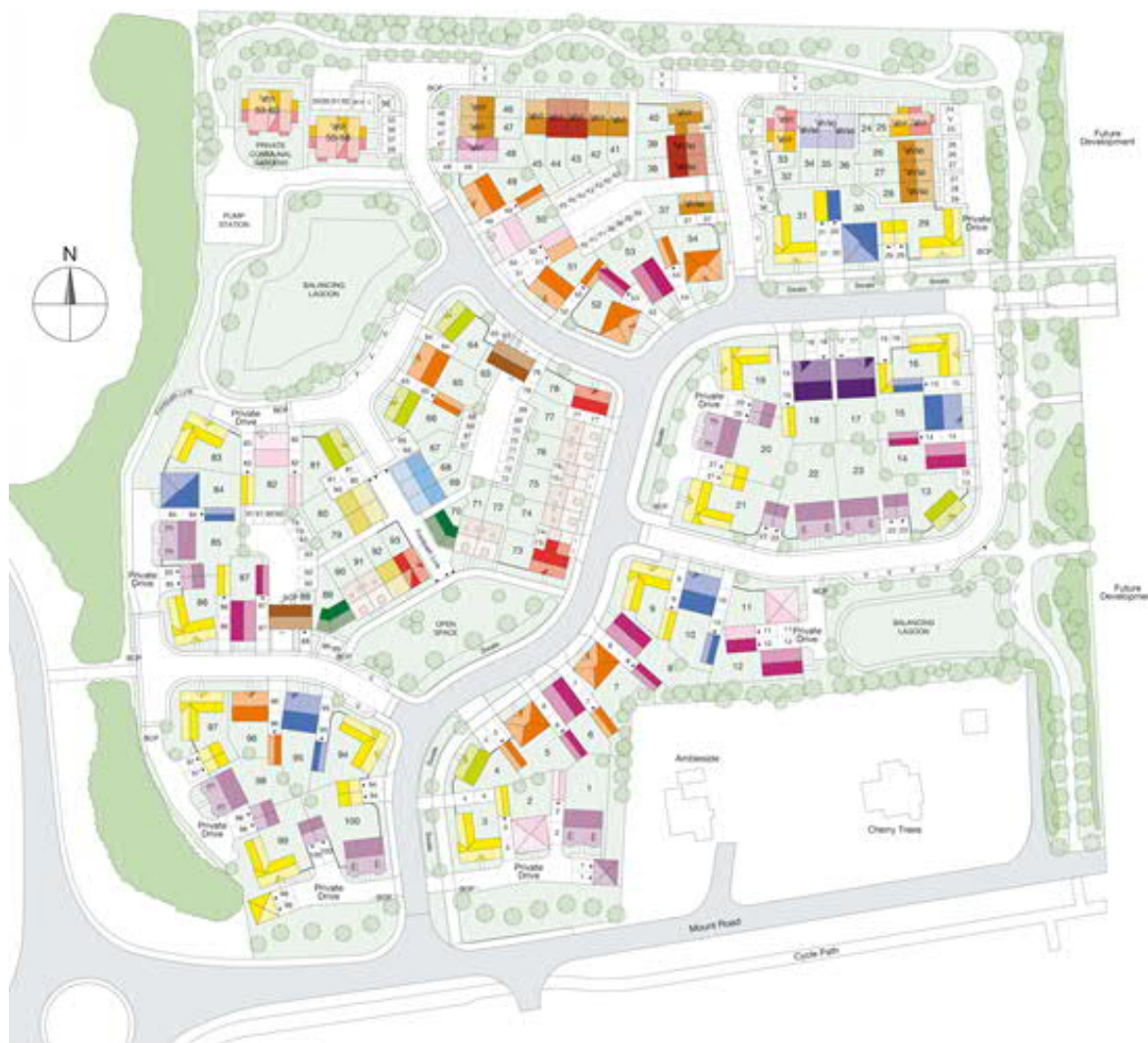
		Ridden bicycles	Pushed bicycles	Total
Saturday	25/06/2016			
Sunday	26/06/2016			
Monday	27/06/2016			
Tuesday	28/06/2016	1	13	14
Wednesday	29/06/2016	2	3	5
Thursday	30/06/2016	1	7	8
Friday	01/07/2016	1	16	17
Saturday	02/07/2016	7	3	10
Sunday	03/07/2016	9	50	59
		21	92	113

Note that after the first 3 days of census data were analysed, the methodology was changed for counting pedestrians and cyclists. For clarity, during the first 3 days, counts of ridden bicycles & pushed bicycles were categorised within the regular pedestrian classifications.

The level crossing appears to receive no regular usage by older people, those with visible disabilities, wheelchair users, mobility scooters, or unaccompanied children. There is limited recorded usage by prams/pushchairs.

Future Developments

The Moreton Hall scheme: 500 new houses are being constructed by Taylor Wimpey to the south west of the level crossing. (The works have disturbed the road that gives access to the level crossing, which may have had the effect of discouraging usage. However, at the time of the census, these works had not commenced.) A plan showing the proposed layout of the site is below:²



The level crossing is at the top right of the above plan. The road heading south from the level crossing is to be reconfigured as part of these works, with vehicular access being restricted.

² Source: <https://www.taylorwimpey.co.uk/find-your-home/england/suffolk/bury-st-edmunds/lark-grange> 25/07/2017

No new local amenities are proposed within the above site, although there will be some open spaces and balancing lagoons, which may be of interest to the wider community. Some of the funding from the s. 106 Agreement of this development will contribute towards construction of a new secondary school. This is proposed to be located off Lady Miriam Way. This is the road that extends south from the roundabout shown in the bottom left of the above plan.

The land north west of the level crossing is allocated in the Local Plan for residential development. A developer has an option on the site and, at the time of writing (July 2017), is working up a planning application with a view to constructing 1250 houses, and new local amenities. An overview of the proposal is shown below:³



³ Source: <http://www.northeastburystedmunds.co.uk/index.cfm?articleID=181>

Key:

-  Upper Severals Formal Grid
-  Middle Severals Informal Organic
-  Lower Severals Informal Grid
-  Local Centre
-  Gateway Buildings
-  Buildings/ Frontages of Significance
-  Local Centre
-  Development Edge - Buildings Set in Landscape
-  Primary School
-  Trees
-  Hedgerows
-  Structural Planting
-  Landscape Buffer to Cattishall
-  Indicative SUDS Location
-  Strategic Green Space
-  Outdoor Sports
-  Landscape Buffer to Great Barton
-  Landmark Building
-  Allotments

Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially *negative impacts* could this work have on people with protected characteristics?

Protected Characteristic		Explain the potential negative impact
Disability e.g. the impact of a new online process on dyslexic staff or the impact of changes to how passengers get to a platform on someone who cannot use stairs.	N	<p>Studies have shown that, of people with a disability who are able to walk, around 30% can walk no more than 50m without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200m.⁴</p> <p>Safety issues related to level crossings can disproportionately impact disabled people. Walking speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to gates, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may be less able to cross safely because of these factors⁵. People with visual impairments may have difficulty crossing safely due to not being able to see warning signage or approaching trains⁶.</p> <p>Current usage</p> <p>No users with visible disabilities, or using mobility scooters, have been recorded as using the level crossing. Those with disabilities may at present choose to avoid the level crossing because of its inherent risks, and the spring-loaded wicket gates might act as a physical barrier to usage. In view of the crossing's distance from residences and local amenities, it is unlikely that those who have difficulty mobilising for significant distances will wish to use the routes accessed via the level crossing, in spite of the route being surfaced throughout.</p> <p>Diversion of the public footpath from the level crossing to the underbridge will take the route</p>

⁴ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

⁵ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁶ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

		<p>closer to the centre of a residential area, and could encourage greater access to the rights of way network by those presently unable to access the level crossing owing to its distance from their homes, or its self-closing gates. The underbridge provides a safe, flat crossing of the railway where users can take their time and are able to stop and rest mid-way if they wish, which is not safe behaviour on a level crossing. There will be no need for gates on the proposed route.</p> <p>Design of the underpass works should consider surfacing suitable for disabled users, and how the possibility of anti-social behaviour which might deter usage by the disabled can be designed out so far as possible. As the area develops, the provision of seating along the route will facilitate usage for those unable to mobilise for long distances.</p> <p>As the current proposal is for the diversionary route to be created as a right of way for cyclists and pedestrians (technically a public bridleway), sufficient width should be provided to ensure that the use of the route by cyclists should not conflict with the use by potentially slower-moving disabled people.</p> <p>Future usage</p> <p>When and if the housing currently under construction or proposed is occupied, desire lines may change. The development south of the railway will not provide significant local amenities other than some open areas around site. The development north of the railway proposes to have a building-free zone at its eastern end, which will be a larger area for recreation, but most amenities, such as the new local centre, will be at the western end of the site, to which the underbridge is closer.</p> <p>Those living in new homes north of the railway will not have to cross the railway to enjoy the recreation area, and they will be able to reach other local amenities to the south and west via the underbridge which is, in most cases, no further than if a bridge were provided at the level crossing.</p>
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		<p>Construction of a stepped footbridge at or near the current level crossing would enable those living south of the railway, who are able to manage steps and are near the crossing but are unable to mobilise for long distances, to access the recreation area. A ramped footbridge would be unnecessary because diversion via the existing underbridge would be of comparable length to a route via ramps if provided at the recommended gradient of 1:20. Additionally, ascending and descending ramps would require greater effort than following the natural contours of the land in the area.</p> <p>As the population of the area increases, consideration should be given to provision of benches for the use of those unable to mobilise for long distances.</p>
<p>Age e.g. the impact of changes to long-service benefits on younger and older staff or the impact of a long alternative route to close a level crossing on an older person with a long-term health issues</p>	N	<p>The nine-day census revealed that no unaccompanied children crossed the railway. However, reduced interaction with the railway (due to the use of a safe diversion as an alternative or a bridge) is likely to lead to significantly reduced risk for this group.</p> <p>Safety issues related to level crossings disproportionately impact children. This is due to their potentially slower walking speeds and because children and younger people can have difficulty correctly processing the speed of oncoming vehicles. Research conducted on behalf of the House of Commons Transport Select Committee showed that children perceived vehicles moving towards them at more than 20mph as stationary.⁷</p> <p>Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and may struggle to climb stairs⁸. Therefore, increased walking distances as a result of the diversion could disproportionately impact older people with mobility issues, as these people are more likely to have difficulties walking long</p>

⁷ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

⁸ NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway'

		<p>distances and experience pain or discomfort in doing so⁹.</p> <p>Safety issues related to level crossings disproportionately impact older people, due to their potentially slower walking speeds. Research by University College London has shown that older pedestrians (aged 65 or over) walk more slowly than other pedestrian users. The mean walking speed achieved by older pedestrians in controlled studies was 0.9m/s in men and 0.8m/s in women, compared to the mean speed for the population as a whole of 1.2m/s¹⁰. This slower walking speed places them at greater risk on level crossings and when crossing carriageways. Older people are also particularly at risk as their field of vision declines over time, making them more vulnerable to moving vehicles. Studies have shown that this can be at a rate of 1° and 3° per decade¹¹.</p> <p>Current usage</p> <p>Whilst no unaccompanied children were recorded using the level crossing, the closure of this crossing will disproportionately benefit the safety of this vulnerable group, for whom level crossings might prove attractive play areas.</p> <p>Increases in walking distances, as a result of diversion to the underbridge could disproportionately impact on older people, who may be less able to mobilise for long distances. For this reason, it is recommended that resting places are provided along the route.</p> <p>As diversion to the underbridge brings the route nearer to housing and present and proposed local amenities, this will have the effect of shortening walks, making it more suitable and attractive for older people.</p> <p>Future usage</p>
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⁹ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

¹⁰ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

¹¹ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

		<p>The construction of new housing with family-sized homes would be expected to bring more children to the area. The underbridge will be located at the heart of the built out residential area and will provide level, safe access across the railway. The provision of a stepped footbridge at or near the existing level crossing would provide additional connectivity for children (and their parents) to cross the railway and access the new open spaces that are to be provided. Those requiring step-free access across the railway would be able to use the underbridge, which would not be a significantly longer or more onerous route than a theoretical ramped bridge with gradients of 1:20.</p>
<p>Pregnancy/maternity e.g. the impact of team relocation on a woman who is on maternity leave or the increase in height of a footbridge over the railway</p>	N	<p>Current usage</p> <p>Parents with prams, pushchairs or buggies can have difficulty using level crossings because of the need to operate gates, and when stood behind a pram, the person making the decision to cross the railway will be behind the decision point from which sighting is measured.</p> <p>Children in prams and pushchairs, recorded as occasional users of the level crossing, should have no difficulty in using the diversionary route, which will be free of gates and level crossing risk. Increase in distance should be minimal as the underbridge route is substantially on the desire line between local amenities, and in any case, the route over the level crossing forms part of a longer route between villages.</p> <p>Future usage</p> <p>As the area develops and the population grows, the step-free route across the railway via the underbridge will remain suitable and safe. Those requiring step-free access across the railway at or near the current level crossing would be able to use the underbridge, which would not be a significantly longer or more onerous route than a theoretical ramped bridge with gradients of 1:20.</p>
<p>Race e.g. the impact of psychometric testing on the recruitment of people who don't have English as a first language or the gentrification of an area</p>	N	<p>Instructions at level crossings are provided in English. By removing a level crossing, the risk of users making a mistake due to misunderstanding instructions will be eliminated. No other</p>

following station redevelopment that makes retail outlets too expensive for local businesses		disproportionate impacts are anticipated for this protected characteristic because of this project.
Religion or belief e.g. the impact of a new expenses policy on meal times or the closure of a level crossing between a community and its place of worship	N	The places of worship in the vicinity of the level crossing are located some distance away. Reaching them via the underbridge should be no more onerous than a journey via the current level crossing. No disproportionate negative impacts are anticipated for this protected characteristic because of this project.
Gender e.g. the impact of a local decision to adopt arbitrary 'core hours' on women who are more likely managing childcare issues or the impact of changes in parking policies on women who are more likely to start work later due to childcare issues	N	<p>Males are more prone to taking risk on level crossings than females, and comprise a greater proportion of fatalities. Closure of the level crossing and diversion to the underbridge will disproportionately benefit the safety of males over females in terms of safety.</p> <p>Consideration should be given to the provision of features on the diversionary route such that females do not fear for their personal safety. This could include elements such as overlooking, lighting, and potentially CCTV in some areas. However, it is noted that the route via the current level crossing is at present unlit and largely not overlooked. Provision of lighting is therefore likely to be desirable as part of future developments rather than diversion to the underbridge.</p>
Sexual orientation e.g. the impact of a decision to invite partners to an away day on a gay man who hasn't disclosed his sexual orientation or the secondment of a lesbian member of staff to a project in a country where this would be a risk to life / human rights	N	<p>No disproportionate impacts are anticipated for this protected characteristic because of this project.</p> <p>Consideration should be given to the provision of features on the diversionary route such that those undergoing gender reassignment do not fear for their personal safety. This could include elements such as overlooking, lighting, and potentially CCTV in some areas. However, it is noted that the route via the current level crossing is at present unlit and largely not overlooked. Provision of lighting is therefore likely to be desirable as part of future developments rather than diversion to the underbridge.</p>
Marriage/Civil Partnership e.g. the impact of the extension of private health care to spouses	N	<p>No disproportionate impacts are anticipated for this protected characteristic because of this project.</p> <p>Consideration should be given to the provision of features on the diversionary route such that those</p>

		undergoing gender reassignment do not fear for their personal safety. This could include elements such as overlooking, lighting, and potentially CCTV in some areas. However, it is noted that the route via the current level crossing is at present unlit and largely not overlooked. Provision of lighting is therefore likely to be desirable as part of future developments rather than diversion to the underbridge.
Gender reassignment e.g. the impact of a decision to publish Oracle gender data on a new intranet staff finder page or the impact of a decision to not let staff use taxis for late night events in high risk areas	N	<p>No disproportionate impacts are anticipated for this protected characteristic because of this project.</p> <p>Consideration should be given to the provision of features on the diversionary route such that those undergoing gender reassignment do not fear for their personal safety. This could include elements such as overlooking, lighting, and potentially CCTV in some areas. However, it is noted that the route via the current level crossing is at present unlit and largely not overlooked. Provision of lighting is therefore likely to be desirable as part of future developments rather than diversion to the underbridge.</p>

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- **Commitment 1:** Get everyone home safe every day. Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary route.
- **Commitment 2:** Deliver reliable infrastructure. The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- **Commitment 6:** Being a customer focused organisation. The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.
- **Commitment 9:** A railway fit for the future. The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

List the groups you have consulted or reference previous relevant consultation? ¹²	What issues were raised in relation to one or many of the protected characteristics?
Public consultation Round 1 (June 2016)	<p>General public consultation was undertaken in 2016. In June 2016, the public were asked about their preferred closure option for the level crossing involving users being diverted to the underpass. The 2 options presented were the red route, being a new footpath heading due north from the underpass, or a blue route, being a new footpath through the underpass, heading east parallel to the railway line, and joining Cattishall Road north of the existing level crossing. Of the 13 respondents, 31% favoured the red option, 54% the blue, and 15% 'other'. 54% had a positive attitude to implementation of the proposals, 23% were neutral, and 23% disagreed.</p> <p>No comments were made with respect to discrimination against or difficulties for those with protected characteristics if either proposal were implemented.</p>
Public consultation Round 2 (September 2016)	<p>Further general public consultation was undertaken in September 2016. The red route, being diversion alongside the railway line, was chosen as the single option and received 70% support.</p> <p>Again, no comments were made with respect to discrimination against or difficulties for those with protected characteristics if the proposal were implemented.</p>
Complications	<p>Two issues complicated the public consultation at this site.</p> <ol style="list-style-type: none"> 1. Awareness by locals of the proposed developments, and the increased demand for crossings of the railway as the development comes on stream. This additional demand is being addressed through provision of the developer-funded footbridge, to be included as a requirement in the planning application for the land north of the railway. 2. Recognition that the diversionary route should be suitable for use as a cycle track, notwithstanding that the level crossing is a public footpath. The proposed route will be constructed to 3m wide and surfaced so

¹² This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

	that it is suitable for cycling in all weathers. It will technically be a public bridleway, although equestrian usage in the area is not believed to be significant.
Objections to the draft Network Rail (Suffolk Level Crossing Reduction) Transport and Works Act Order	Six objections were received to the formal application for powers. These objections primarily relate to the importance of maintaining resilient access across the railway, and the desire to see a bridge provided at the level crossing. None mention users with protected characteristics.

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

Previous discussions between Network Rail Liability Negotiations and Suffolk County Council (SCC) had raised the underbridge as a potential diversionary route for the level crossing.

Network Rail met with SCC's rights of way team in April 2015 to discuss the closure of Cattishall level crossing as part of the Anglia Level Crossing Reduction Strategy, being a proposal to close multiple level crossings by diversion or extinguishment of rights of way through the use of a Transport and Works Act Order. Network Rail asked SCC to review its early proposals and send back any comments.

SCC and St Edmundsbury Council have consistently stated that they are not happy with just the use of the existing underbridge, although it is common ground that the opening of the underbridge to use by the public has benefits, both now and as the development of housing proceeds.

The results of the census and analysis of the existing amenities in the area show that the underpass route is a suitable and convenient diversion for current users of the level crossing. The future desire for the site to have access to an additional crossing of the railway will be accommodated by a new bridge over the railway, rightly to be funded as part of that development.

Step 5: Informed Decision-Making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).


1. Change the work to mitigate against potential negative impacts found	<p>Provided that the detailed design of the diversionary route is conscious of creating a welcoming route suitable for users with protected characteristics, which has sufficient capacity to accommodate use by cyclists, there should be no issues created by the diversion. Diversion to the underbridge will bring an out-of-town route into an urban area where it will be of greater utility to those unable to travel long distances. The distribution of local amenities either to the south or south west of the level crossing means current and future users should not create significant extra distances to travel in most cases.</p> <p>As housing in the area develops, there will be more demand for crossings of the railway. The provision of a stepped footbridge as part of these developments will provide the shortest possible route across the railway for those at the eastern-most extent of the developments. There would be no benefit, given the current area identified in the local plan, in the provision of a ramped bridge, because diversion to the underbridge would be a less onerous diversion for most users. However, if housing extends further east on the north side of the railway (and nothing is currently proposed), consideration should be given to providing additional accessible crossings of the railway. If any stepped footbridge provided is capable of having ramps added in the future, should the need arise, this would provide an efficient option for delivering a new crossing of the railway, although the optimum placement of any facility will of course depend on the distribution of local amenities and employment areas.</p>
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	

Step 6: Action Planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By who
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and any other benefits of the scheme, particularly focussing on user safety improvements.	Ongoing.	Network Rail project team
Review the DIA at every design stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team

Step 7: Sign off

Name	Position	Signed	Date
Steve Day, Liability Negotiations Manager	Superuser ¹³		27/07/2017
	Senior Manager ¹⁴		

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

¹³ Quality assurance check.

¹⁴ Sign-off should be by someone who can approve policy, programme or budget changes.

Diversity Impact Assessment (DIA)

Guidance for completing each section is provided in the
Everyone Guide to Diversity Impact Assessments

Name of policy, programme or project: S69 Bacton – Anglia Level Crossing Reduction Strategy

Your Name: TBC

Your Job Title: Scheme Project Manager

Your Email: TBC

Department: Level crossings

Document Ref: TBC

Version No: 2

Step 1: Clarifying aims

Q1. What are the aims of this project/piece of work?



Anglia Level Crossing Reduction Strategy

Network Rail has committed to achieving a 25% reduction in level crossing system risk nationally as part of a programme of works undertaken within Control Period 5 (CP5), which runs from 2014-19.

Network Rail has been working hard to better manage its level crossings and the risks they pose. It has developed proposals for the possible closure or change to public rights of way at around 130 level crossings within the counties of Suffolk, Cambridgeshire, Essex, Hertfordshire, and the unitary authorities of Thurrock, Havering, and Southend-on-Sea. This is referred to as the Anglia Level Crossing

Reduction Strategy ('the Strategy'). Closing or modifying level crossings can help to bring about a number of benefits:

- Improve the safety of level crossing users
- Deliver a more efficient and reliable railway, which is vital in supporting the regional and UK economy
- Reduce the ongoing operating and maintenance cost of the railway
- Reduce delays to trains, pedestrians and other highway users
- Improve journey time reliability for railway, highway and other rights of way users

S69 - Bacton Level Crossing

Bacton is a public footpath level crossing located in the village of Bacton, Suffolk. The crossing is on the two track Great Eastern Main Line.

The approach to the level crossing is uneven with a ballast path and requires the use of stiles. Bacton level crossing is a 'Stop, Look and Listen' crossing, where the user determines whether it is safe to cross. Appendix A contains site photographs.

The crossing has an All Level Crossing Risk Model (ALCRM – the system used to measure risk at crossings) score of C6. The individual risk rating for crossing users is 'C' (where 'A' is highest risk and 'M' is lowest) and the collective risk rating for this crossing is '6' (where '1' is highest risk and '13' is lowest), making Bacton a high risk crossing. Key issues relate to frequent trains and sun glare. Approximately 100 trains (both passenger and freight) using it daily, and a line speed of 100mph. Between 2011 and 2015, there weren't any incidents of misuse, near misses or accidents at the crossing.

Network Rail aims to ensure the most viable option for continued access across the line based on the need to ensure public safety, meet local needs, and ensure compliance with its duties under the Equality Act 2010.

Project location

The level crossing has residential properties on the west and is bordered by a football pitch to the east. The level crossing forms part of a public right of way and is part of public footpath 13.

The map below shows the location of the level crossing.



Anglia level crossing reduction strategy

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Proposals for the project

Network Rail has conducted two rounds of public consultation; the first was to obtain feedback on its initial options for level crossings in the programme (in June 2016), and the second to obtain feedback on its preferred options (in September 2016). As part of public consultation Round 1, four questionnaire responses were received with one respondent preferring the blue route and three liking another route (see Appendix B). Following the receipt of this feedback, consideration was given as to how any proposed closure of the level crossing and implementation of an alternative route might best be progressed and managed.

The second round of public consultation 2 received nine questionnaire responses: one respondent agreed with the proposal, whilst eight disagreed with the planned work.

It is proposed that Bacton level crossing will be closed to all users with all current level crossing infrastructure removed and users being permanently diverted to an alternative route.

Network Rail's preferred diversion route (following feedback from the first round of public consultation and as shown in Figure 1 below) involves diverting users to an existing underbridge on Pound Hill, which is 150m from the current crossing (via Broad Road to the east and Birch Avenue to the west). Users would connect to the existing public right of way network to the west via an existing track and the addition of a new 2m wide footpath and a proposed timber footbridge over an existing drainage ditch which currently provides an obstruction.

In addition, a second 2m wide footpath will run down the eastern side of the railway to connect up to S13 Fords Green. The new footpaths and footbridge will be constructed to an appropriate standard and will include new wayfinding signs.

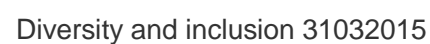
Because stakeholders raised concerns about the use of Pound Hill and Broad Road B1113 – as there is no designated footway on either road or going under Pound Hill underbridge – consideration is being given to a footway on Broad Road to improve user safety.

Although it was noted that a total of 22,531 vehicles used Pound Hill over the nine-day census period, a safety audit regarding the underbridge on Pound Hill did not highlight any concerns about the use of the road and bridge by pedestrians. It is recommended¹, though, that in order to improve pedestrian safety under Pound Hill underbridge, vegetation should be cleared and a 10m length verge be created (see Appendix A) to allow a safe standing area from pedestrians. Kerbing may also be considered as an alternative measure. New white line marking and additional road measures will also be provided. This will improve user safety and help to mitigate any potential negative impacts.

If users are travelling from the intersection of public footpath 13 and Broad Road to the intersection between Birch Road and the public footpath, the diversion will add an additional 450m to their journey.

¹ See Project Note: MMD-267516-TN10.

The drawing below shows the preferred diversion route suggested at public consultation Round 2. This is also available in Appendix B, together with the proposed diversion taken to the Round 1 public consultation.



Q2. Could this work impact on people? If yes, briefly explain how (considering our duty to promote equality, tackle discrimination and foster good relations between groups).

Yes, this work could impact on people.

Without the closure of Bacton level crossing, there is a risk of a future incident at this location. The closure of the crossing will better separate people from the railway line, thereby improving the safety of local residents and other users.

The proposal for Bacton level crossing will impact accessibility, walking distances, and journey times for users in the local community, and leisure walkers using the route recreationally.

The implementation of a permanent diversion via Pound Hill may disproportionately affect certain sections of the population who find walking longer distances difficult and may struggle with the new terrain required.

Step 2: The evidence base

Q3. Record here the data you have gathered about the diversity of the people potentially impacted by this work e.g. from the 2011 national census or from HR Shared Service. You should also include any research on the issues affecting inclusion in relation to your work.

Consider evidence in relation to all the protected characteristics:

- | | |
|--|------------------------------|
| - Disability including carers ² | - Age |
| - Pregnancy/maternity | - Race |
| - Religion or belief | - Gender |
| - Sexual orientation | - Marriage/Civil Partnership |
| - Gender reassignment | |

This Diversity Impact Assessment is primarily concerned with ensuring fulfilment of Network Rail's duties under the Equality Act 2010.

Network Rail's responsibility is to identify any potential negative impacts on those people with protected characteristics and mitigate these wherever possible and practicable by reasonable adjustments.

User profile

The crossing is not heavily used. The nine-day census carried out at Bacton level crossing in June / July 2016 indicated that a total of 28 people used the crossing during the survey period – an average of three people per day. The survey results showed that adult pedestrians constituted 5 out of 28 of level crossing users (including one railway employee). The remaining 22 users were unaccompanied children. All of these users used the crossing on the same day, meaning that on six of the nine days of the survey no one used the crossing at all. There was no recorded use by other groups including: older people, people with pushchairs / prams or wheelchair or impaired users during the whole survey period (although it is noted that the stiles presently preclude some use).

A summary of the census data can be found in Appendix C.

Population profile

In order to gain a better insight into the local community and potential users of the level crossing, existing statistical data were reviewed to establish the composition of the local population – here taken as Mid Suffolk.³ These are as follows:

- Children (under 16 years of age) make up 18% of the Mid Suffolk population, which is in line with the national average of 19%.
- Younger people (16-24 years old) make up 9% of the population of Mid Suffolk, which is slightly lower than the national figure (12%).

² Including those with physical, mental and hidden impairments as well as **carers** who provide unpaid care for a friend or family member who due to illness, disability, or a mental health issue cannot cope without their support

³ Source: ONS Population estimates taken from nomis. Available at:
[https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid suffolk](https://www.nomisweb.co.uk/reports/lmp/la/1946157242/report.aspx?town=mid%20suffolk)

- The proportion of older people (here described as people of retirement age – 65 and over) in Mid Suffolk is 20%, which is higher than the national figure of 16%.
- 17% of the Mid Suffolk population have a long-term illness or disability that limits their daily activities. This is the same as the national average.
- 4% of the population of Mid Suffolk is from Black, Asian or ethnic minority (BAME) groups. This is considerably lower than the national figure of 20%.
- The figure for people belonging to minority faith groups (including Buddhist, Hindu, Jewish, Muslim, Sikh and 'other' in national Census data) in Mid Suffolk is 1%, which is also much lower than the national average of 9%.

The above demographic analysis suggests that the populations of all of the protected characteristics (for which there are demographic data) are broadly in line with national proportions. There are two exceptions to this. Mid Suffolk has a significantly lower proportion of people from both BAME and minority faith groups.

Local amenities

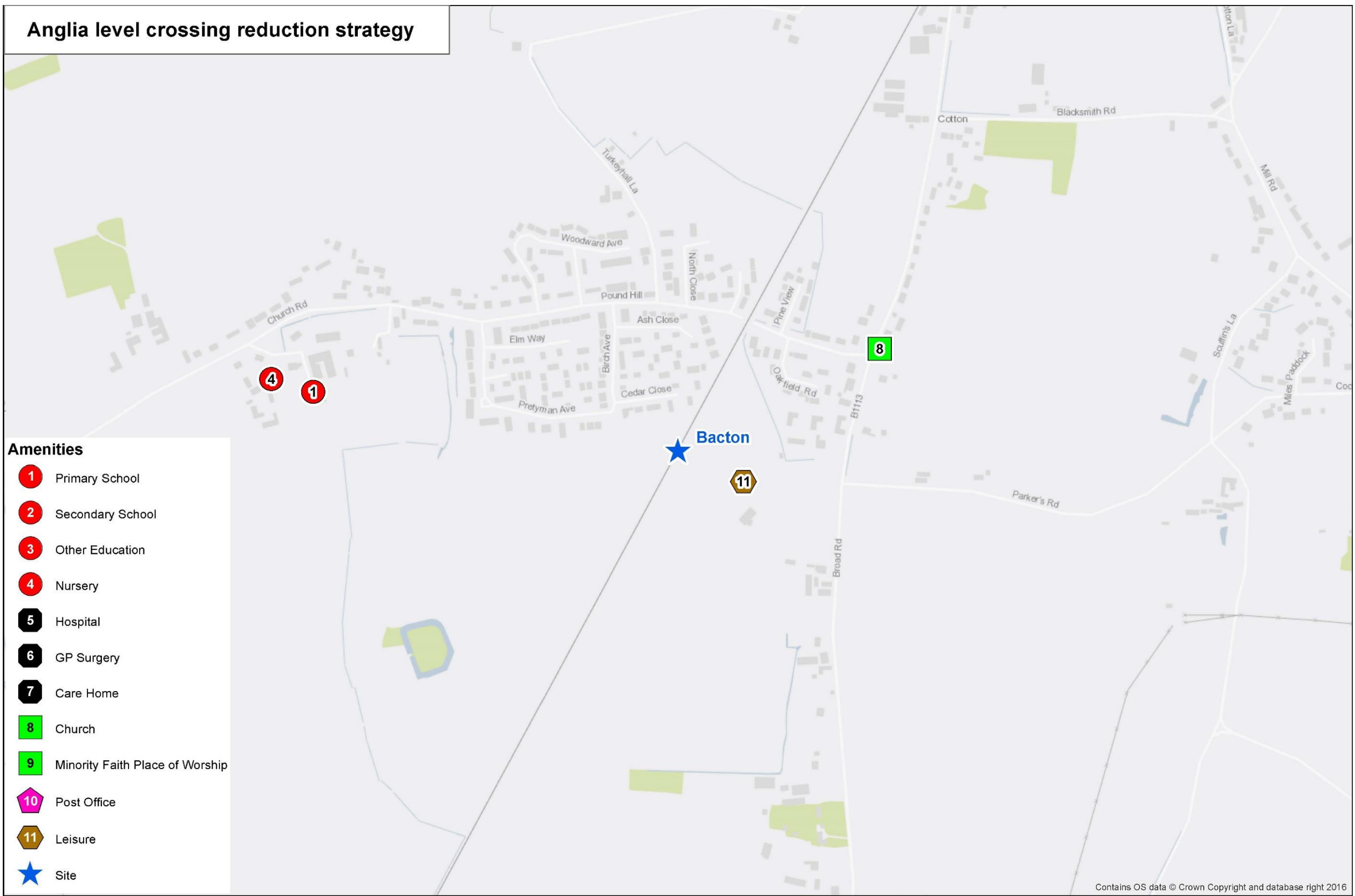
An analysis of local planning applications in December 2016 highlighted that there is currently permission in place for the creation of up to 47 residential properties on land to the west side of Broad Road.⁴ This is likely to increase the volume of traffic using Pound Hill underbridge.

An analysis of local amenities indicates that there are a limited number of amenities of importance to equalities groups close to Bacton level crossing. These include a nursery, primary school, church and a leisure centre. The surrounding area is made up of other small villages, which have a similar range of amenities. The closest large urban centre is Bury St Edmunds, which has a large range of amenities but is approximately 20km away from the crossing.

The map below shows local amenities.

⁴ Mid Suffolk Council: <http://planningpages.midsuffolk.gov.uk/online-applications/simpleSearchResults.do?action=firstPage>.

Anglia level crossing reduction strategy



- Amenities**
- 1 Primary School
 - 2 Secondary School
 - 3 Other Education
 - 4 Nursery
 - 5 Hospital
 - 6 GP Surgery
 - 7 Care Home
 - 8 Church
 - 9 Minority Faith Place of Worship
 - 10 Post Office
 - 11 Leisure
 - ★ Site

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Step 3: Impact

Q4. Given the evidence listed at step 2, what potentially negative impacts could this work have on people with protected characteristics?

The below table assesses the potential impact of the proposed work at Bacton level crossing on the protected characteristic groups as outlined in the Equality Act 2010 (disability, age, pregnancy / maternity, race, religion / belief, gender, sexual orientation, marriage / civil partnership and gender reassignment).

Protected Characteristic		Explain the potential negative impact
Disability	Y	<p>The permanent closure of Bacton level crossing will remove pedestrian access at this point, potentially having a disproportionate impact on disabled people (including people with mobility, sensory and respiratory conditions) wishing to use the crossing in terms of increased walking distances and reduced user safety.</p> <p>However, due to the current accessibility challenges at Bacton level crossing (and specifically the uneven ballast approach and presence of stiles), as well as the location of local amenities, it is likely that use by people with mobility impairments is minimal. This was confirmed by the census data which identified no users of any kind on most days of the survey period and did not document any disabled people using the crossing. The below text refers to disabled people (including people with cognitive impairments, ambulant disabilities etc.) who are able to manage the current crossing infrastructure.</p> <p>Permanent increased walking distances due to length of diversion</p> <p>Increases in walking distances, as a result of the permanent diversion routes, are likely to disproportionately impact upon some disabled people (such as those with mobility impairments or respiratory illness). Disabled people are more likely to have difficulties walking long distances and many experience pain or discomfort in doing so.</p> <p>Studies have shown that of people with a disability who are able to walk, around 30% can walk no more than 50 metres without stopping or experiencing severe discomfort and a further 20% can only manage between 50 and 200 metres.⁵</p> <p>The proposed diversion route would add 450m to the route. However, as noted above, the crossing is seldom used (including by disabled people) and as such any impact is likely to be very limited.</p> <p>There are plans for the creation of a 2m wide footpath to connect existing public rights of way, which would improve pedestrian accessibility for disabled people in the area.</p> <p>Impacts on user safety</p>

⁵ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

		<p>Safety issues related to level crossings can disproportionately impact disabled people. Crossing speeds are likely to be slower for people with disabilities and level crossings often require users to negotiate physical challenges related to structure, gradient and exposure to the track. Pedestrians with sensory, physical or cognitive impairments may also be less able to cross safely because of these factors.⁶ People with visual or hearing impairments can also have difficulties crossing safely due to not being able to pick up on the variety of visual and audible warning messages at level crossings.⁷ While access to the crossing for many disabled users is likely to be limited, reduced interaction with the railway means potentially reduced crossing risk for this group.</p> <p>However, the diversion route makes use of Pound Hill, which is located 150m from the Bacton level crossing. Stakeholders raised concerns about the route, as there is no designated footway going under the bridge on Pound Hill or Broad Road B1113 and the route does not meet DfT requirements regarding pedestrian accessibility. This could result in increased risk of a pedestrian-vehicle collision.</p> <p>However, following the Round 2 consultation feedback, proposals are under consideration to provide a footway on Broad Road and the implementation of other measures to improve provision for pedestrians (see the Action Plan below for details). This will improve user safety and mitigate any potential negative impacts.</p>
Age	Y	<p>The permanent closure of Bacton level crossing will remove pedestrian access at this point, potentially having a disproportionate impact on particular age groups – notably children and older people – compared to other sections of the population.</p> <p><u>Children</u></p> <p>Impacts on user safety</p> <p>Safety issues related to level crossings disproportionately impact children. This is due to their potentially slower walking speeds and because children and younger people can have difficulties correctly processing the speed of oncoming vehicles. Research conducted on behalf of the House of Commons Transport Select Committee showed that children perceived vehicles moving towards them at more than 20 mph as stationary.⁸</p> <p>The nine-day census highlighted that the most common user of the level crossing was unaccompanied children (22 out of 28) over the survey period – children are likely to be using the crossing to access the football pitch on the east of the line from the residential area on the west. In the case of the census period, all 22 uses by children occurred on one weekend day.</p>

⁶ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁷ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

⁸ House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

	<p>As such, reduced interaction with the railway (due to the use of a safe diversion as an alternative) is likely to lead to significantly reduced crossing risk for this group.</p> <p>However, and as noted above, due to the lack of a footway on Pound Hill and Broad Road, safety benefits associated with the closure of the level crossing may be reduced by the need for children to walk in the carriageway. This puts children in particular at greater risk of being involved in an incident, as the same issues of risk perception that make them particularly vulnerable at level crossings also apply when walking in the carriageway.</p> <p>Plans, however, are under consideration to install a footway on Broad Road, and other measures to improve provision for pedestrians (see the Action Plan below for further information).</p> <p>These measures will help to mitigate the negative impacts of the new route and prevent concern over the suitability of the route from deterring children from walking from the village to the football pitch.</p> <p><u>Older people</u></p> <p>Due to the nature of the current level crossing terrain and the location of both the crossing and local amenities, it is unlikely that the crossing forms part of a popular route for older people. This was confirmed by only five adult users and no documented uses by older people during the nine-day survey period.</p> <p>Permanent increased walking distances due to length of diversions</p> <p>The proposed diversion route following the closure of the level crossing would increase walking distances by 450m.</p> <p>Increases in walking distances, as a result of the closure of Bacton level crossing and the permanent use of diversion routes, are likely to disproportionately impact on older people.</p> <p>Older people are more likely to experience conditions such as arthritis or weak muscles, meaning that they typically walk more slowly, tire more easily, and may struggle to climb stairs.⁹ Therefore, increased walking distances as a result of the diversion could disproportionately impact older people with mobility issues, as these people are more likely to have difficulties walking long distances and experience pain or discomfort in doing so.¹⁰</p> <p>Impacts on user safety</p> <p>Safety issues related to level crossings disproportionately impact older people, due to their potentially slower walking speeds. Research by University College London has shown that older pedestrians (aged 65 or over) walk more slowly than other pedestrian users. The mean walking speed achieved by older pedestrians in controlled studies was 0.9 metres per second (m/s) in men and 0.8 m/s in women, compared</p>
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⁹ NHS (2014): 'Safe, compassionate care for frail older people using an integrated care pathway'

¹⁰ Department for Transport (2005): 'Inclusive mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure'

		<p>to the mean speed for the population as a whole of 1.2m/s.¹¹ This slower walking speed places them at greater risk on level crossings and when crossing carriageways. Older people are also particularly at risk as their field of vision declines over time, making them more vulnerable to moving vehicles. Studies have shown that this can be at a rate of 1° and 3° per decade.¹²</p> <p>As discussed above, the lack of designated pedestrian footways on both Pound Hill and Broad Road means that safety benefits associated with the closure of Bacton level crossing may be reduced by the need for pedestrians to walk in the carriageway when using the proposed diversion routes. Plans, however, are under consideration to install a footpath on Broad Road and other improvements to pedestrian safety (see the Action Plan for details).</p>
Pregnancy / maternity	Y	<p>The permanent closure of Bacton level crossing will remove pedestrian access at this point, potentially having a disproportionate impact on people with pushchairs / prams. However, the nine-day census confirmed that use of the level crossing is minimal (in general and by this group in particular), which is likely to be due, in part, to the uneven approach and location of amenities. Impact on this group is therefore likely to be minimal.</p>
Race	N	<p>No disproportionate impacts are anticipated for this protected characteristic because of the project.</p>
Religion or belief	N	<p>Despite the location of a church near the bridge, it is not considered that the Bacton level crossing forms part of any primary route. Therefore, no disproportionate impacts are anticipated for this protected characteristic because of the project.</p>
Gender	Y	<p>Impacts on user safety</p> <p>Safety issues related to level crossings can disproportionately impact men. Male pedestrians dominate accidents at level crossings, associated with 70% of all train strikes. Given that males represent approximately 50% of the population as a whole, this would suggest male pedestrians are more at risk at level crossings than female pedestrians.¹³ Reduced interaction with the railway (due to the diversion onto the bridge) would lead to reduced crossing risk for men.</p> <p>As discussed above, the lack of designated pedestrian footways on both Pound Hill and Broad Road means that safety benefits associated with the closure of Bacton level crossing may be reduced by the need for pedestrians to walk in the carriageway when using the proposed diversion routes.</p> <p>Plans, however, are under consideration to install a footway on Broad Road and other improvements for pedestrians (as outlined in the below Action Plan).</p>

¹¹ 1.2 m/s is the speed assumed in the programming of pedestrian level crossings on the road network, and is generally taken to be the mean walking speed.

¹² House of Commons Transport Committee (2014): 'Safety at level crossings: Eleventh Report of Session 2013–14'

¹³ Rail Safety and Standards Board (2011): 'Research Programme: Operations and Management - Improving safety and accessibility at level crossings for disabled pedestrians'

Sexual orientation	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Marriage/Civil Partnership	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.
Gender reassignment	N	No disproportionate impacts are anticipated for this protected characteristic because of the project.

Q5. What could you do to ensure your work has a positive impact on diversity and inclusion including by supporting delivery of the [Everyone Strategy](#).

The project will support the delivery of Network Rail's Everyone Strategy, and in particular the following commitments:

- Commitment 1: Get everyone home safe every day.
Improving the safety of level crossings reduces the risk of crossing the railway for all users. The project will help to improve safety for rail users by reducing interaction with the railway through safe diversionary route.
- Commitment 2: Deliver reliable infrastructure.
The project will help to deliver more reliable infrastructure by reducing the assets along the network requiring maintenance and management.
- Commitment 6: Being a customer focused organisation.
The project will help to improve the safety of journeys for infrastructure users through, among other things, use of customer engagement and stakeholder involvements in the planning process.
- Commitment 9: A railway fit for the future.
The project helps to deliver an inclusive and accessible railway that links people to communities, education and jobs – ultimately delivering economic growth. The project helps to deliver required improvements and rationalisation to ensure network infrastructure is fit for future use.

Step 4: Consultation

Q6. How has consultation with those who share a protected characteristic informed your work?

List the groups you have consulted or reference previous relevant consultation? ¹⁴	What issues were raised in relation to one or many of the protected characteristics?
Public consultation Round 1 (June 2016)	<p>Questionnaire responses received during the first round of public consultation identified the following comments / issues regarding the proposals for Bacton level crossing:</p> <ul style="list-style-type: none"> • One respondent was concerned that the proposals did not remove risk to pedestrians crossing the railway, as cross field paths could create issues with agricultural machinery and would be impassable for a short time if cultivated. • Support was received for the green route, as it would create a nice circular walk to the south of Bacton • Concerns were raised over the safety of pedestrians / cyclists / equestrians along the proposed diversion route. • Particular concerns were raised over traffic crossing at Pulhams Lane as there is no footpath under the bridge of the B1113. • Concerns were raised over the length of the proposed diversion. • Some disputes were raised over how the proposals would achieve the scheme objectives.
Public consultation Round 2 (September 2016)	<p>Questionnaire responses received during the second round of public consultation identified the following comments / issues (outlined below) regarding the proposals for Bacton level crossing:</p>
Parish Councillor	<ul style="list-style-type: none"> • At present, pedestrian access under the railway bridge is dangerous due to the lack of a footpath. • There is a railway-owned track beside the roadway either side of the bridge, leading to a long closed crossing for high vehicles - perhaps that land could be used to put in a footpath through a new underpass at the bridge.
NFU	<ul style="list-style-type: none"> • In closing this crossing, safety risks are transferred from Network Rail directly to the landowner.

¹⁴ This could include our staff networks, the Built Environment Access Panel, local faith leaders etc.

	<ul style="list-style-type: none"> • The proposed diversion is too long and runs across agricultural land which has associated risks – part of the land is pasture with grazing livestock. • New rights of way are being created with very little evidence of use.
W1 walking group	<ul style="list-style-type: none"> • The closure of two existing crossings together will mean people will have to walk by the side of the road, which poses hazards for pedestrians.
Stowmarket Ramblers Footpath Secretary	<ul style="list-style-type: none"> • Closure of this local amenity will cause hardship to the residents of Bacton – although it is not greatly used, it will break a network of local paths.
Public response	<ul style="list-style-type: none"> • Concerns were raised regarding the diversion of a rural footpath to a road, as pedestrians will be less safe. • The bridge itself floods regularly. • Concerns were raised about the reliability of the pedestrian census data. • The diversion via Low Bridge is more dangerous than the level crossing, as it has no footpath. • The B1113 is a designated lorry route.

Q7. Where relevant, record any consultation you have had with Network Rail teams who are delivering work that might overlap with yours. This will ensure that our solutions are joined up.

N/A

Step 5: Informed decision-making

Q8. In light of the assessment above, what is your decision?

Please tick one box and provide a rationale (for most DIAs this will be box 1).

1. Change the work to mitigate against potential negative impacts found	
2. Continue the work because no potential negative impacts found	
3. Justify and continue the work despite negative impacts (please provide justification)	<p>✓</p> <p>Due to the current user profile and proposed diversion routes, closure and redirection is considered an appropriate solution.</p> <p>However, Network Rail should consider the proposed route improvement measures along the identified diversion (as outlined below in the Action Plan) to ensure that the route is fully accessible for all users.</p>
4. Stop the work because discrimination is unjustifiable and no obvious ways to mitigate	

Step 6: Action planning

Q9. What specific actions will be taken to deliver positive impacts and address any potentially negative impacts identified at step 3 or through consultation?

Action	By when	By who
Develop a communication strategy to ensure that local residents are kept abreast of developments, including scheduling of works, details of enhancements and improvements, and any other benefits of the scheme, particularly focussing on user safety improvements.	Ongoing	Network Rail project team
<p>Following concerns raised by stakeholders, Network Rail should consider improvements to diversion routes, including: creation of footways and rest areas along the route, signage to support wayfinding; and ensuring level surfaces, including dropped kerbs and tactile paving.</p> <p>Proposals¹⁵ for vegetation clearance and the 10m verge, new kerbing, new white line marking and additional road measures should be taken forward to improve user safety.</p> <p>Installing a footway on Broad Road should also be considered further.</p>	Detailed design	Network Rail project team
Review the DIA at every design stage to ensure equality of access is maintained for all.	Ongoing	Network Rail project team

¹⁵ See Project Note: MMD-267516-TN10.

Step 7: Sign off

Name	Position	Signed	Date
DIA Owner TBC	Scheme Project Manager		
Superuser ¹⁶	Liability Negotiations Mgr	<i>Steve Day</i>	29/01/2018
Senior Manager ¹⁷			

If you don't have a local superuser please send your DIA for quality assurance to DiversityImpactAssessment@networkrail.co.uk

To help us respond more quickly please make sure you have;

1. Sent your DIA as a Word document not a PDF
2. Used this naming convention '**Name of project-Draft DIA**'
3. Used the correct DIA form with no additional pages e.g. 'not for circulation cover-sheets'
4. Included any relevant maps / diagrams needed to understand your project
5. Completed all sections of the DIA in line with guidance and training

Step 8: Publication

Send your final DIAs to DiversityImpactAssessment@networkrail.co.uk. Customer related DIAs will be published on our website.

¹⁶ Quality assurance check.

¹⁷ Sign-off should be by someone who can approve policy, programme or budget changes.
Diversity and inclusion 31032015

Appendix A: Site photographs



Diversion route photograph – Pound Hill underbridge

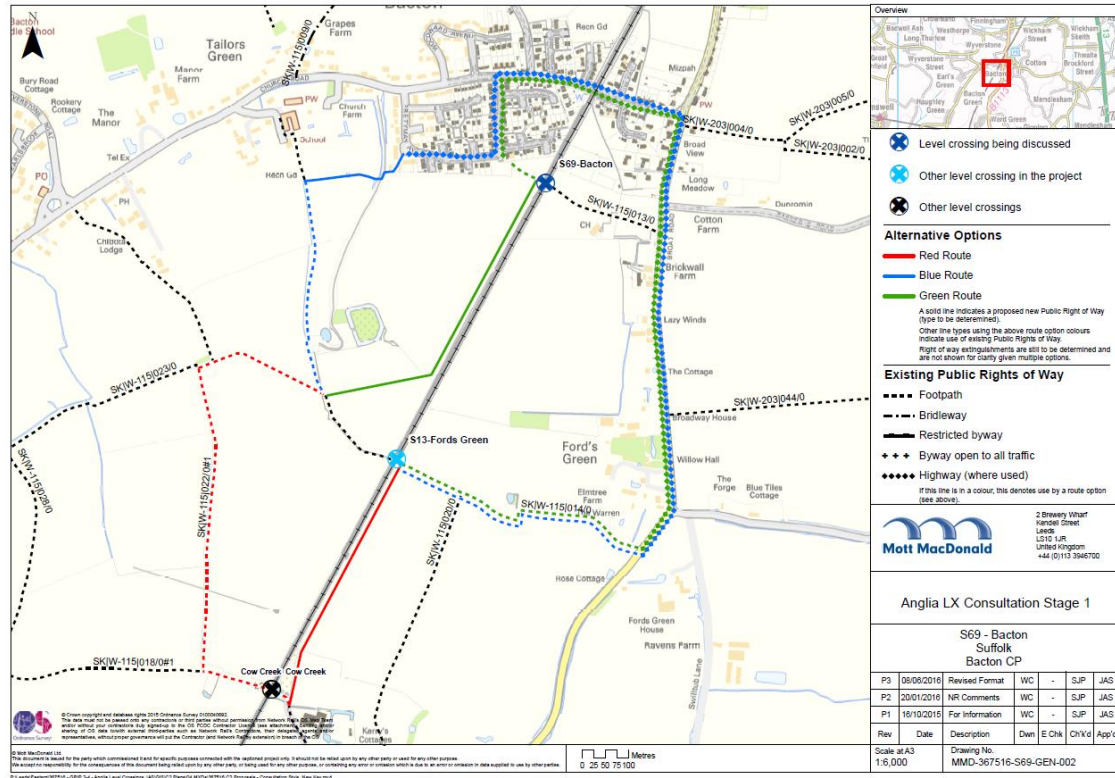


Improvements to Pound Hill underbridge

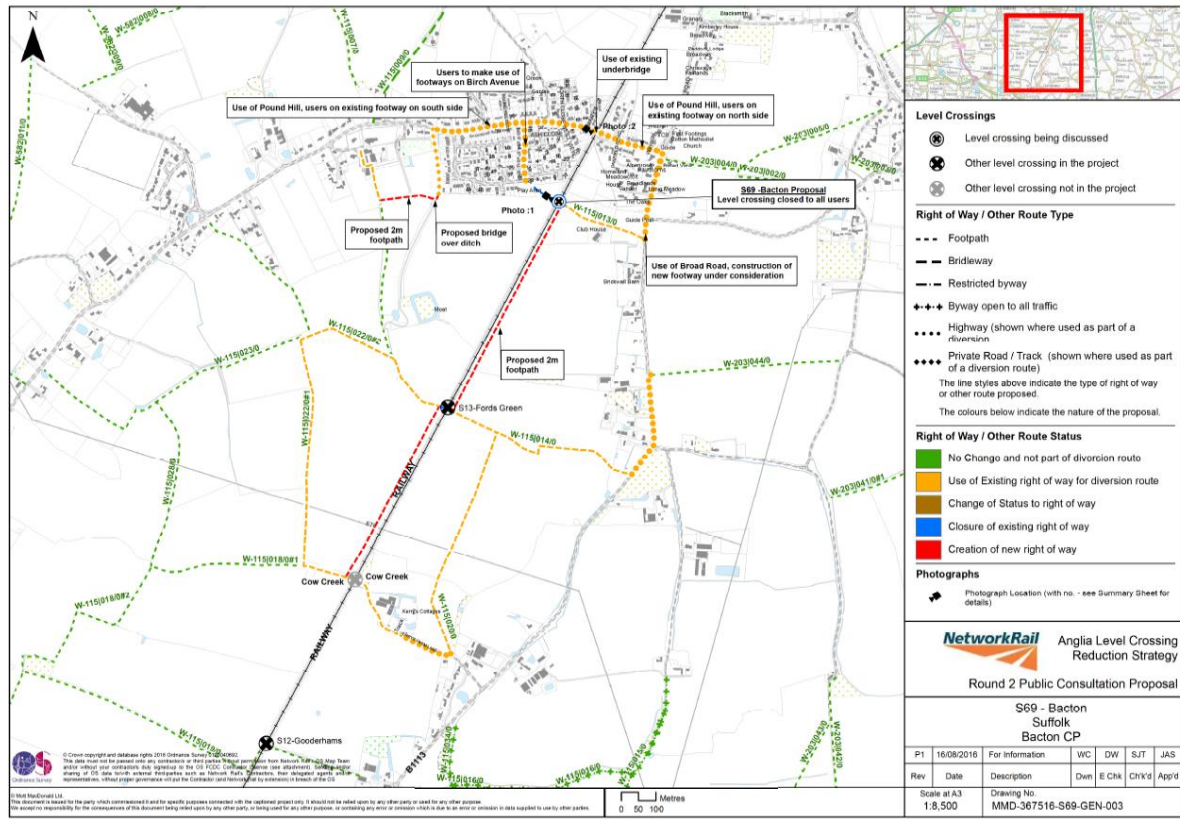


Appendix B: Site drawings

Round 1 consultation – proposed diversion (initial option)



Round 2 consultations – preferred option (at the time, September 2016):



Appendix C: Nine-day census data

Summary

The survey was successfully completed in accordance with the Network Rail specification.

The data is summarised below:

			Combined				Direction : Combined											
			Horse riders	Riding Cycles	Walking Cycles	Total	Adult		Accompanied Child	Unaccompanied Child	Elderly	Impaired	Wheelchair	Pushchair/ Pram	Scooter	Railway Personnel	Total	
Day 1	Saturday	25/06/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 2	Sunday	26/06/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 3	Monday	27/06/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Day 4	Tuesday	28/06/2016	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	5
Day 5	Wednesday	29/06/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 6	Thursday	30/06/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 7	Friday	01/07/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 8	Saturday	02/07/2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Day 9	Sunday	03/07/2016	0	0	0	0	0	0	22	0	0	0	0	0	0	0	22	22
			0	0	0	0	5	0	22	0	0	0	0	0	0	1	28	28

N. Guidance on The Ramblers walking speed

Calculating walking pace



How long you take to walk a specific distance, or how far you walk in a given time, will depend on a number of factors from your fitness level and the length of your stride to the number of stops you take to rest or enjoy your surroundings and any weight you're carrying on you in a rucksack or backpack.

Things can also vary at a moment's notice. The weather might suddenly turn or children you're walking with could tire. Circumstances at the time of your walk can also affect your speed – you'll probably walk that bit faster if you're late for an appointment than you would if you're simply enjoying some fresh air on a Sunday afternoon!

Everyone walks at a different pace, but as a guide most adults can walk at around 2.5 miles (4km) an hour without accounting for stops. If you're new to walking or recovering from an illness, allow yourself more time. Experienced walkers will often walk faster than this and walk further in an hour.

Whatever your walking ability though, the type of ground you're covering will impact your waling pace. People walk faster on smoother surfaces such as roads, pavements and surfaced paths, while uneven ground and more difficult surfaces such as mud or boggy areas, gravel and sand will slow you down.

And then there are hills to consider. 'Naismith's Rule' (devised by Scottish mountaineer William Wilson Naismith in 1892) allows an hour for every three miles (5km), plus an extra half an hour for every 1000ft (330m) climbed, so you'll need to factor in more time for a walk that includes ascents.

When calculating pace the most important thing is to know your limitations and those of the people you're walking with. It's no fun being left behind so if you're walking with others the group should adjust its speed to the slowest member of the group and give them plenty of encouragement.

O. Chapter 8 Traffic Signs Manual

Traffic Signs Manual

CHAPTER

8

**Traffic Safety Measures and Signs for
Road Works and Temporary Situations**

Part 1: Design

2009

Traffic Signs Manual

Chapter 8

Traffic Safety Measures and Signs for Road Works and Temporary Situations

Part 1: Design

Department for Transport/Highways Agency

Department for Regional Development (Northern Ireland)

Transport Scotland

Welsh Assembly Government

Contents of Chapters 1-8

CHAPTER 1 Introduction

CHAPTER 2 Informatory Signs *

CHAPTER 3 Regulatory Signs

CHAPTER 4 Warning Signs

CHAPTER 5 Road Markings

CHAPTER 6 Illumination of Traffic Signs *

CHAPTER 7 The Design of Traffic Signs

CHAPTER 8 Traffic Safety Measures and Signs for Road Works and Temporary Situations

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Chapter 8

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D1.1 BACKGROUND

D1.1.1 In the operation and maintenance of highway networks, it is necessary from time to time to put in place temporary traffic management measures to facilitate safe road works, temporary closures or incident management, whilst keeping the traffic flowing as freely as possible. With high traffic flows on many roads, it is particularly important to plan all works activities and temporary closures to optimise safety, road space and work efficiency, whilst minimising road user congestion, delay and inconvenience.

D1.1.2 Road works on or near a carriageway, cycleway or footway might impair the safety and free movement of vehicles, cyclists and pedestrians (particularly those with mobility and visual impairments). All reasonable steps should be taken to ensure that the effects of the works are reduced to a minimum. This Chapter sets out the effects of road works or temporary closures on all kinds of road user and recommends steps that should be taken to minimise these effects. It also emphasises the importance of following the recommended measures.

D1.1.3 The Health and Safety at Work, etc. Act 1974 and the Health and Safety at Work (NI) Order 1978 require all clients, employers and employees to establish and maintain safe systems of work. Highway authorities, statutory undertakers and contractors must give due attention to the detailed traffic management arrangements at road works sites and incident locations in order to ensure the safety of the public and of their own employees at these obstructions. It is essential for the safety of all concerned that uniform and consistent procedures should be adopted. Chapter 8 is intended to provide a standard of good practice for the signing and marking of obstructions as well as for the temporary traffic control necessitated by such obstructions of the highway. The standard described is a minimum, which should always be achieved. At difficult sites, i.e. sites where the on-site risk assessment has shown that the level of risk is above normal, further signs and other equipment will be necessary.

D1.1.4 Under the Construction (Design and Management) Regulations 2007 (CDM) and the Construction (Design and Management) Regulations (NI) 2007, clients, co-ordinators, designers and contractors have legal duties to plan, co-ordinate and manage health and safety throughout all stages of the project. CDM goes hand in hand with the Management of Health and Safety at Work Regulations 1999 (MHSW) and the Management of Health and Safety at Work Regulations (NI) 2000. Good management of the work is essential to prevent accidents and ill health.

D1.1.5 Further reasonable adjustments may also need to be made to works in order to comply with the Disability Discrimination Act 2005. Further guidance on meeting the requirements of the Act can be found in the revised Code of Practice on Section 3 of the Disability Discrimination Act.

D1.2 STRUCTURE AND SCOPE OF THE DOCUMENT

D1.2.1 Chapter 8 (2009) comprises two documents:

- This document, **Part 1: Design**, provides guidance for those responsible for the design of temporary traffic management arrangements which should be implemented to facilitate maintenance activities or in response to temporary situations. It contains advice relating to traffic safety measures, and the identity and location of the traffic signs needed to guide road users, including pedestrians, safely past obstructions in temporary situations. It is structured to facilitate and reflect the design process for temporary traffic management, from the initial broad brief to details of signing provision. It raises the principal issues that need to be considered in temporary traffic management design and provides advice about their resolution. The document deals with the design of temporary traffic management arrangements on single carriageway roads and dual carriageway roads separately. The design guidance is illustrated by the inclusion of sample plans.

- **Part 2: Operations** provides guidance for those responsible for planning, managing, and participating in operations to implement, maintain and remove temporary traffic management arrangements. It contains advice relating to good working practice spanning all aspects of temporary traffic management operations from broad management issues to issues involving the activities of individual operatives. The guidance is illustrated by the inclusion of sample plans relating to the operational guidance of particular temporary traffic management techniques.

D1.2.2 Working drawings for the design of the signs shown in the plans and other prescribed signs are available for download free of charge on the Department for Transport website: www.dft.gov.uk.

D1.3 LEGAL STATUS

D1.3.1 The Traffic Signs Manual is applicable in England, Northern Ireland, Scotland and Wales. This Chapter sets out a code of practice to enable the legal requirements to be met in a wide variety of circumstances, although it has no statutory force, except in Northern Ireland where an authorised officer for the Department may deem it to have such force. (In Northern Ireland, Article 31 (or equivalent) is the legal status that deems Chapter 8 to be a legal document for certain roads only and only for the signs and devices used.) All authorities, bodies and organisations responsible for all types of roads to which the public have access, are strongly recommended to make compliance with the requirements of Chapter 8 a condition of contract in the case of works carried out on their behalf. These roads include toll roads, tunnels and bridges, industrial parks, retail parks, leisure parks, academic, hospital, dock, railway, Ministry of Defence, heritage, park, and similar estate roads etc.

D1.3.2 It should be noted that many of the basic principles contained in this document are also covered in the Safety at Street Works and Road Works: A Code of Practice, which has legal backing under Sections 65 and 124 of the New Roads and Street Works Act 1991 and Article 25 of the Street Works (NI) Order 1995.

D1.3.3 Section 174 of the Highways Act 1980 and Section 60 of the Roads (Scotland) Act 1984 and Article 31 of the Road Traffic Regulation (NI) Order 1997 make it clear that the proper guarding, lighting and signing of the works are the responsibility of the person carrying them out.

D1.3.4 Traffic signs and other apparatus for the control of traffic must conform to the Traffic Signs Regulations and General Directions (TSRGD) in force at the time of the works. Any requirement for goods or materials to comply with a specified standard shall be satisfied by compliance with the requirements for mutual recognition contained in clauses 104 and 105 of the Manual of Contract Documents for Highway Works (Volume 1 Specification for Highway Works).

D1.3.5 The contents of this document may be considered as representing what is reasonably practicable for the enforcement of the Health and Safety at Work etc. Act 1974, the Health and Safety at Work (NI) Order 1978, and associated regulations.

D1.3.6 Compliance with the requirements of this Chapter may assist local traffic authorities to comply with their network management duties under Section 16 of the Traffic Management Act 2004.

D1.4 CONCEPTS AND OBJECTIVES

D1.4.1 Safe and efficient traffic management is founded upon the following simple principles:

- provision of clear and early warning of obstructions in the highway;
- optimisation of road space and the provision of an adequate safety zone and working space at works locations;
- clear directions relating to decisions/actions required from road users;

- minimisation of potential conflict between road users, and between road users and road workers and their operations;
- credibility of traffic signs and temporary requirements; and
- speed limits and restrictions appropriate for the temporary highway geometry and safety features.

D1.4.2 Underlying the design of temporary traffic management arrangements should be the aim to produce a safety performance no worse than the rate for non-works conditions, whilst minimising delays for traffic passing the works or incident. The provisions within this Chapter are intended to achieve this aim. Health and Safety legislation imposes a duty upon designers to ensure that their temporary traffic management arrangements can be implemented, modified, maintained, and removed safely.

D1.4.3 In general this document sets out design provisions for temporary traffic management arrangements which are appropriate in all weather, visibility and traffic conditions. However it also indicates how these provisions may be relaxed in response to short-term situations with good visibility and low traffic flows, see [Section D1.6](#). The relaxations contained within this document are intended to retain the fundamental signing principles whilst reducing the intensity of temporary traffic signs, road markings, and delineators.

D1.4.4 This document makes recommendations based on good practice for the guidance of temporary traffic management designers. It is intended to guide the designer through the design process and through the considerations that are necessary to produce safe and effective temporary traffic management arrangements. It is not a prescriptive specification or a collection of model temporary traffic management layouts. It is recognised that the guidance given cannot cover all situations and it is for the designer to adopt, adapt or develop the required traffic management to suit the actual conditions.

D1.5 PRIMARY DEFINITIONS

D1.5.1 In this document the word “**must**” is used to indicate a legal requirement which must be complied with. The word “**shall**” indicates an essential (or mandatory) requirement of compliance with this document, and “**should**” indicates a course of action that is strongly recommended by the Department, see [Glossary \(Appendix 2\)](#). The word “**may**” is used to indicate an option, which requires consideration depending on the circumstances.

D1.5.2 In this document the terms “**traffic**” and “**road users**” shall be taken to include both motorised and non-motorised users such as pedestrians, cyclists and horse riders.

D1.5.3 In this document “**road works**” are defined as any works or temporary restrictions which cause partial or total obstruction of any road or highway, whether on the verge, hard shoulder, footway, cycleway, bridleway or carriageway. Examples may include highway improvement schemes, excavations, structural or maintenance works of any kind, street works or any other work executed on or near the highway together with the necessary working space, safety zones, space required for the storage of any materials, the construction of any temporary structures and the operation of any constructional plant required for the execution of such work, including associated surveys and inspections.

D1.6 STANDARD WORKS AND RELAXATIONS

D1.6.1 Temporary traffic management schemes referred to in this Chapter are either “**standard**” schemes, “**relaxation**” schemes or else emergency traffic management.

D1.6.2 “**Standard**” schemes are appropriate for works carried out in all weather, visibility and traffic conditions.

D1.6.3 “Relaxation” schemes are appropriate for certain types of works (as indicated within this Chapter) for short-term situations with good visibility and low traffic flows. In this document “short-term situations” are situations that are expected to last less than 24 hours, “good visibility” means visibility extending to the full length of the stopping sight distance and “low traffic flows” means flows less than the reduced available carriageway capacity when the works are in place. “Stopping sight distance” is the distance required for a vehicle to come to a stop, taking into account the time taken to perceive, react, brake and stop safely – for full details see Table 3 of TD 9 “Highway Link Design” (DMRB 6.1.1). Individual plans state, where appropriate, what relaxations may be applied. Plans for single carriageway roads can be found in [Section D5](#) and plans for dual carriageway roads in [Section D6](#).

D1.6.4 If relaxation schemes are located on roads with a permanent speed limit of 40mph or more and are in place during the hours of darkness then warning lights must be added in accordance with the requirements given for the appropriate standard works. Additional signs may also be required to suit site specific circumstances. On roads with a lower permanent speed limit the use of warning lights should be considered, depending on the standard of street lighting.

D1.6.5 The relaxations contained within this document are intended to retain fundamental signing principles whilst reducing the number of temporary traffic signs, road markings, and delineators. The general principle is that signing for relaxation schemes is a subset of signing for standard schemes, such that should conditions at the site deteriorate then additional signing can be added to bring the signing up to the level of the equivalent standard scheme. Alternatively, if appropriate, the site should be cleared. Due to the requirement for supplementary signing should conditions deteriorate, and the short-term nature of the works, relaxations should only be applied at works which are manned continuously.

D1.6.6 Emergency traffic management should only be deployed for short-term incident management.

P. LTN 2/95 Design of Pedestrian Crossings

THE DESIGN OF PEDESTRIAN CROSSINGS



LOCAL TRANSPORT NOTE 2/95

APRIL 1995

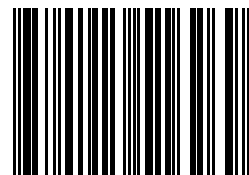
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Local Transport Note 2/95**

TITLE - THE DESIGN OF PEDESTRIAN CROSSINGS

Department of Transport, The Welsh Office, The Scottish Office,
The Department for the Environment for Northern Ireland

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ABSTRACT

This note recommends the practices to be followed when planning, designing and installing at-grade pedestrian crossings. It describes all types of crossings, including shared facilities with cyclists, other than those at signalled junctions.

PUBLICATIONS SUPERSEDED

Departmental Advice Note TA 52 and Standard TD 28 (DMRB Vol.8, Section 5).

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1 INTRODUCTION

1.1 This note recommends the practices to be followed when planning, designing and installing at-grade pedestrian crossings. It describes all types of crossings, including shared facilities with cyclists, other than those at signalled junctions.

1.2 This note replaces the recommendations for the design of pedestrian crossings contained in Departmental Standard TD 28 and Departmental Advice Note TA 52.

1.3 Advice is given on the design of pedestrian crossings in general and the operation of signal-controlled (Pelican, Puffin or Toucan) crossings in particular.

1.4 This publication complements the Statutory Instruments which set out the Regulations controlling the use of Zebra, Pelican, Puffin and Toucan Crossings and the Regulations for traffic signs.

1.5 Statutory Instruments

For Northern Ireland see section 11 REFERENCES.

- The 'Zebra' Pedestrian Crossing Regulations 1971⁽¹⁾.
- The 'Pelican' Pedestrian Crossings Regulations and General Directions 1987⁽²⁾
- The 'Puffin' Pedestrian Crossings Regulations⁽³⁾. (in preparation - authorisation is required in the interim) - not available in Northern Ireland.
- The Traffic Signs Regulations and General Directions 1994⁽⁴⁾ for 'Toucan' Crossings - (authorisation required at present) - not available in Northern Ireland.

1.6 All signal-controlled crossings must use Approved equipment. The technical requirements are contained in technical specification TR 0141⁽⁵⁾ the latest issue of which will incorporate Pelican crossing requirements currently specified in MCE 0125, and Puffin and Toucan.

1.7 The Assessment of Pedestrian Crossings⁽⁶⁾ sets out a method for deciding the need for providing a stand-alone crossing at an at-grade site and the options available.

2 GENERAL REQUIREMENTS

This section contains advice on the design of pedestrian crossings generally. Advice which is specific to one type of crossing is presented in the appropriate section.

2.1 Proximity of Junctions

2.1.1 Approach to a Side Road

2.1.1.1 Crossings should be located away from conflict points at uncontrolled junctions. This will give drivers an adequate opportunity to appreciate the existence of a crossing and to brake safely. The 'safe' distance will depend on the geometry of the junction and type of side road. However, a minimum distance of 20 metres is suggested for a signalled-controlled crossing and an absolute minimum of 5 metres for a Zebra crossing. It is suggested that the distance be measured from the position of a driver waiting at the give-way line of the side road. Where it is impossible to obtain a 'safe' distance, consider banning turning movements towards the crossing or make the side road one way away from the junction.

2.1.2 Minor Road Approach

2.1.2.1 Crossings on a minor road should not be sited very close to a 'GIVE WAY' or 'STOP' line. Generally the nearer the crossing is to the major road the greater will be the distance to be crossed. Drivers of vehicles turning into the minor road need time to judge the situation and space in which to stop.

2.1.2.2 There should be sufficient distance between the crossing and the priority marking for at least one waiting vehicle; the optimum will depend on the volume of turning vehicles. Care should be taken to ensure that drivers do not mistake a vehicular green signal on the signal-controlled crossing as a priority signal over traffic on the major road.

Reference to 'pedestrians' in this document should be read to include pedal cyclists and equestrians. However, it should be remembered that only pedestrians may use Pedestrian Crossings.



When planning improved pedestrian facilities it is important to understand where pedestrians may wish to cross. Consideration should be given to established and possible new pedestrian routes. These are often referred to as 'desire lines'.

If there is a strategic network for pedestrian routes this should be referred to before final decisions are made

2.1.3 Approach to a Roundabout

2.1.3.1 When crossings are needed on the approaches to a roundabout, special care is needed in the siting. The use of different types of facility at the same junction is not recommended as this could lead to confusion. Where a crossing must be provided within the junction layout, a Zebra crossing is preferred; it avoids any ambiguity as to priority that a signal-controlled crossing can create for the driver approaching the roundabout Give Way line. If a signal-controlled crossing is provided, it should preferably be of the staggered type to avoid excessive delays at the exit points blocking circulation. The pedestrian desire line, vehicle speeds, visibility, pedestrian/vehicle flows, size of roundabout, and length of crossing/road width should be considered when deciding the optimum location. Crossings away from flared entries are preferable as the carriageway widths are less and the vehicular traffic movements are simpler. It may be necessary in urban areas, where large numbers of pedestrians are present, to provide guard rails or other means of deterring pedestrians to prevent indiscriminate crossing of the carriageway.

2.1.4 Junction with a Yellow Box Marking

2.1.4.1 Where a pedestrian crossing is provided near to a junction with a yellow box marking, the location of the crossing must be chosen to ensure that the zig-zag markings do not overlap the yellow box markings. Note the Regulations allow for the overall length of the zig-zag markings to be varied.

2.1.5 Traffic Signal Controlled Junction

2.1.5.1 The decision to use a signal controlled crossing is often made because of the close proximity to a traffic signalled junction. Neither Zebra crossings nor refuges are suitable as there is a conflict of control methods. Even with a signal-controlled crossing care should be taken to ensure that queues do not build back from one installation to block the other. See the section 5.4 'Linking with other Signalling Systems'.

2.2 School Crossing Patrols

2.2.1 If there is an existing school crossing within 100 metres then a mutually convenient site should be found to accommodate both the patrol and other pedestrians. It may be necessary to install a greater number of guard rail sections to achieve a suitably safe site.

2.2.2 Where a School Crossing Patrol is located at a signal-controlled crossing the operator should be given appropriate instructions for the specific equipment in use.



Additional signal heads may be employed at a signal-controlled crossing where this will improve driver awareness

2.3 Visibility

2.3.1 Minimum distances for drivers' visibility of crossings are set out in Table 1.

2.3.2 Pedestrians must be able to see and be seen by approaching traffic. Visibility should not be obscured or restricted by, for example, parked vehicles, trees or street furniture. If it is not possible to site the crossing elsewhere consideration must be given to either removing/resiting the obstacle or, if the carriageway is sufficiently wide, to building out the kerb-line to provide enhanced sight lines. Particular care should be taken when drawing up the layout for a new crossing. For example, the controller should not be in a position that obstructs the intervisibility between pedestrians and approaching vehicles. The designer is responsible for anticipating not only the problems for maintenance but also the particular visibility problems for wheelchair users and children. If visibility is restricted by parked/loading vehicles, it may be necessary to make a Traffic Regulation Order or impose the maximum waiting and loading restrictions in the appropriate Crossing Regulations.



Built out kerb to improve the sight lines.

2.3.3 Where there is an alignment problem, vehicles queueing back from a crossing can be a hazard. The expected queue length should, therefore, be estimated so that an adequate safety distance can be achieved in the design.

2.4 Crossing Width

2.4.1 The minimum width (between the two rows of studs) for a Zebra, Pelican or Puffin pedestrian crossing is 2.4 metres. If the crossing is of the Toucan type, or is used by a substantial number of cyclists on foot, the minimum width should ideally be 4 metres. However, narrower widths, down to 3 metres, have been successfully tried at some sites. Where pedestrian flows over 600 per hour are encountered wider crossings should be used. Regulations allow for the crossing width at a Zebra crossing to be increased to 5 metres and to 10.1 metres with the authorisation of the Secretary of State. Regulations allow Pelican crossings to have a maximum width of 10 metres. There are no regulations defining the width at a refuge island. However, 2 metres is considered a reasonable minimum to allow for two wheelchairs to pass each other. The use of wide crossings also may help prevent overcrowding of narrow footways.

2.5 Guard Railing

2.5.1 Many accidents at pedestrian crossings occur on the approach to the crossing. The provision of guard railing at such positions should be considered. Guard railing may also provide useful guidance for blind and partially sighted pedestrians.

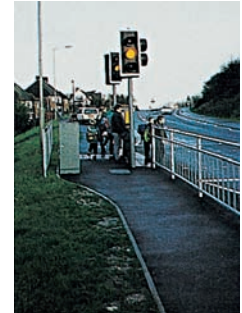
2.5.2 Guard railing manufactured to British Standard (BS) 3049⁽⁷⁾ should be used. Intervisibility is important and should be a major factor in deciding whether guard railing should be provided, the physical layout of the railing and its specific type.

2.5.3 The effectiveness of guard railing is lessened if gaps have to be left for access for vehicles and the loading/unloading of goods. Where possible, crossings should be sited to avoid the necessity for such gaps.

2.5.4 Guard railing, at signal controlled crossings, should start at the signal post but not encroach past the push button position.



An example of bad site layout.



The introduction of guardrail may require footways to be improved to maintain adequate width.

2.6 Crossing Approach Surfaces for Footways and Carriageways

2.6.1 Crossings should be installed so that adjacent drainage collects surface water from the crossing area. Care should be taken to ensure that, even after remedial surface treatment, excess water does not collect at the crossing point. Dropped kerbs must always be provided across the crossing width and the section of footway between the lowered kerb-line and the adjacent footway should be ramped with a slope having a desired gradient of 1 in 20 but not steeper than 1 in 12. Tactile paving should be installed across the dropped kerb and in a strip stretching back to the building line. (See 2.7 'Facilities for Disabled Pedestrians'.)

2.6.2 Both the carriageway and footway crossing areas should be free of surface obstructions such as cable drawpits, access covers to underground services, gratings and gullies. Street furniture, such as supply pillars should not be placed within the tactile paving area. As far as possible such items should be sited in an area not used by pedestrians.

2.6.3 It is recommended that high skid resistance surfaces be provided on the carriageway approaches to pedestrian crossings. Guidance on the choice of Polished Stone Value and Aggregate Abrasion Value for the aggregates exposed on the surface of flexible roads is given in publication HD28⁽⁸⁾. The specification for the application of the flexible surfacing material is the 900 Series of the Specification for Highway Works⁽⁹⁾.

2.6.4 Consider both the approach speed and accident record when determining the length over which high skid resistance surfacing should be applied.



If the main area of footway is the same colour as the recommended tactile surface, a band of lighter/darker coloured bricks/blocks can be used, as an edging, to provide contrast.

2.7 Facilities for Disabled Pedestrians

2.7.1 The needs of disabled pedestrians should be considered when designing the layout of crossings. If these are well provided then a better crossing will probably result for all users.

2.7.2 Dropped kerbs provide easy access for wheelchair users and people with walking difficulties. Care should be exercised, therefore, when laying the kerbs which form the crossing boundary. To ensure the safety of blind and partially sighted people at these sites it is important to provide tactile paving to the recommended layouts in Disability Unit Circular DUL/91 [SOID 2/1994]⁽¹⁰⁾.

2.7.3 The ramped section, leading to the crossing and the immediate approaches, should be indicated by contrasting coloured tactile surfaces. Recommendations for the design and use of tactile pavement are also detailed in Circular No. DU 1/91 [SOID 2/1994]⁽¹⁰⁾.

2.7.4 At signal-controlled crossings audible signals or beepers in the form of a pulsed tone and/or tactile signals are normally used during the green figure or “invitation to cross” period. The signals are intended for the benefit of blind or partially sighted pedestrians although they can also be helpful to others.

2.7.5 In residential areas objections to audible signals may be encountered. It is important that the audible unit is adjusted to suit the local conditions. There can be particular annoyance at night. A time switch may be incorporated to enable the sound to be reduced in level, or, if appropriate, switched off.

2.7.6 At adjacent sites, such as at a staggered crossing, there is a risk that the signal at one crossing may be heard and mistaken for another and so the standard audible signal must not be used. An alternative which is suitable for use at staggered crossings is the facility known as ‘bleep and sweep’. The tone produced by the unit has been specially designed to be distinctive and the audible range has been restricted. By monitoring the ambient level of traffic noise the unit adjusts the level of the audible tone to that which is loud enough to be heard only near the crossing in use.

2.7.7 If audible signals cannot be used then tactile signals should always be provided. These are small cones mounted beneath the push button box which rotate when the steady green figure is shown. Reference should be made to local mobility officers/representative groups. If there are local people with vision and hearing difficulties, tactile signals are strongly recommended. Also if audible signals are to be switched off at night, then tactile signals should be considered.

2.7.8 All the above devices, whether audible or tactile, must conform to TR 0141⁽⁵⁾ including the requirements for lamp monitoring. Traffic Advisory Leaflet 4/91⁽¹¹⁾ gives further information.

2.7.9 An embossed ‘Z’ on the beacon post is being trialled to help blind pedestrians recognize Zebra crossings. This may be introduced as an option in the future.

2.8 Lighting

2.8.1 It should be remembered that pedestrian crossings are often used at night as well as during the day. It is necessary to ensure that the crossing can readily be seen against the background of other lights and signs.

2.8.2 Good road lighting will reduce the majority of the problems related to extraneous light sources. An experienced lighting engineer should ensure that the level recommended in the appropriate part of BS 5489⁽¹²⁾ is used at all pedestrian crossing sites. BS 5489 also gives details of lighting column positions and spacings, in relation to crossings. Reference should also be made to the current version of Technical Report No. 12, ‘Lighting of Pedestrian Crossings’⁽¹³⁾.

2.8.3 At night drivers may not be able to see pedestrians waiting to cross unless the road lighting is to the standard recommended above. If there is still doubt about the visibility of pedestrians then supplementary lighting can be provided to illuminate the crossing.

2.8.4 If supplementary lighting is employed it must be designed to prevent glare to drivers which could hide or “veil” pedestrians standing behind it, thus defeating the objective of its installation. The pedestrian approach (at least the area covered by the tactile paving surface) and the carriageway crossing area must be illuminated to a uniform level.

2.8.5 Supplementary lighting units appear to be especially susceptible to vandalism and should be checked regularly to see that they are aligned and operating correctly. It is essential that all units are operating correctly to ensure that uniform lighting of the crossing is achieved.

2.9 Signing

2.9.1 Where a signal-controlled crossing is sited on a road where the speed limit or 85 percentile speed on any approach is 50 m.p.h. or greater, advance warning signs to diagram 543, Traffic Signs Regulations and General Directions 1994⁽⁴⁾ should always be used.

2.9.2 Where a Zebra crossing is sited on a road where the speed limit or 85 percentile speed on any approach is greater than 30 m.p.h., advance warning signs to diagram 544, Traffic Signs Regulations and General Directions 1994⁽⁴⁾, are recommended.

2.9.3 On roads where the 85 percentile speed is lower, advance warning signs should only be erected where visibility of the crossing is impaired. The siting details for warning signs are given in the Traffic Signs Manual, Chapter 4, Table A⁽¹⁴⁾.

Note: This advice on the placement of signs modifies that given in the Traffic Signs Manual, Chapter 4.

2.9.4 Where a School Crossing Patrol is operating at a Zebra or signal-controlled crossing, the relevant Regulations and Traffic Signs Manual, Chapter 4 should be referred to.

2.9.5 Examples of zig-zag markings are given (or will be given in the case of Puffin Crossings) in the relevant Regulations. It is not possible to cover all layouts that will be experienced and the designer will need to make individual decisions within the Regulations and the spirit of the examples given. It should be remembered that restrictions imposed by zig-zag markings apply to laybys as well as the main carriageway. Any part of an affected layby, used by general traffic, should be hatched or physically infilled to prevent ambiguity.



Diagram 543



Diagram 544

2.10 Provision for Bus Stops

2.10.1 A pedestrian crossing may be sited near a bus stop. Close coordination should be maintained between the highway authority, the police and the bus operator during the planning process to ensure that stopped buses do not obscure the vision of pedestrians or drivers. Generally a bus stop is better sited on the exit side.

2.11 Street Furniture

2.11.1 Adequate clearance is required between the kerb edge and the closest part of any street furniture. A minimum of 0.5 metre is recommended but this should be increased in cases where the road camber or speed of vehicles necessitates. Particular care is needed at refuge islands on bends or where vehicles may be turning.

3 PEDESTRIAN REFUGE ISLANDS

3.1 Refuge islands are a relatively inexpensive method of improving crossing facilities for pedestrians.

3.2 Where they are to be provided it is essential they are large enough. An absolute minimum of 1.2 metres width is needed but the standing area for pedestrians must be sufficient for the location. Near a school, for example, large numbers of children and parents with prams and pushchairs may need to be accommodated.

3.3 The carriageway width at the crossing should be sufficient to prevent vehicles passing too close to the refuge or the footway as this can be intimidating for pedestrians. Consider also the needs of cyclists who could be overtaken alongside a refuge. A single carriageway approach width of 4 to 4.5 metres adjacent to a refuge is recommended although refuges have been



A clear conflict: a refuge intended for pedestrians but unsuitable kerbing opposite.



Good lighting will ensure clear visibility for approaching drivers. To enhance this, or if there is a problem with vertical alignment, a central marker beacon is sometimes used. Care should be taken that the beacon column does not obstruct pedestrians.

used successfully with narrower widths. If the refuge island is not on a straight stretch of carriageway, the width either side of the refuge may need to be greater.

3.4 The width of the crossing should be maintained across the full carriageway. This should include the refuge island which will have either openings or dropped kerbs. Under no circumstances should a pedestrian be encouraged to cross with dropped kerbs on one footway only to find a lesser provision on the refuge or the other footway. See also Disability Unit Circular DU 1/91 [SOID 2/1994]⁽¹⁰⁾.

3.5 Pedestrians can be tempted to cross near or in the 'shadow' of the refuge. This can be potentially dangerous. In these cases, if the refuge cannot be located where there is a clear desire line, measures such as guard railing should be considered.

3.6 Vehicles parking adjacent to the refuge may reduce intervisibility or block the free flow of vehicular traffic. If considered a problem then waiting and loading restrictions may need to be imposed. For the same reason care should be taken if the refuge is to be near a bus stop.

3.7 If a refuge is to be on the approach to a junction the existence and extent of the average vehicle queue should be recorded. Queueing vehicles can block access to a refuge resulting in the pedestrian having the choice of either crossing through the queue or away from the refuge. The positioning of the refuge is, therefore, important. For disabled pedestrians the dangers are accentuated.



4 ZEBRA CROSSINGS

4.1 Road markings and details of studs and materials are given in the Traffic Signs Manual, Chapter 5⁽¹⁵⁾. Dimensions for road markings and studs are given in the 'Zebra' Pedestrian Crossing Regulations 1971⁽¹⁾.

4.2 Flashing rates, the photometric performance of globes and construction and electrical requirements are set out in BS 873⁽¹⁶⁾.

4.3 The Highways (Road Humps) Regulations 1990 do permit the use of a road hump in connection with a Zebra crossing, though not in the Zebra zig-zag area, provided that the location of the road hump would conform to the other requirements of the regulations. Where these requirements can be met there is some advantage in providing a road hump, as vehicle speed will be slower on the approach, and pedestrians can cross the carriageway at the same level as the footway.

4.4 Refuge islands can be used with Zebra crossings (but see the section on signal-controlled crossings).

4.5 As with refuges and signal-controlled crossings, it is important to keep the approaches to the Zebra crossing clear. Trees and street furniture are a hazard for pedestrians, especially those with disabilities.



Street furniture and a well established tree obstructing the approach to a Zebra crossing.

5 SIGNAL-CONTROLLED CROSSINGS

This chapter gives general advice regarding the design of signal controlled pedestrian and Toucan crossings. This Note does not expressly cover the design of pedestrian facilities at junctions although many of the comments are applicable.

5.1 Installation

5.1.1 The minimum requirements for positioning and the restrictions on the mounting height for signals are contained in the relevant Regulations (see Introduction).

5.1.2 Departmental Advice Notes TA 13⁽¹⁸⁾ and TA 14⁽¹⁹⁾ provide recommendations for good working practice on all roads.

5.1.3 Staggered crossings are considered as two separate crossings. For electrical safety during maintenance, a post on the central refuge must have equipment for only one crossing mounted on it.



Where mast arm signals are employed, structural approval of the mast arm will be required. Departmental Standard BD 2⁽²³⁾ refers.

5.1.4 Accessibility for maintenance of crossings is important. Although written primarily for use on trunk roads, the requirements for maintenance are detailed in Departmental Standards TD 24⁽²⁰⁾, TD 25⁽²¹⁾ and TD 26⁽²²⁾.

5.1.5 Drivers must have a clear view of at least one signal head on approaching, and when stationary at the stop line. Where the view of the vehicular signals is reduced by the vertical or horizontal alignment of the road or other situations such as masking of signals in heavy traffic conditions or by overhanging trees, the conspicuity should be enhanced. This can be done, for example, by the provision of additional secondary heads, tall posts, building out kerb-lines if the carriageway width is sufficient or installing signals over the carriageway. Such overhead signals should be considered as supplementary to and not replacements for those listed as minimum in the relevant Regulations. If the overhead signal option is to be considered the problems of maintenance should be taken into account.

5.1.6 To assist partially sighted pedestrians, posts may have one white or yellow band as detailed in the appropriate General Directions.

5.1.7 To assist blind and partially sighted pedestrians, as they approach the crossing, the primary push button/indicator panel should normally be located on the right hand side. The alignment should encourage them to face oncoming vehicles. The centre of the push button should be between 1.0 and 1.1 metres above the footway level.

5.1.8 At Toucan crossings it is normal to install a push button unit either side of the crossing place at the height quoted above. Special arrangements may be needed if an equestrian push button is required.

5.1.9 The push button unit should be close enough to the tactile surface to allow all pedestrians, who could reasonably be expected to use the crossing, to reach it easily. This is particularly important for crossings with kerb-side detectors.



The push button should be readily accessible.

5.2 Typical Layouts

5.2.1 Details of road markings and the minimum requirements for equipment are given in the relevant Regulations.

5.2.2 The use of a refuge at a non-staggered crossing is not recommended. They can be confusing for pedestrians and drivers and there is often insufficient space, particularly for prams and push chairs. They should, therefore, only be used if the road width cannot be increased locally to accommodate a staggered crossing. If used the refuge should be provided with push button(s) and signals as required.

5.2.3 Where the road is more than 15 metres wide a staggered layout should be provided. If the road width is greater than 11 metres a staggered layout should be considered.

5.2.4 Staggered signal-controlled crossings are not recommended for one-way roads. If unavoidable, such as within a town centre gyratory system, adequate road markings should be provided in order to deter drivers from weaving when approaching the crossings. Such crossings can also be confusing for pedestrians and consideration should be given to providing informatory signs. Such signs may need authorisation.

5.2.5 Staggered crossings on two-way roads should have a left handed stagger so that pedestrians on the central refuge are guided to face the approaching traffic stream. At some crossings a right handed stagger may be unavoidable. Where this is the case, and there are far-side pedestrian signals, confusion can be caused if the pedestrian signals can be seen simultaneously. A waiting pedestrian may “see through” a red signal to a green signal at the opposite crossing. Careful alignment and special precautions to limit the field of view may be needed.



Left handed stagger installation.

Staggered crossings are not suitable for equestrians and special arrangements may have to be made.

5.2.6 When calculating the settings for signal-controlled crossings, the crossing length used is the distance between footway kerbs except in the case of staggered crossings where each carriageway should be treated as a separate crossing.

5.2.7 Areas where pedestrians are waiting to cross should be of a sufficient size. The area should cater both for those waiting and any wishing to pass by. The central refuge of a staggered crossing should be :-

- long enough to indicate the segregation of the crossings. A minimum of 3 metres between crossing limits is recommended;

- wide enough to allow pedestrians to pass each other between the crossings. A recommended minimum width of 3 metres will give 2 metres between guard railing;

- of sufficient capacity to accommodate pedestrians waiting to cross.

5.3 Vehicle Actuation

5.3.1 Unless part of a linked scheme, vehicle actuation is the normal method of signal operation. The use of both the microwave and inductive loop types of detector are covered in Department of Transport specifications MCK 2123⁽²⁸⁾ and MCE 0108⁽²⁹⁾ respectively. Vehicle actuation may be desirable within a linked scheme depending mainly on whether the linking is full time. Each case should be considered on its merits.

5.3.2 On roads subject to a speed limit of 30 m.p.h. and where the 85 percentile approach speeds do not exceed 35 m.p.h., fixed time operation is still an option. Under fixed time operation a pedestrian demand will initiate the Operational Cycle and the vehicle precedence period will terminate when a preset time has expired. The preset time is normally set low, say 20 to 30 seconds, but can be extended during peak periods if the pedestrian waiting area is sufficient. Linked systems are dealt with in the following section 5.4.

5.3.3 Vehicle actuation is essential on roads with higher speed limits or 85 percentile approach speeds. The recommended options are described in Table 2. The "Approach Speed" should be taken to mean the 85 percentile speed under free flow conditions. For further information reference should be made to Departmental Advice Note TA 22⁽²⁴⁾.

5.3.4 Microwave vehicle detection should not be used with either Speed Assessment or Speed Discrimination equipment.

5.4 Linking with other Signalling Systems

5.4.1 Where it is proposed to site a crossing close to a signalled junction, consideration should be given to a linked system. The distance at which this should be considered will vary with traffic conditions but 100 metres would be a likely minimum.

5.4.2 Crossings within the overall boundary of an Urban Traffic Control (UTC) area may be:-

- a) omitted from the UTC scheme and remain on isolated control when coordination is not justified. This may be a permanent or part-time arrangement; or
- b) operated as part of an adjacent controlled junction;
- c) controlled directly by the computer.

5.4.3 If controlled directly, the normal method employed for a Pelican crossing is to control the change to the start of the pedestrian stage. It is either allowed or inhibited (by use of the "PV bit"). Where a kerb-side detector strategy is used, improved control may also be achieved by modelling the crossing as a junction with the pedestrian stage entered as a stage with a call/cancel facility. This method will also allow for the variable all-red.

5.4.4 The vehicle precedence time of the crossing should be matched to the timings of the adjacent installations.

5.4.5 It may be necessary, and desirable, for a complete crossing sequence to operate more than once within the area cycle time to avoid long pedestrian waiting times.

5.4.6 Under UTC it may be possible to insert artificial pedestrian demands. This practice is to be deprecated because the driver could be presented with an unexpected loss of right of way.

5.4.7 The options for crossings within a local linked scheme are the same as for UTC.

6 PELICAN CROSSINGS

The Pelican Crossing uses far-side pedestrian signal heads and a flashing amber/flashing green crossing period, of a fixed duration, which is demanded solely by push button.

6.1 Timings

The Operational Cycle use and variations are described in Table 3 and the timings in Table 4. The cycle is initiated by a pedestrian demand.



Period A

Under vehicle actuation:-

- a) The minimum time will normally be 7 seconds. Exceptionally this may be adjusted for site conditions between the limits of 6 to 15 seconds in increments of not less than 1 second.
- b) The maximum time will normally be preset at 40 seconds or less. This may be adjusted for site conditions up to a maximum of 60 seconds.
- c) The maximum time will start at the commencement of the minimum time ('pretimed max.') on roads subject to speed limits up to and including 30 m.p.h. and at the pedestrian demand for other roads.
- d) Termination will be subject to a pedestrian demand either at the end of the minimum time, when a gap is detected in traffic (gap change), or on the expiry of the preset maximum time (forced change).
- e) The extension times for vehicles will be determined by the type of detection system used (see Table 2).

Period B

This is the mandatory 3 second stopping amber signal to vehicles.

Period C

Where the 85 percentile speed exceeds 35 m.p.h., period C will normally be 3 seconds. For other roads it will normally be 1 second for a gap change and 1, 2 or 3 seconds for a forced change.

Period D

The timing for the Pedestrian green walking figure period, with the option of the audible/tactile signal, should normally be set as follows:-

- a) 4 seconds for crossings up to 7.5 metres in length.
- b) 5 seconds for crossings over 7.5 metres and up to 10.5 metres.
- c) 6 seconds for crossings over 10.5 metres and up to 12.5 metres.
- d) 7 seconds for crossings over 12.5 metres.

It may be desirable to extend the period by two seconds if-

- the appearance of Period E habitually causes pedestrians to hesitate or turn back;
- it is expected that there will be considerable use by disabled pedestrians;
- a non-staggered central refuge is provided thus enabling pedestrians to get established on the second half of the crossing before the flashing amber signal appears to the vehicle;
- waiting pedestrians have difficulty establishing themselves on the crossing.

Period E

The overlap arrangement may be preferred to that in the previous period:

- to maximise the efficiency of the crossing for both pedestrians and vehicles where there is a traffic capacity problem;
- where pedestrians constantly experience difficulty because of encroachment by vehicles at the commencement of period F. A short period of overlap is allowed between the flashing green figure and vehicle red. This is achieved by extending the vehicle red period by 2 seconds (at the expense of the normal flashing amber time) to run concurrently with the first 2 seconds of the flashing green figure time. The loss of flashing amber time is not compensated for by extending the flashing amber/red standing figure time (Period G).

The steady green figure (Period D) extension and the overlap facility (Period E) should not normally be used together at the same crossing.

Period F

The timing for the flashing green figure/flashing amber period should normally be set at 6 seconds plus 1 second for each 1.2 metres of crossing over 6 metres in length.

NOTE: The controller is capable of extending the timing to a maximum of 18 seconds. It would, however, be unacceptable and impracticable to provide an undivided Pelican crossing of 20.4 metres. Equally it would adversely affect the balance of vehicle and pedestrian delay to depart from the preceding advice.

Period G

The timing for the red standing figure/flashing amber period should normally be set at 1 second for crossings up to 10.5 metres in length and 2 seconds for crossings exceeding this.



7 PUFFIN CROSSING

7.1 General Arrangement

7.1.1 Puffin crossings use near-side pedestrian signal heads and an extendable all-red crossing period which is instigated by a push button request accompanied by a pedestrian detector demand. It is intended that the Puffin operational cycle will become the standard form of pedestrian crossing at stand-alone crossings and junctions.

7.1.2 Puffin crossings have two forms of detection for pedestrians. These are:

- a) kerb-side detectors. These cancel pedestrian demands which are no longer required.
- b) on-crossing detectors. These extend the all-red time, Period 5.

7.2 Timings

The Operational Cycle use and variations are described in Table 5 and timings in Table 6.

The cycle is initiated by a pedestrian demand formed by both the push button being pressed and occupancy of the kerb-side detector zone. The delay time, after which the call is cancelled if the kerb-side detector does not detect a pedestrian, should be set to a value between 2 and 4 seconds depending on site conditions.

Period 1

Under vehicle actuation:-

- The minimum time will normally be 7 seconds. Exceptionally this may be adjusted for site conditions between the limits of 6 to 15 seconds.
- The maximum time will normally be set between 10 and 30 seconds. Only in exceptional circumstances should a value greater than 30 seconds be used. The highest value available is 60 seconds.
- The maximum period will normally start at the pedestrian demand but may start at the commencement of the vehicle green ('pretimed max.') on roads subject to speed limits up to and including 30 m.p.h.
- it will terminate, subject to a pedestrian demand, either at the end of the minimum time; when a gap is detected in traffic (gap change); or on the expiry of the preset maximum time (forced change).
- The extension times for vehicles will be determined by the type of detection system used (see Table 2).

Period 2

This is the mandatory 3 second stopping amber signal to vehicles.

Period 3

Where the 85 percentile speed exceeds 35 m.p.h., this period will be 3 seconds. For other roads it will normally be 1 second for a gap change and 1, 2 or 3 seconds for a forced change.

Period 4

The timing for the Pedestrian green walking figure period, with the option of the audible and/or tactile signal, should normally be set to 4 or 5 seconds at crossings with light to moderate pedestrian flows. Where one or more of the following conditions occur the length of this period should be increased to 6–9 seconds as appropriate:

- the crossing is in an area where heavy pedestrian flows are generated;
- the distance between kerbs is greater than 11 metres;
- a central refuge is provided;
- space in the pedestrian waiting area is limited.
- areas where there is a higher proportion of disabled or elderly people.

Period 5

The all-red period of 1-5 seconds.

Period 6

The all-red is extended by the on-crossing detectors up to 25 seconds.

The extension period for the pedestrian on-crossing detector should normally be set within the range 1.6 to 2.2 seconds.

Period 7

If the normal maximum of the clearance period is reached when pedestrians are still being detected on the crossing, this operates to permit the pedestrians to clear before the Period 9 commences. The duration of this period is normally 3 seconds but can be adjusted between 0-3 seconds.

The maximum duration of the pedestrian extendable clearance period (Periods 6 and 7 together), in seconds, should normally be set to $5 + 1.67$ (the length of crossing - 3 metres).

Period 8

If the normal maximum of the clearance period is not reached Period 7 will be followed by this period. Normally set to 0 seconds but can be adjusted in steps of 1 second to a maximum of 3 seconds.

Period 9

The red/amber period is fixed at 2 seconds.

8 TOUCAN CROSSINGS

8.1 General arrangement

The Toucan Crossing has the same form of vehicular detection as the Pelican and Puffin crossings and normally the same form of pedestrian on-crossing detector as the Puffin crossing. It is intended to develop kerb-side detectors. The method of operation given in this document is interim and it is intended that the method now used for the Puffin crossings will become standard once development of the Toucan is far enough advanced.

8.2 Timings

The Operational Cycle use and variations are described in Table 7 and the timings in Table 8.

The Operational Cycle is initiated by a demand by a pedestrian or cyclist.



A Toucan crossing is an unsegregated signal-controlled crossing for pedestrians and cyclists, linking cycle track and footway systems on opposite sides of a carriageway.

Period I

Under vehicle actuation:

- a) The minimum time will start at the commencement of the vehicular green and should normally be 6 seconds but is adjustable up to 15 seconds to suit unusual site conditions.
- b) The maximum time will start at the commencement of the minimum time on roads where the 85 percentile speed is 35 miles per hour or less and at the pedestrian/cyclist demand for other roads.
- c) The maximum time should normally be set to 40 seconds or less. This may be adjusted for site conditions up to 60 seconds.
- d) It will terminate subject to a pedestrian/cyclist demand either at the end of the minimum time, when a gap is detected in traffic (gap change) or on the expiry of the maximum time (forced change).
- e) The extension times for vehicles will be determined by the type of detector system used (see Table 2).

Period II

This is the mandatory 3 second stopping amber signal to vehicles.

Period III

Where the 85 percentile speed exceeds 35 m.p.h., this will normally be 3 seconds. For other roads it will normally be 1 second for a gap change and 1, 2 or 3 seconds for a forced change.

Period IV

The timing for the green figure/cycle, with the option of the audible and/or tactile signal, should normally be set as follows:

- a) 4 seconds for crossings up to 7.5 metres in length.
- b) 5 seconds for crossings over 7.5 metres and up to 10.5 metres.
- c) 6 seconds for crossings over 10.5 metres and up to 12.5 metres.
- d) 7 seconds for crossings over 12.5 metres.

It may be desirable to extend the period by 2 seconds. The circumstances are outlined for Period D of the Pelican operational cycle.

Period V

The fixed black-out of 3 seconds.

Period VI

The black-out is extended by the on-crossing detectors from between 3 to 22 seconds.

The extension period for the on-crossing detector should normally be set within the range 1.6 to 2.2 seconds.

Period VII

If the normal maximum of the clearance period is reached when pedestrians/cyclists are still being detected on the crossing, this operates to permit the pedestrians/cyclists to clear before Period VIII commences. The duration of this period is fixed at 3 seconds.

The maximum duration of the pedestrian extendable clearance period (VI & VII together), in seconds, should normally be set to $5 + 1.67$ (the length of crossing - 3 metres).

Period VIII

The all-red should be 1, 2 or 3 seconds.

Period IX

The red/amber period is fixed at 2 seconds.



A near-side mounted signal may replace the far-side one for future Toucan crossings.

9 CONSULTATION

Submission of pedestrian crossing schemes is no longer required, but consultation with the police, public notice and written notification to the Secretary of State are necessary before a crossing is established, altered or removed. (The Road Traffic Regulation Act 1984⁽²⁵⁾).

It is possible that the installation of a pedestrian crossing may, under certain circumstances, provide liabilities under the provisions of the Land Compensation Act 1973⁽²⁶⁾, to which reference should be made.

10 PUBLICITY

General guidance is given in the Highway Code⁽³⁰⁾. Specific information on Puffin pedestrian crossings, is available in 'How To Use a Puffin Crossing'⁽³¹⁾, (Bilingual versions available in Wales), and 'The Use of Puffin Pedestrian Crossings'⁽³²⁾. Reference to the Toucan crossings is made in Traffic Advisory Leaflet 10/93, "Toucan" An Unsegregated Crossing for Pedestrians and Cyclists⁽³³⁾. It is most important when installing or modifying a crossing that local publicity is provided. Visits, by Road Safety Officers, to schools and centres for elderly or disabled people help to inform the more vulnerable. Posters designed and produced by local authorities have been very successful in getting the message across. These have been displayed in schools, centres, libraries, surgeries, etc. and together with a localised postal distribution of 'How to Use a Puffin Crossing' can reach a wide audience.

11 REFERENCES

Note: * References are for Northern Ireland.

Introduction

1 The 'Zebra' Pedestrian Crossing Regulations 1971, updated by the Amendment Regulations 1990

* 'Zebra' Pedestrian Crossings Regulations (Northern Ireland) 1974

2 The 'Pelican' Pedestrian Crossings Regulations and General Directions 1987

* The (Pelican) Pedestrian Crossings Regulations (Northern Ireland) 1982

3 The 'Puffin' Pedestrian Crossings Regulations (in preparation)

4 The Traffic Signs Regulations and General Directions 1994

* The Traffic Signs Regulations (Northern Ireland) 1979

5 Department of Transport Specification TR 0141B, (in preparation at time of this publication).

6 Department of Transport Local Transport Note 1/95 The Assessment of Pedestrian Crossings

General Requirements

7 BS 3049: 1976 Pedestrian Guard Rails (Metal)

8 HD28 (Design Manual for Roads & Bridges [DMRB] 7.3.1) Skidding Resistance

9 Manual of Contract Documents for Highway Works Vol. 1 [MCHW -1]

10 Disability Unit Circular No DU 1/91. The Scottish Office equivalent is SOID Circular 2/1994.

11 Traffic Advisory Leaflet 4/91 - Audible and Tactile Signals at Pelican Crossings.

12 BS 5489 Part 2:1992 Code of Practice for Road Lighting - Lighting for Traffic Routes.

13 Institution of Lighting Engineers, Technical Report No. 12, Lighting of Pedestrian Crossings.

14 Traffic Signs Manual, Chapter 4, Warning Signs, Table A.

'Zebra' Pedestrian Crossings

15 Traffic Signs Manual, Chapter 5, Road Markings.

16 British Standard 873 Part 2:1984. Road Traffic Signs and Internally Illuminated Bollards - Specification for Miscellaneous Signs.

17 The Highways (Road Humps) Regulations 1990. The Scottish Office equivalent is The Road Humps (Scotland) Regulations 1990.

* The Highways (Road Humps) Regulations 1992

Signal-controlled Crossings

18 Departmental Advice Note TA 13, (DMRB Vol.8, Section 1). Requirements for the Installation of Traffic Signals and Associated Control Equipment.

19 Departmental Advice Note TA 14, (DMRB Vol.8, Section 1). Procedures for the Installation of Traffic Signals and Associated Control Equipment.

20 Departmental Standard TD 24, (DMRB Vol.8, Section 1). All Purpose Trunk Roads and Trunk Road Motorways. Maintenance of Traffic Signals.

21 Departmental Standard TD 25, (DMRB Vol.1, Section 2). All Purpose Trunk Roads and Trunk Road Motorways. Maintenance of Traffic Signs.

22 Departmental Standard TD 26, (DMRB Vol.8, Section 2). All Purpose Trunk Roads and Trunk Road Motorways. Maintenance of Road Markings.

23 Standard BD 2 (DMRB Vol.1, Section 1) - Technical Approval of Highway Structures on Trunk Roads (including Motorways).

24 Departmental Advice Note TA 22, (DMRB Vol.8, Section 1) - Vehicle Speed Measurement on All Purpose Roads.

Consultation

25 Road Traffic Regulation Act 1984

* The Road Traffic (Northern Ireland) Order 1981

26 Land Compensation Act 1973. The equivalent in Scotland is the Land Compensation (Scotland) Act 1973.

Visibility Requirements

27 Departmental Advice Note TA 12, (DMRB Vol.8, Section 1). Traffic Signals on High Speed Roads.

Vehicle Detection Requirements

28 Department of Transport Specification MCK 2123

29 Department of Transport Specification MCE 0108/MCK 1030 - Siting of Inductive Loops for Vehicle Detecting Equipment at Permanent Road Traffic Signal Installations.

Publicity

30 The Highway Code - HMSO

31 'How to Use a Puffin Crossing' - Departmental pamphlet

32 Department of Transport Advisory Leaflet 'The Use of Puffin Pedestrian Crossings'.

33 Department of Transport Traffic Advisory Leaflet 10/93 "Toucan" An Unsegregated Crossing for Pedestrians and Cyclists.

12 TABLES

Table 1 ALL TYPES OF CROSSING - VISIBILITY REQUIREMENTS

Reference should be made to Departmental Advice Note TA 12/81⁽²⁷⁾

85 Percentile Approach Speed (m.p.h.)	25	30	35	40	45	50
Desirable Minimum Visibility (metres)	50	65	80	100	125	150
Absolute Minimum Visibility (metres)	40	50	65	80	95	115

Table 2 PELICAN, PUFFIN & TOUCAN CROSSINGS - VEHICLE DETECTION REQUIREMENTS

Speed Limit (m.p.h.)	85 percentile approach speed (m.p.h.)	Recommended Operation
Up to and including 30	Up to and including 35	<p>(a) Fixed time operation, or</p> <p>(b) Microwave vehicle detection (MVD) in accordance with Department of Transport Specification MCK 2123⁽²⁷⁾ & ⁽²⁸⁾, or</p> <p>(c) With a single loop sited 39m from the stop line with a 4.0 second extension time for vehicles, (see Note 1) or</p> <p>(d) With a multi loop configuration such as System D, (see Note 1)</p>
Above 30	Up to and including 35	Vehicle actuation as in (c) or (d) above
Not relevant	Greater than 35 and up to and including 45	Vehicle actuation as in (c) or (d) above. In addition, Speed Discrimination loops spaced at 79m from the stop line (vehicles travelling in excess of 30 m.p.h. being granted 3.0 second extensions) should be used (see Note 1).
Not relevant	Greater than 45 (see paragraph 2.1)	Vehicle actuation as in (c) or (d) above. In addition, Speed Assessment loops sited 151m from the stopline should always be used (see Note 1).
Note 1: In accordance with Department of Transport Specification MCE 0108 ⁽²⁷⁾ & ⁽²⁸⁾		
Note 2: In Scotland, microwave vehicle detection may be used on higher speed roads but signal settings must be adjusted to ensure safe clearance periods are introduced. The adoption of this form of strategy must be agreed with the Scottish Office.		

Table 3 PELICAN CROSSINGS - OPERATIONAL CYCLE, USE & VARIATIONS

PERIOD	USE	VARIATION FOR
A	Vehicle running time	Traffic volume
B	Standard stop warning to vehicles	None
C	Vehicle clearance period	Vehicle actuation
D	Pedestrian invitation to cross	Road width, disabled pedestrians, crossings with central refuge
E	Warning to pedestrian to clear the crossing and not to cross. Vehicles remain stopped. For use with divided crossing	Site conditions
F	As period E above but with vehicles allowed to proceed provided the crossing is clear of pedestrians ahead of them	Road width
G	Additional pedestrian clearance time before vehicle running period	Road width

Table 4 PELICAN CROSSINGS - OPERATIONAL CYCLE & TIMINGS

PERIOD	SIGNALS SHOWN		TIMINGS (Seconds)
	TO PEDESTRIANS	TO VEHICLES	
A	Red Standing Figure (wait)	Steady Green (proceed if way is clear)	20-60 (fixed) 6-60 (VA)
B	Red Standing Figure	Steady Amber (stop unless not safe to do so)	3 (Mandatory)
C	Red Standing Figure	Steady Red (stop, wait behind Stop line on carriageway)	1 to 3
D	Green Walking Figure with audible signal if provided (cross with care)	Steady Red	4 to 7 (in some circumstances plus 2)
E	Flashing Green Figure (do not start to cross)	Steady Red	0 or 2
F	Flashing Green Figure	Flashing Amber (give way to pedestrians on the crossing - they have priority)	6 to 18
G	Red Standing Figure	Flashing Amber	1 or 2

Table 5 PUFFIN CROSSINGS - OPERATIONAL CYCLE, USE & VARIATIONS

PERIOD	USE	VARIATION FOR
1	Vehicle running time	Traffic volumes
2	Standard amber to vehicles	None
3	Vehicle clearance period	Vehicle actuation
4	Pedestrian invitation to cross	Road width, disabled pedestrians, crossings with central refuge
5	Pedestrians must not start to cross	Type of detector
6	Completion of pedestrian crossing time	Road width
7	Additional pedestrian clearance time	Pedestrian detection
8	Additional pedestrian clearance time	Pedestrian gap change
9	Standard red/amber to vehicles	None

Table 6 PUFFIN CROSSINGS - OPERATIONAL CYCLE & TIMINGS

PERIOD	SIGNALS SHOWN		TIMINGS (Seconds)
	TO PEDESTRIANS	TO VEHICLES	
1	Red Standing Figure (Wait)	Green (proceed if way is clear)	20-60 (fixed) 6-60 (VA)
2	Red Standing Figure	Amber (stop unless not safe to do so)	3
3	Red Standing Figure	Red (stop, wait behind Stop line on carriageway)	1 to 3
4	Green Walking Figure with audible signal if provided (cross with care)	Red	4 to 9
5	Red Standing Figure (do not start to cross)	Red	1-5
6	Red Standing Figure	Red	0-22 (pedestrian extendable period)
7	Red Standing Figure	Red	0-3 (only appears on a maximum change if pedestrians are still being detected)
8	Red Standing Figure	Red	0-3 (only appears at a pedestrian gap change)
9	Red Standing Figure	Red with Amber (stop)	2

Table 7 TOUCAN CROSSINGS - OPERATIONAL CYCLE, USE & VARIATIONS

PERIOD	USE	VARIATION FOR
I	Vehicle running time	Traffic volumes
II	Standard amber to vehicles	None
III	Vehicle clearance period	Vehicle actuation
IV	Pedestrian invitation to cross	Road width, disabled pedestrians, crossings with central refuge
V	Pedestrians must not start crossing	None
VI	Completion of pedestrian crossing time	Road width
VII	Additional pedestrian clearance time	Pedestrian detection
VIII	All red	Pedestrian clearance
IX	Standard red/amber to vehicles	None

Table 8 TOUCAN CROSSINGS - OPERATIONAL CYCLE & TIMINGS

PERIOD	SIGNALS SHOWN		TIMINGS (Seconds)
	TO PEDESTRIANS	TO VEHICLES	
I	Red Standing Figure (Wait)	Green (proceed if way is clear)	20-60 (fixed) 6-60 (VA)
II	Red Standing Figure	Amber (stop unless not safe to do so)	3 (mandatory)
III	Red Standing Figure	Red (stop, wait behind stop line on carriageway)	1 to 3
IV	Green Walking Figure with audible signal if provided (cross with care)	Red	4 to 7
V	Black-out - no signal shown (Do not start to cross)	Red	3 (fixed period)
VI	Black-out	Red	0 to 22 pedestrian extendable period)
VII	Black-out	Red	0-3 (only appears on a maximum change if pedestrians are still being detected)
VIII	Red	Red	1-3
IX	Red Standing Figure	Red with Amber (stop)	2

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Q. Planning decision B/15/00263/FUL/SMC



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Philip Isbell

**Professional Lead - Growth &
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Babergh District Council

Corks Lane, Hadleigh, Ipswich IP7 6SJ

DX NO: 85055 Exchange: Babergh

Website: www.babergh.gov.uk

PLANNING PERMISSION

Town and Country Planning Act 1990

Correspondence Address:

Boyer Planning Ltd
15 De Grey Square
De Grey Road
Colchester
Essex
CO4 5YQ

Applicant: St Francis Group (Brantham) Ltd

Part 1 - Particulars of Application

Date of application: 25 February 2015

Application No: B/15/00263/FUL/SMC

Date Received: 25 February 2015

Particulars and location of development:

Re-advertisement: Hybrid application for regeneration of existing industrial estate and development of adjoining land. **Outline:** Mixed use development to comprise approximately 320 dwellings; approximately 44,123 sqm of Class B1, B2 and B8 employment uses; approximately 720sqm of Class A1, A3, A4 and A5 retail uses and Class D1 community uses; provision of public open space and new playing pitches (Class D2). **Full:** Proposed new access from Brooklands Road; improvements to Factory Lane; new on site road network and structural landscaping; and foul and storm water drainage infrastructure (As amplified by Transport Assessment (Rev B dated April 2015) received on 7 May 2015).

Brantham Industrial Estate and land to the north and the peninsula (part of), Factory Lane, Brantham, MANNINGTREE, CO11 1NL

Part 2 - Particulars of decision

The **Babergh District Council** hereby give notice in pursuance of the provisions of the Town and Country Planning Act 1990 that **permission has been granted** for the development referred to in Part 1 hereof in accordance with the application and plans submitted subject to the following conditions:

INTERPRETING THIS DECISION NOTICE

Conditions **1 to 32** relate to the **OUTLINE** Planning Permission.

Conditions **33 to 51** relate to the **FULL** Planning Permission (i.e. The new access from Brooklands Road; improvements to Factory Lane; new on site road network (employment land); structural landscaping and foul and storm water drainage infrastructure.

Conditions **52 to 64** relate to both the **FULL** and **OUTLINE** Planning Permissions.

1. ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: TIME LIMIT FOR RESERVED MATTERS APPLICATION

Application for approval of reserved matters must be made not later than the expiration of seven years beginning with the date of this permission and the development must be begun not later than whichever is the later of the following dates:-

- a) the expiration of seven years from the date of this permission or
- b) the expiration of two years from the final approval of the reserved matters or, in the case of approval on different dates, the final approval of the last such matter to be approved.

Reason – Required to be imposed pursuant to Section 92 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

2. LISTING OF APPROVED PLANS & DOCUMENTS

The development hereby permitted shall be carried out largely in accordance with the following approved documents or such other drawings/documents as may be approved by the Local Planning Authority in writing pursuant to other conditions of this [permission/consent]; or such drawings/documents as may subsequently be approved in writing by the Local Planning Authority as a non-material amendment following an application in that regard:

Defined Red Line Plan:

The defined Red Line Plan for this application is Drawing Site Identification Plan (Ref 8831/PL/001A) received 11 March 2015 only. This drawing is the red line plan that shall be referred to as the defined application site. Any other drawings approved or refused that may show any alternative red line plan separately or as part of any other submitted document have not been accepted on the basis of defining the application site.

Approved Plans and Documents: _

- Green Infrastructure Plan - 8831/PL/002
- Movement Framework Plan – 8831/PL/003
- Land Use Plan - 8831/PL/004
- Building Heights Parameter Plan - 8831/PL/005
- Indicative Masterplan - 8831/PL/006
- Management Plan - 8831/PL/007
- Phasing Plan - 8831/PL/008
- Indicative Sections - 8831/PL/009
- Proposed Highways, Structural Landscape and SuDs Layout (Drawing Ref. 8831/PL/010A)

Reason - For the avoidance of doubt and in the interests of proper planning of the development.

3. PERMITTED USE CLASSES: COMMERCIAL/EMPLOYMENT USES

The permitted retail/commercial/employment development shall not exceed the maximum size for buildings within the Specified Use Class of the Town and Country Planning (Use Classes) Order 1987 (as amended)(or in any provision equivalent to these Classes in any statutory instrument revoking or re-enacting that Order), for each

class below:-

Use Class (Maximum Size)

- Class B1, B2, B8 - 44,123 sq. m
- Class A1, A3, A4, A5 and D1 – 720 sq. m

Reason – To enable the Local Planning Authority to retain control over the development in the interests of the amenity.

4. RESERVED MATTERS

Before any reserved matters development is commenced, approval of the details of the appearance, scale and layout of the building(s), and the landscaping (including structural landscaping the Public Open Space to the east and the location, design and layout of a car parking area near the Decoy Pond for visitors use) of the site (hereinafter called "the reserved matters") shall be obtained in writing from the Local Planning Authority.

Reason – To enable the Local Planning Authority to secure an orderly and well-designed development in accordance with the character and appearance of the neighbourhood and in accordance with the Development Plan.

5. CONCURRENT WITH RESERVED MATTERS FOR BOTH COMMERCIAL AND RESIDENTIAL: STRATEGY FOR OPEN SPACE

Concurrently with the submission(s) of each reserved matter referred to in Condition 4 above, for both residential and commercial development, a management strategy for the approved open space/landscaping within each parcel, shall be submitted to and approved in writing by the Local Planning Authority. The development shall be implemented in accordance with such details as approved.

Reason - To ensure the proper management and maintenance of the approved landscaping in the interests of amenity and the character and appearance of the area.

6. CONCURRENT WITH RESERVED MATTERS FOR BOTH COMMERCIAL AND RESIDENTIAL: SLAB LEVELS

Concurrently with the submission(s) of each reserved matter referred to in Condition 4 above, for both residential and commercial development, precise details of the existing site levels, proposed site levels and finished floor levels of the proposed buildings from a fixed off-site datum point shall be submitted to and agreed in writing with the Local Planning Authority. The development shall thereafter be implemented in accordance with such details as approved.

Reason – To enable the Local Planning Authority to secure an orderly and well-designed development in accordance with the character and appearance of the neighbourhood and in accordance with the Development Plan.

7. CONCURRENT WITH RESERVED MATTERS FOR RESIDENTIAL: SECURED BY DESIGN

Concurrently with the submission of reserved matters for each residential development to which it relates, a scheme/schedule of measures to demonstrate compliance with the approach of 'Secured by Design Principles' (2004) or any subsequent guidance that may accompany or replace it. The detailed scheme of approved measures shall thereafter be fully implemented prior to the first occupation

of each relevant part of the development unless otherwise agreed in writing by the Local Planning Authority.

Reason - In the interests of crime prevention and community safety. In pursuance of the Council's duty under S.17 of the Crime and Disorder Act 1998 to consider crime and disorder implications in exercising its planning functions and in accordance with the National Planning Policy Framework and saved policy CN04 of the Babergh Local Plan, Alteration No.2 (2006).

8. DETAILS OF SECONDARY FLOOD DEFENCE MEASURES

Concurrently with the submission of the first reserved matters application for residential development, details of the proposed secondary flood defence measure, identified on Drawing No. PL010 A (to the north of Factory Lane) shall be submitted to and approved in writing by the Local Planning Authority. The approved defences shall be constructed prior to occupation of the first residential dwelling.

Reason: To ensure clear arrangements are in place for ongoing operation and maintenance of the disposal of surface water drainage.

9. DISPOSAL OF SURFACE WATER

Concurrent with the submission of the each reserved matters application details of proposals for the disposal of surface water that are consistent with the agreed strategy for the whole site (see Condition 37) shall be submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal, to ensure that the proposed development can be adequately drained.

10. IMPLEMENTATION, MAINTENANCE AND MANAGEMENT OF DISPOSAL OF SURFACE WATER

Concurrent with the submission of each reserved matters application details of the proposals for the implementation, maintenance and management of the surface water assets that are consistent with the strategy for the disposal of surface water on the whole site (see Condition 37) shall be submitted to and approved in writing by the Local Planning Authority. The strategy shall be implemented and thereafter managed and maintained in accordance with the approved details.

Reason: To ensure clear arrangements are in place for ongoing operation and maintenance.

11. CONCURRENT WITH THE SUBMISSION OF RESERVED MATTERS: NOISE IMPACT

As part of any reserved matters submission for commercial development (and to ensure that the layout and operations of the aforementioned commercial development are such that noise effects on existing and proposed dwellings are minimised) a noise assessment shall be carried out, in respect of each commercial unit, in accordance with BS4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound' (or subsequent revisions thereof). Such an assessment shall take into account noise from deliveries/associated traffic and also noise from any fixed or noisy plant such as air handling units and the use of tonal reversal alarms and proposed hours of use. A background noise survey shall be carried out to determine current background/ambient levels prior to any reserved matters development commencing

and shall be used for all future noise assessments for this area. The assessment shall be submitted and agreed in writing by the Local Planning Authority and the development carried out in accordance with such details as approved.

Reason – To enable the Local Planning Authority to retain control over the development in the interests of the amenity.

12. CONCURRENT WITH THE SUBMISSION OF RESERVED MATTERS

Concurrently with the submission of reserved matters for each phase of development (both residential and employment/commercial) details of the areas to be provided for the parking of vehicles including secure cycle storage relating to the relevant reserved matters consent shall be submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure that sufficient space for the onsite parking of vehicles is provided and maintained in order to ensure the provision of adequate on-site space for the parking and manoeuvring would be detrimental to highway safety to users of the highway.

13. CONCURRENT WITH RESERVED MATTERS: ECOLOGICAL DESIGN STRATEGY FOR PUBLIC OPEN SPACE

Concurrently with the submission of the reserved matters for any area or phase of residential development, the Ecological Design Strategy (EDS) for the LNR standard Public Open Space shall be submitted to and approved in writing by the Local Planning Authority.

The EDS shall include the following:

- a) Purpose and conservation objectives for the proposed works.
- b) Review of site potential and constraints.
- c) Detailed design(s) and/or working method(s) to achieve stated objectives.
- d) Extent and location/area of proposed works on appropriate scale maps and plans.
- e) Type and source of materials to be used where appropriate, e.g. native species of local provenance.
- f) Timetable for implementation demonstrating that works are aligned with the proposed phasing of development.
- g) Persons responsible for implementing the works.
- h) Details of initial aftercare and long-term maintenance.
- i) Details for monitoring and remedial measures.
- j) Details for disposal of any wastes arising from works.

The EDS shall be implemented in accordance with the approved details and all features shall be retained in that manner thereafter.

Reason: In order to reasonably minimise the adverse impacts of the proposal on ecological receptors both on and off site.

14. CONCURRENT WITH RESERVED MATTERS: FURTHER SURVEYS AND DEVELOPMENT PHASED OVER A PERIOD OF TIME

Concurrently with the submission of the reserved matters for any phase of development, further supplementary ecological surveys for breeding birds and reptiles shall be undertaken for the land affected by that phase or area to inform the preparation and implementation of corresponding phases of ecological measures

required. The supplementary surveys shall be of an appropriate type for the above habitats and/or species and survey methods shall follow national good practice guidelines. The development shall thereafter be carried out in accordance with the recommendations of the surveys.

For the purposes of this condition, development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: In order to reasonably minimise the adverse impacts of the proposal on ecological receptors both on and off site.

15. CONCURRENT WITH THE SUBMISSION OF RESERVED MATTERS FOR RESIDENTIAL DEVELOPMENT: BFL12

Concurrent with the submission of any reserved matters for residential development, either in a parcel or as a whole, a Building for Life 12 Assessment shall be submitted to and approved in writing by the Local Planning Authority demonstrating that the development achieves an Amber standard on all elements, unless otherwise agreed in writing by the Local Planning Authority. Following approval all elements of the scheme shall be completed as agreed unless otherwise agreed in writing by the Local Planning Authority.

Reason – To ensure that the development makes fullest contribution to achieving an acceptable level of functionality and sustainability in the built environment in accordance with Policy CS12 of the Babergh Core Strategy (2014).

16. CONCURRENT WITH THE SUBMISSION OF RESERVED MATTERS FOR RESIDENTIAL AND EMPLOYMENT/COMMERCIAL DEVELOPMENT: ENERGY STATEMENT

Concurrently with the submission of the reserved matters to which it relates (both employment and residential development), an energy statement shall be submitted to and approved in writing by the Local Planning Authority which encompasses the predicted energy use for all buildings to which the reserved matters application relates. The energy statement will assess the deployment of renewable technologies to the scheme and demonstrate how the scheme will achieve 10% of its agreed predicted energy use from renewable sources. The deployment of renewables will include specifications of all technologies employed and detailed site plans showing the location of all renewable technologies. Following agreement of the details with the Local Planning Authority the deployment of renewable technology shall be delivered as agreed prior to occupation of the development to which they relate.

Reason: To ensure that the development makes the fullest contribution to minimising carbon dioxide emissions in the built environment in accordance with Policies CS12-15 of the Babergh Core Strategy (2014).

17. CONCURRENT WITH THE SUBMISSION OF RESERVED MATTERS FOR RESIDENTIAL DEVELOPMENT: GLAZING SPECIFICATION

As part of any reserved matters submission for residential development a glazing specification as laid out in Sections 9.78 and 9.111 of the revised Environmental Statement shall be used in order to meet internal noise standard in dwellings.

Dwellings directly facing Factory Lane or at a nominal distance of 10 metres from Factory lane shall have a double glazing specification for living rooms 10mm/12mm/4mm (thickness of pane of glass/size of air gap/thickness of second pane of glass) and a sound reduction capacity of 29dB RTRA along with passive

acoustic ventilation. Bedrooms of those dwellings and all rooms of all other residential dwellings shall have a double glazing specification 4mm/12mm/4mm or 4mm/16mm/4mm (thickness of pane of glass/size of air gap/thickness of second pane of glass) and a sound reduction capability of 25DB RTRA. Bedrooms of those dwellings shall also have passive acoustic ventilation.

Details of the scheme, including a plan showing the scheme for each dwelling shall be submitted for approval by the Local Planning Authority prior to commencement of construction.

Prior to first occupation, a sample of residential properties (the number and locations of which shall be agreed between the developer and the Local Planning Authority) shall be independently tested and certified so as to demonstrate that the scheme of glazing has been effectively installed and that internal design values, as stated in BS:8233:2014 'Guidance on Noise Reduction and Sound Insulation for buildings are met.

Reason – To protect the residential amenity of future occupiers.

18. ACTION REQUIRED PRIOR TO COMMENCEMENT OF THE SPORTS PITCH/SPORTS FACILITY

Before the reserved matters development for the sports pitches (indicatively indicated on Drawing No 8831/PL006) are commenced, approval of the following details shall be obtained in writing by the Local Planning Authority and subsequently implemented as set out:

- Details of the layout;
- Surface treatment (including details relating to cut and fill);
- Boundary treatment;
- Hours of use;
- Proposed scheme of lighting including types, angle and position of luminaire, hours of operation, and a polar luminance diagram based on vertical luminance at the site boundary, or at the nearest residential property and management

Reason: In the interest of protecting residential amenity.

19. CONCURRENT WITH RESERVED MATTERS: COMMERCIAL DEVELOPMENT COMPRISING A COMMERCIAL KITCHEN/PLANT AND MACHINERY

As part of a reserved matters submission for any units comprising a commercial kitchen (to include canteens) full details of the kitchen exhaust system, including outlet height odour abatement and noise levels (to be presented in the form of a noise assessment, to be based on BS4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound' or later revisions thereof), shall be submitted for approval by the Local Planning Authority. The equipment shall be effectively operated and maintained in accordance with the manufacturer's instructions for as long as the proposed use continues. (Note: The applicant is referred to the Defra document 'Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems').

Reason – To enable the Local Planning Authority to retain control over the development in the interests of the amenity.

20. PRIOR TO COMMENCEMENT OF WORKS ON THE PUBLIC OPEN SPACE: MITIGATION FOR SKYLARKS

Prior to the commencement of works to provide the Public Open Space (as identified on Drawing No 8831/PL/008 as Landscaping Phase A and B), details of off-site skylark nest plots on the peninsula land shall be submitted to and approved in writing by the Local Planning Authority. The mitigation measures shall be implemented in full in accordance with such details as approved (including providing an alternative nesting habitat) in advance of works starting on the Public Open Space.

Reason: To provide appropriate nesting habitats for Skylarks which would be lost as a result of the development.

21. PRIOR TO THE COMMENCEMENT OF EACH PHASE OF RESIDENTIAL DEVELOPMENT: SUBMISSION OF FOUL DRAINAGE SCHEME

Prior to the commencement of development within each phase or sub-phase of the residential development on the proposed housing land (Proviso D) a foul water drainage scheme for that phase or sub phase in accord with the approved drainage strategy Drawing 40443/P/001F and the amended outfall connection advice from Anglian Water dated 30 July 2015 shall be submitted to and approved in writing by the Local Planning Authority. No dwelling shall be occupied until the agreed method of foul water drainage for that phase or sub-phase of the residential development has been fully installed and is functionally available for use unless otherwise agreed in writing by the Local Planning Authority. The approved foul water drainage scheme shall thereafter be maintained as approved.

Reason: To ensure that an adequate and satisfactory means of foul drainage is provided in relation to each phase or sub-phase of the residential development on the proposed housing land (Proviso D) to prevent environmental and amenity issues arising.

22. ACTION REQUIRED PRIOR TO COMMENCEMENT OF RESIDENTIAL WORKS: ESTATE ROAD LAYOUT

The new estate road junction(s) with Factory Lane and Brooklands Road serving the residential developments [inclusive of cleared land within the sight splays to the junction(s)] shall be formed prior to the commencement of any residential works or delivery of any other materials.

Reason: To ensure a safe access to the site is provided before other works and to facilitate off street parking for site workers in the interests of highway safety.

23. ACTION REQUIRED PRIOR TO COMMENCEMENT OF RESIDENTIAL DEVELOPMENT: ESTATE ROADS

No development shall commence in relation to the reserved matters for residential development (unless otherwise approved in writing by the Local Planning Authority) until a timetable detailing the phased provision of roads and footpaths hereby approved has been submitted to and approved in writing by the Local Planning Authority. The approved roads and footpaths shall then be implemented in such phased arrangement as has been approved.

Reason - To ensure that satisfactory access is provided for the safety of residents and the public.

24. ACTION REQUIRED PRIOR TO COMMENCEMENT OF RESIDENTIAL DEVELOPMENT: RESIDENTIAL ESTATE ROADS

Before the commencement of a residential reserved matters consent, details of the estate roads and footpaths, [including layout, levels, gradients, surfacing and means of surface water drainage] and a timetable for said works relevant to that reserved matters consent, shall be submitted to and approved in writing by the Local Planning Authority. The details agreed to satisfy this condition shall be implemented and completed in accordance with the timetable and details as agreed.

Reason: To ensure that roads/footways are constructed to an acceptable standard. This condition is required to be agreed prior to the commencement of any development to ensure highway safety is secured early for both development, its construction and addresses areas of work before any other parts of the development can take place. If agreement was sought at any later stage there is an unacceptable risk to highway and public safety and risk of cost to the developer if the details are not found acceptable.

25. PRIOR TO COMMENCEMENT OF DEVELOPMENT OF ANY COMMERCIAL DEVELOPMENT: BREEAM

A BREEAM Design Stage Assessment, demonstrating that the relevant Consented Reserved matters Commercial development or phase will achieve an Excellent rating (unless otherwise agreed in writing with the Local Planning Authority), shall be submitted to and approved by the Local Planning Authority before commencement of the applicable reserved matters commercial development or phase of development. A Final BREEAM Certificate demonstrating that the applicable completed development or phase of development has achieved an Excellent rating (unless otherwise agreed in writing by the Local Planning Authority) shall be submitted to the Local Planning Authority within six months the completion of the applicable development or phase.

Reason: In order to promote the highest standards of design in the interests of energy and resource efficiency.

26. ACTION REQUIRED PRIOR TO OCCUPATION OF RESIDENTIAL DEVELOPMENT: GARAGES

The approved garage/parking spaces for each dwelling approved under the reserved matters submission shall be made functionally available for use prior to the occupation of the associated dwelling and shall thereafter be retained for these purposes. Notwithstanding the provisions of Article 3, Schedule 2 of the Town & Country Planning (General Permitted Development)(England) Order 2015 (or any Order revoking and re-enacting that Order with or without modification) no development shall be carried out in such a position as to preclude vehicular access to those car parking spaces.

Reason - In the interests of highway safety and to ensure adequate vehicular parking and turning provision within the site is provided and maintained.

27. ACTION REQUIRED PRIOR TO COMMENCEMENT OF THE FIRST RESIDENTIAL DEVELOPMENT: WORKS TO PUBLIC FOOTPATH 13

Prior to commencement of the residential development, details of the proposed works to Footpath 13 to widen to 2 metres (and including the securing of the realignment of the current boundary fence, along with a timetable for the works), shall be submitted to and approved in writing by the Local Planning Authority. The details agreed to satisfy this condition shall be implemented and completed in their entirety in accordance with the timetable as agreed.

Reason - To ensure that the footways are constructed to an acceptable standard. This condition is required to be agreed prior to the commencement of any development to ensure Public rights of Ways are maintained to appropriate standards. If agreement was sought at any later stage, there is an unacceptable risk to public safety and risk of cost to the developer if the details are not found acceptable.

28. ACTION REQUIRED PRIOR TO THE LOSS OF THE EXISTING PARKING AREA: PARKING PROVISION AT THE DECOY POND

Prior to the loss of the existing parking area, the new parking area near the decoy pond (approved as part of the reserved matters), shall be constructed and made available for use in accordance with such details as approved and shall be retained thereafter.

Reason - In order to ensure that satisfactory parking is provided near the decoy pond.

29. ACTION REQUIRED PRIOR TO ERECTION OF BOUNDARY TREATMENT IN FACTORY LANE

All proposed new dwellings with private rear garden areas facing Factory Lane shall have a 1.8 metre high close timber fence or wall applied to the facing boundary, prior to first occupation. Details of the fence/wall shall have been submitted to and agreed in writing with the Local Planning Authority. The boundary treatment shall thereafter be retained in accordance with such details as approved.

Reason – To protect the residential amenity of future occupiers in accordance with paragraph 9.81 of the Environmental Statement.

30. MANAGEMENT OF SURFACE WATER AND STORM WATER DURING CONSTRUCTION

No development shall commence following a reserved matters consent until details of a construction surface water management plan detailing how surface water will be managed on the whole site during construction is submitted to and agreed in writing by the Local Planning Authority. The construction surface water management plan shall be implemented and thereafter managed and maintained in accordance with the approved plan.

Reason: To ensure the development does not cause increased pollution of the watercourse (Cattawade Creek) in line with the River Basin Management Plan.

31. REQUIREMENT FOR FLOOD RISK ASSET REGISTER

No development hereby permitted shall be occupied until the flood risk asset register template has been submitted in the required for, to and approved in writing by, the Local Planning Authority.

Reason: To ensure all flood risk assets and their owners are recorded onto the LLFA's statutory flood risk asset register.

32. ACTION REQUIRED PRIOR TO OCCUPATION OF RESIDENTIAL DEVELOPMENT: DETAILS OF FIRE HYDRANTS

Prior to the occupation of any phase of residential development (unless otherwise approved in writing by the Local Planning Authority) details of the number and location of fire hydrant provision for the approved development shall be submitted to and approved in writing by the Local Planning Authority. The approved details shall then be implemented in such phased arrangement as has been agreed prior to first occupation of any dwelling.

Reason – To ensure fire hydrants are provided in sufficient numbers and locations to meet fire safety requirements.

CONDITIONS RELATING TO THE FULL PLANNING PERMISSION (33 - 51).

33. ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: COMMENCEMENT TIME LIMIT

Development granted FULL permission (new access from Brooklands Road; improvements to Factory Lane; new on site road network and structural landscaping; and foul and storm water drainage infrastructure) shall be begun not later than the expiry of three years from the date of this permission.

Reason – To comply with the requirements of Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004

34. LISTING OF APPROVED PLANS & DOCUMENTS

The development hereby permitted shall be carried out in accordance with the following approved documents or such other drawings/documents as may be approved by the Local Planning Authority in writing pursuant to other conditions of this [permission/consent]; or such drawings/documents as may subsequently be approved in writing by the Local Planning Authority as a non-material amendment following an application in that regard:

Defined Red Line Plan:

The defined Red Line Plan for this application is Drawing Site Identification Plan (Ref 8831/PL/001A) received 11 March 2015 only. This drawing is the red line plan that shall be referred to as the defined application site. Any other drawings approved or refused that may show any alternative red line plan separately or as part of any other submitted document have not been accepted on the basis of defining the application site.

Approved Plans and Documents:

- Indicative Master plan (Drawing Ref. PL006)
- Proposed second access at Brooklands Road (Drawing Ref. 40443/P/101E)
- Factory Lane Improvements (Drawing Ref. 40442/P/102B)
- Highway Construction Details - (Drawing Ref. 40443/P/103A)
- Improvements to Factory Lane junction with A137 - (Drawing Ref. 40443/P/106)
- A137 shared-use pedestrian and cycle route (Drawing Ref's. 40443/P/107A/108B/109A and 111B)
- Drainage Strategy (40443/P/001F)
- Highways, Structural Landscape Suds Layout (PL010 Rev A)

Reason - For the avoidance of doubt and in the interests of proper planning of the development.

35. GROUND CONTAMINATION

No development shall take place until:

- i) An additional site investigation scheme based on Section 4.1 of the Remedial Options and Implementation Strategy prepared by G&J Geoenvironmental Consultants, Ref. GJ028-ROIP-V2-FINAL, dated November 2015, to provide information for a detailed assessment for the risk to all receptors that may be affected, including those off site shall be submitted and approved in writing by the Local Planning Authority (in conjunction with the Environment Agency) prior to occupation of the relevant phase with the exception of ongoing monitoring if so required
- ii) taking into account the results of the additional site investigation and detailed risk assessment referred to in (i), the remediation requirements for land contamination and/or pollution of controlled waters affecting the site will be undertaken in line with Section 4 of the Remedial Options and Implementation Strategy Prepared by G&J Geoenvironmental Consultants, Ref: GJ028-ROIP-V2-FINAL, dated November 2015
- iii) A Verification plan (in line with Section 5 of the Remedial Options and Implementation Strategy prepared by G&J Geoenvironmental Consultants Ref: GJ028-ROIP-V2-FINAL, dated November 2015) is required to demonstrate that the works set out in the remediation strategy in (ii) are complete.
- iv) The verification report (as described in Section 5.3 of the Remedial Options and Implementation Strategy prepared by G&J Geoenvironmental Consultants, Ref: GJ028-ROIP-V2-FINAL, dated November 2015) shall provide evidence that the required works regarding contamination have been carried out in accordance with the approved method(s), with post remediation sampling and monitoring results being included in the report to demonstrate that the remediation requirements for land contamination and/or pollution of controlled waters affecting the site have been fully met.

Reason - To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other off site receptors.

36. PRIOR TO THE COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): SURFACE WATER DISPOSAL

No development shall commence until the Flood Risk Assessment (FRA) is amended to include storage to be provided and sized to contain the 1 in 100 year + 40% climate change event and has been submitted to and approved in writing by the Local Planning Authority. For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal, to ensure that the proposed development can be adequately drained.

37. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): SURFACE WATER DRAINAGE STRATEGY

No development shall commence until the strategy (currently contained within Mixed Use Development Site Specific Flood Risk Assessment Brantham Industrial Estate

Project No: 40443 Rev B) is updated with full technical details for the disposal of surface water on the whole site and has been submitted to and approved in writing by the Local Planning Authority. For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: To ensure that the principles of sustainable drainage are incorporated into this proposal, to ensure that the proposed development can be adequately drained.

38. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): MANAGEMENT OF SURFACE WATER

No development shall commence until details of the implementation, maintenance and management of the strategy for the disposal of surface water on the site have been submitted to and approved in writing by the Local Planning Authority. The strategy shall be implemented and thereafter managed and maintained in accordance with the approved details. For the purposes of this condition development shall not include demolition or remediation of the brownfield land forming part of the site.

Reason: To ensure clear arrangements are in place for ongoing operation and maintenance of the disposal of surface water drainage.

39. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): MANAGEMENT OF SURFACE WATER AND DURING CONSTRUCTION

No development shall commence until details of a construction surface water management plan detailing how surface water will be managed on the whole site during construction is submitted to and agreed in writing by the Local Planning Authority. The construction surface water management plan shall be implemented and thereafter managed and maintained in accordance with the approved plan. For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: To ensure the development does not cause increased pollution of the watercourse (Cattawade Creek) in line with the River Basin Management Plan.

40. ACTION REQUIRED PRIOR TO COMMENCEMENT OF WORKS ON THE PENINSULA: CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (BIODIVERSITY)

Prior to the commencement of development on the peninsular in the formation of the Suds area (including vegetation clearance or ground works) a Construction Environmental (& Ecological) Management Plan (CEMP) shall be submitted to and be approved in writing by the local planning authority. The content of the CEMP shall include the following:

- a) Risk assessment of potentially damaging construction activities
- b) Identification of "biodiversity protection zones"
- c) Practical measures to avoid or reduce impacts during construction
- d) Location and timing of sensitive works to avoid harm to biodiversity features
- e) Times during construction when specialist ecologist need to be present on site

- to oversee works
- f) Responsible persons and lines of communication
- g) Use of protective fences, exclusion barriers and warning signs

The approved plan shall be adhered to and implemented in full throughout the construction period for all phases strictly in accordance with the approved consent, unless otherwise agreed in writing by the local planning authority.”

Reason: In order to safeguard protected species, minimise ecological impacts in accordance with the NPPF and Policy CS15 of the Babergh Core Strategy 2015 and to secure the full implementation of the recommendations in the Ecology chapter of ES.

41. PRIOR TO THE SUBMISSION OF THE FIRST RESERVED MATTERS APPLICATION ON THE EMPLOYMENT LAND: INTERIM WORKPLACE TRAVEL PLAN (GREEN TRAVEL PLAN)

An Interim Workplace Travel Plan (Green Travel Plan) shall be submitted to, and approved in writing by, the Local Planning Authority no later than the submission of the first reserved matters application on the employment land.

Reasons: In accordance with Babergh Local Plan Policy TP16.

42. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): SOFT AND HARD LANDSCAPING

No development shall take place (other than the approved infrastructure works i.e. site preparation, demolition and remediation) until there has been submitted to and approved, in writing, by the Local Planning Authority a scheme of hard, soft and boundary treatment landscaping works in relation to the infrastructure works, south of Factory Lane which shall include accurately identify spread, girth and species of all existing trees, shrubs and hedgerows on the site and indicate any to be retained.

Planting, seeding or turfing shown on the approved landscaping details shall be carried out in full during the first planting and seeding season (October - March inclusive) following the commencement of the development or in such other phased arrangement as may be approved, in writing, by the Local Planning Authority up to the first use or first occupation of the development.

Any trees, hedges, shrubs or turf identified within the approved landscaping details (both proposed planting and existing) which die, are removed, seriously damaged or seriously diseased, within a period of 5 years of being planted or in the case of existing planting within a period of 5 years from the commencement of development, shall be replaced in the next planting season with others of similar size and species.

Reason – In the interests of visual amenity and the character and appearance of the area. This condition is required to be agreed prior to the commencement of any development to ensure matters of tree and hedgerow protection are secured early to ensure avoidance of damage or loss due to the development and/or its construction. If agreement was sought at any later stage there is an unacceptable risk of loss and damage to important trees and hedgerow that would result in harm to amenity.

43. ACTION REQUIRED PRIOR TO DEMOLITION OF THE BRITISH XYLONITE FACTORY BUILDINGS: HISTORIC RECORDING

Prior to the demolition of the derelict remains of the former British Xylonite Factory to the south of the railway line on the peninsular, a programme of historic recording and analysis where safe to do so shall be secured in accordance with a Written Scheme of Investigation (WSI) which has been submitted and approved by the Local Planning Authority unless otherwise agreed in writing with the Local Planning Authority the Written Scheme of Investigation shall include:

- a. The programme and methodology of site investigation and recording
- b. The programme for post investigation assessment
- c. Provision to be made for analysis of the site investigation and recording
- d. Provision to be made for publication and dissemination of the analysis and records of the site investigation
- e. Provision to be made for archive deposition of the analysis and records of the site investigation
- f. Nomination of a competent person or persons/ organisation to undertake the works set out within the Written Scheme of Investigation
- g. The site investigation shall be completed prior to development, or in such other phased arrangement, as agreed and approved in writing by the Local Planning Authority

Reason - To allow proper investigation and recording of the site that is potentially of archaeological and historic significance. This condition is required to be agreed prior to the commencement of any development to ensure matters of archaeological importance are preserved and secured early to ensure avoidance of damage or loss due to the development and/or its construction. If agreement was sought at any later stage there is an unacceptable risk of loss and/or damage to archaeological and historic assets.

44. ACTION REQUIRED PRIOR TO COMPLETION OF THE DEMOLITION OF THE BRITISH XYLONITE FACTORY BUILDINGS: ARCHAEOLOGY IN ACCORDANCE WITH THE WRITTEN SCHEME OF INVESTIGATION

Prior to the completion of the demolition of the derelict remains of the former British Xylonite Factory to the south of the railway line on the peninsular the site investigation (where safe to do so) and post investigation assessment shall have been completed, submitted to and approved in writing by the Local Planning Authority, in accordance with the programme set out in the Written Scheme of Investigation approved under Condition 43 and the provision made for analysis, publication and dissemination of results and archive deposition.

Reason - To safeguard the recording of archaeological assets within the approved development boundary from impacts relating to any groundworks associated with the development scheme and to ensure the proper and timely investigation, recording, reporting and presentation of archaeological assets affected by this development.

45. PHASING: CONTAMINATION CONTEMPORANEOUSLY WITH RESIDENTIAL DEVELOPMENT

Phased remediation of contaminated industrial estate land and provision of infrastructure to enable sequential delivery of serviced plots for employment and other uses contemporaneously with the phased delivery of residential development shall be required to be submitted and agreed in writing by the Local Planning Authority at key stages relative to (a) not later than occupation of the 100th dwelling (b) not later than occupation of the 200th dwelling and (c) not later than occupation of the 300th dwelling. In the event that the development does not proceed to any of the three key stages referred above, then pro rata remediation and infrastructure shall be carried

out to an agreed standard to be agreed in writing by the LPA.

Reason – To enable the Local Planning Authority to secure an orderly and well-designed development and to ensure that the employment land is delivered alongside residential development in a commensurate and proportionate way.

46. ACTION REQUIRED PRIOR TO COMMENCEMENT OF WORKS ON THE PENINSULA: PROTECTION OF WINTERING WILDFOWL DURING CONSTRUCTION

Prior to the commencement of any works on the peninsula land, a scheme for the timing of works on the peninsula land south of the railway line, between August and the following April, in accordance with the approved Appropriate Assessment for the development, shall be submitted to and approved in writing by the Local Planning Authority. The agreed scheme shall be carried out in full in accordance with such details as agreed.

Reason: In order to safeguard protected species and minimise ecological impacts in accordance with the NPPF and Policy CS15 of the Babergh Core Strategy 2015.

47. ACTION REQUIRED PRIOR TO OCCUPATION: HIGHWAY WORKS

No part of the development hereby approved shall be occupied until the following highway improvement works have been provided or completed, or a phased programme for their implementation approved which sets out an agreed timetable for works, unless otherwise agreed in writing with the Local Planning Authority;

- Improvements at the A137/B1070 roundabout as shown in principle on Drawing No. 40443/P/106 including two-lane approach and footway improvements.
- A shared use footway/cycleway between the proposal site and central refuge island to the north of the A137 railway crossing.
- A central refuge island to the north of the A137 railway crossing.
- A minimum 2-metre-wide footway between the central refuge island to the north of the A137 railway crossing and A137 railway crossing underpass a minimum 1.2-metre-wide footway, 2.7-metre-wide carriageway and 0.6-metre-wide protection strip through the A137 railway crossing underpass with full height kerb.
- Street lighting at the central refuge island to the north of the A137 railway crossing and between the island and through the A137 railway crossing underpass (if required but subject to agreement with Network Rail).
- A pedestrian and cycling safety improvement scheme on Factory Lane as indicated on Drawing No. 40442/P/102B.
- New footway provided on the south side of the B1070 as shown on Drawing No. 40443/P/107A.

Reason - to protect highway efficiency of movement and safety and to ensure that the proposal site is accessible by more sustainable modes of transport such as public transport, cycling and walking, in accordance with NPPF.

48. ACTION REQUIRED PRIOR TO FIRST OCCUPATION: FLOOD RISK ASSET TEMPLATE

No development hereby permitted shall be occupied or first brought into use until the flood risk asset register template has been submitted, in the required form, to and approved in writing by the Local Planning Authority.

Reason: To ensure all flood risk assets and their owners are recorded onto the LLFA's statutory flood risk asset register.

49. FOUL WATER DRAINAGE

The development shall be carried out in accordance with the foul drainage Drawing No 40443/P/001 Rev F dated February 2015 and the amended outfall connection advice from Anglian Water dated 30 July 2015.

Reason – To prevent environmental and amenity problems arising from flooding.

50. ACTION REQUIRED PRIOR TO COMMENCEMENT OF ROAD INFRASTRUCTURE: ROADS SERVICING EMPLOYMENT LAND

Prior to commencement of development of the main road infrastructure on the employment land (with the exception of site preparation, demolition and remediation site preparation works), details of the estate roads and footpaths, levels, gradients, surfacing and means of surface water drainage shall be submitted to and agreed in writing by the Local Planning Authority. The development shall be carried out in accordance with the approved details.

Reason: To ensure that roads/footways are constructed to an acceptable standard.

51. WORKS TO BYWAY 14

The development of the site shall be implemented so as not to prejudice the route of the proposed diversion of the right of way shown on the definitive map as Restricted Byway 14. No development shall take place on, or so as to block, obstruct or otherwise impact on, Restricted Byway 14 for as long as it remains along its current alignment as shown on the drawing prepared by Suffolk County Council entitled "Brantham Industrial Estate – Proposed Creation and Extinguishment Order – Package to Remedy Previous Invalid Orders" (attached to the consultation response to Babergh District Council dated 23 April 2015).

Reason - To ensure that the development is carried out in such a way as to allow for an acceptable alternative route for Restricted Byway 14 to be provided which will not be compromised by the redevelopment proposals.

CONDITIONS RELATING TO BOTH THE OUTLINE AND THE FULL PLANNING PERMISSIONS (52 - 64).

52. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): TREE PROTECTION

No works shall start on site (other than the approved infrastructure works i.e. site preparation, demolition and remediation) until a Tree Survey, Arboricultural Impact Assessment, Arboricultural Method Statement and Tree Protection Plan that comply with the recommendations set out in BS 5837: 2012 *Trees in relation to design, demolition and construction*, in relation to the relevant phase have been submitted to and approved in writing by the Local Planning Authority. Unless otherwise agreed the details shall include an auditable system of arboricultural site monitoring for the duration of the development. The development shall then be undertaken strictly in accordance with the approved method statement.

Reason – To adequately safeguard the continuity of amenity afforded by existing trees.

53. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT (OTHER THAN DEMOLITION AND REMEDIATION OF THE BROWNFIELD LAND): APPOINTMENT OF ECOLOGICAL CLERK OF WORKS

No development shall commence until the role and responsibilities and operations to be overseen by an ecological clerk of works have been submitted to and approved in writing by the Local Planning Authority. The appointed person shall undertake all activities, and works shall be carried out, in accordance with the approved details. For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: In order to safeguard protected species and minimise ecological impacts in accordance with the NPPF and Policy CS15 of the Babergh Core Strategy 2015.

54. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT OF ANY PHASE OF DEVELOPMENT: CONSTRUCTION MANAGEMENT PLAN

Prior to the commencement of development for each phase or parcel of development (including the infrastructure works) details of the construction methodology shall be submitted to and approved in writing by the Local Planning Authority and shall incorporate the following information: -

- a) Details of the storage of construction materials on site, including details of their siting, protection from wind-whipping and maximum storage height.
- b) Details of how construction and worker traffic and parking shall be managed.
- c) Details of any protection measures for footpaths surrounding the site.
- d) Details of any means of access to the site during construction.
- e) Details of the scheduled timing/phasing of development for the overall construction period.
- f) Details of arrangements for dust management (to include water suppression for any stone or brick cutting), details of wheel washing to be undertaken, management and location it is intended to take place.
- g) Details of the siting of any on site compounds, site boundary treatments and portalos.
- h) Details of the arrangements for the control of noise (to include calculations of noise at specific receptors in order to identify appropriate mitigation methods, as referred to in 9.61 and 9.62 of the Revised Environmental Statement) and vibration in accordance with BS 5228:2009 Code of Practice of Noise and Vibration Control on Construction and Open Sites (or any later version thereof).
- j) Details of external lighting including hours of operation, locations, heights and angle of luminaires

The construction shall at all times be undertaken in accordance with the agreed methodology approved unless otherwise agreed in writing by the Local Planning Authority.

Reason - To minimise detriment to nearby residential and general amenity by controlling the construction process to achieve the approved development. This condition is required to be agreed prior to the commencement of any development as any construction process, including site preparation, by reason of the location and scale of development may result adverse harm on amenity.

55. ACTION REQUIRED PRIOR TO COMMENCEMENT OF EACH PHASE OF

DEVELOPMENT: MEANS OF PREVENTING DISCHARGE OF WATER ONTO THE HIGHWAY

Prior to the commencement of each phase of development, details shall be submitted to and approved in writing by the Local Planning Authority showing the means to prevent the discharge of surface water from the development onto the highway. The approved scheme shall be carried out in its entirety before the access is first used and shall be retained and maintained thereafter in its approved form.

Reason - To prevent hazards caused by flowing water or ice on the highway.

56. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT WITHIN ANY PHASE - WASTE MANAGEMENT

No development shall commence within any phase of development until a waste minimisation and recycling strategy (to include a Site Waste Management Plan) relating to the construction and occupation stages of the development has been submitted to and approved in writing by the Local Planning Authority. The development shall be constructed and occupied in accordance with the approved strategy.

For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason - In the interests of minimising and managing waste arising from the development as supported by the Framework.

57. ACTION REQUIRED PRIOR TO OCCUPATION OF EACH PHASE OF DEVELOPMENT – PARKING & ESTATE ROADS

The approved parking and cycling schemes for each relevant phase of development shall be carried out in its/their entirety before the development is brought into use and shall be retained thereafter and used for no other purpose. (Note - for the residential development, no dwelling shall be occupied until the carriageways and footways serving that dwelling have been constructed to at least base course level or above in accordance with the approved details unless agreed in writing by the Local Planning Authority).

Reason: To ensure that sufficient space for the onsite parking of vehicles is provided and maintained in order to ensure the provision of adequate on-site space for the parking and manoeuvring would be detrimental to highway safety to users of the highway.

58. ACTION REQUIRED PRIOR TO COMMENCEMENT OF WORKS: REPTILE MITIGATION STRATEGY

No development shall take place until a reptile mitigation strategy has been submitted to and approved in writing by the local planning authority. The content of the method statement shall include the:

- a) purpose and objectives for the proposed works;
- b) detailed design(s) and/or working method(s) necessary to achieve stated objectives (including, where relevant, type and source of materials to be used);
- c) extent and location of proposed works shown on appropriate scale maps and plans;
- d) timetable for implementation, demonstrating that works are aligned with the proposed phasing of construction;
- e) persons responsible for implementing the works;

- f) initial aftercare and long-term maintenance (where relevant);
- g) disposal of any wastes arising from works.

The works shall be carried out strictly in accordance with the approved details and shall be retained in that manner thereafter.

For the purposes of this condition, development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: In order to safeguard protected species and minimise ecological impacts in accordance with the NPPF and Policy CS15 of the Babergh Core Strategy 2015.

59. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEMOLITION AND DELIVERY OF MATERIALS: HGV MOVEMENTS

All HGV traffic movements to and from the site for all phases of development (including the infrastructure and demolition works), shall be subject of a Deliveries Management Plan (DMP) which shall be submitted to and approved in writing by the Local Planning Authority a minimum of 28 days before any deliveries of materials commence in the relevant phase. All HGV movements subject to deliveries shall thereafter be undertaken fully in accordance with the provisions of the approved DMP.

Reason - In the interests of highway safety and residential amenity.

60. CONCURRENT WITH RESERVED MATTERS: LIGHTING DESIGN SCHEME

Prior to construction or redevelopment of any building above slab level within a development area or phase, a lighting design scheme where applicable (which also addresses biodiversity) shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall:

- a) Identify those features on site that are particularly sensitive for bats and that are likely to cause disturbance along important routes used for foraging; and
- b) Show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent bats using their territory.
- c) Clearly detail types, angle and position of luminaire, hours of operation and a polar luminance diagram based on vertical luminance at the parcel boundary, or at the nearest residential property in relation to any commercial development
- d) Clearly demonstrate that areas to be lit have reasonably minimised light pollution through the use of minimum levels of lighting and features such as cut off cowls or LED

All external lighting shall be installed in accordance with the specifications and locations set out in the scheme and maintained thereafter in accordance with the scheme. No external lighting shall be installed without prior consent from the Local Planning Authority.

Reason: In the interests of visual amenity, to reduce the impact of night time illumination on the character of the area and in the interests of biodiversity.

61. PRIOR TO FIRST OCCUPATION: LANDSCAPE AND ECOLOGICAL MANAGEMENT PLAN

Prior to 1st occupation of any phase, a Landscape and Ecological Management Plan (LEMP) relevant to that phase shall be submitted to and be approved in writing by the Local Planning Authority. The content of the LEMP shall include the following:

- a) Description and evaluation of the features to be managed and enhanced
- b) Aims and objectives of management
- c) Appropriate management options for achieving aims and objectives
- d) Prescriptions for management actions
- e) Preparation of a work schedule (including annual work plan capable of being rolled forward over a five year period)
- f) Details of the body or organisation responsible for implementation of the plan
- g) Ongoing monitoring and remedial measures

The LEMP shall also include details of the legal and funding mechanisms by which the long term implementation of the plan will be secured by the developer with the management body responsible for its delivery. The plan shall also set out how contingencies and/or remedial action will be identified, agreed and implemented so that the development still delivers the fully functioning biodiversity objectives of the originally approved scheme. The approved plan will be implemented in accordance with the approved details.

For the purposes of this condition, development shall not include demolition and remediation of the brownfield land forming part of the site.

Reason: In order to reasonably minimise the adverse impacts of the proposal on ecological receptors both on and off site.

62. NO BURNING OF WASTE

There shall be no burning of any waste material (including green waste) on site during the construction and demolition phases.

Reason - In the interests of protecting the local environment from air pollution, pursuant to the advice as set out within the NPPF.

63. CONSTRUCTION WORKING HOURS

Unless otherwise agreed in writing by the Local Planning Authority, construction works and ancillary operations relating to all phases of the construction of the development hereby approved (and including the infrastructure and demolition works) shall only be carried out between the hours of 0800 and 1800 hours Mondays to Fridays and between the hours of 0900 and 1300 hours on Saturday. Outside these hours there shall be no works which would be noise intrusive at the site boundary (or other such location) unless agreed in writing with the Local Planning Authority.

Reason – To enable the Local Planning Authority to retain control over the construction phase of the development in the interests of residential amenity within close proximity.

64. TIMESCALE FOR IMPLEMENTATION OF LANDSCAPING SCHEME TIME: WITHIN FIRST PLANTING SEASON FOLLOWING COMMENCEMENT OF DEVELOPMENT

All Planting, seeding or turfing shown on the approved landscaping details shall be carried out in full during the first planting and seeding season (October - March inclusive) following the commencement of the development (or phase of development) or in such other phased arrangement as may be approved, in writing, by the Local Planning Authority up to the first use or first occupation of the development.

Any trees, hedges, shrubs or turf identified within the approved landscaping details (both proposed planting and existing) which die, are removed, seriously damaged or seriously diseased, within a period of 5 years of being planted or in the case of

existing planting within a period of 5 years from the commencement of development, shall be replaced in the next planting season with others of similar size and species.

Reason – In the interests of visual amenity and the character and appearance of the area. This condition is required to be agreed prior to the commencement of any development to ensure matters of tree and hedgerow protection are secured early to ensure avoidance of damage or loss due to the development and/or its construction. If agreement was sought at any later stage, there is an unacceptable risk of loss and damage to important trees and hedgerow that would result in harm to amenity.

Notes to Applicant:

1. This planning permission is the subject of a s106 agreement.
2. It is an OFFENCE to carry out works within the public highway, which includes a Public Right of Way, without the permission of the Highway Authority. Any conditions which involve work within the limits of the public highway do not give the applicant permission to carry them out. Unless otherwise agreed in writing all works within the public highway shall be carried out by the County Council or its agents at the applicant's expense. The County Council's Central Area Manager should be contacted at Phoenix House, 3 Goddard Road, Ipswich, IP1 5NP. Telephone 01473 341414. A fee is payable to the Highway Authority for the assessment and inspection of both new vehicular crossing access works and improvements deemed necessary to existing vehicular crossings due to proposed development.
3. The Local Planning Authority recommends that developers of housing estates should enter into formal agreement with the Highway Authority under Section 38 of the Highways Act 1980 relating to the construction and subsequent adoption of Estate Roads.
4. Note: The works within the public highway will be required to be designed and constructed in accordance with the County Council's specification. The applicant will also be required to enter into a legal agreement under the provisions of Section 278 of the Highways Act 1980 relating to the construction and subsequent adoption of the highway improvements. Amongst other things the Agreement will cover the specification of the highway works, safety audit procedures, construction and supervision and inspection of the works, bonding arrangements, indemnity of the County Council regarding noise insulation and land compensation claims, commuted sums, and changes to the existing street lighting and signing.
5. Access to buildings for fire appliances must meet with the requirements specified in the Building Regulations Approved Document B (Fire Safety) 2006 Edition, incorporating 2010 and 2013 amendments Volume 1 - Part B5, Section 11 dwellings houses and Volume 2, Part B5, Sections 16 and 17 in the case of buildings other than dwelling houses. Should the developer require any further advice or information, they should contact Building Control at Babergh District Council.
6. Under the terms of the Water Resources Act 1991, prior written consent of the Environment Agency is required for any proposed works or structures in, under, over or within 9 metres of the main river Stour or the existing flood defences. For this and any other information, the developer is advised to contact the Environment Agency on 03708 506506..
7. The developer is referred to the Standing Advice prepared by Natural England for all matters related to protected species. For further advice, the developer is advised to contact Natural England on 0300 060 3900.
8. When determining planning applications The Town and Country Planning

(Development Management Procedure) (England) Order 2015 requires Local Planning Authorities to explain how, in dealing with the application they have worked with the applicant to resolve any problems or issues arising. In this case, the scheme has been amended/amplified in response to comments received on the Environmental Statement, additional traffic modelling/mitigation, Appropriate Assessment, drainage, viability, noise and contamination issues.

Babergh and Mid Suffolk District Councils have adopted Community Infrastructure Levy (CIL) charging which affects planning permissions granted on or after 11th April 2016 and permitted development commenced on or after 11th April 2016. If your development is for the erection of a new building, annex or extension or the change of use of a building over 100sqm in internal area or the creation of a new dwelling or holiday let of any size your development may be liable to pay CIL and you must submit relevant documents to our Infrastructure Team telling us more about your development, who will pay CIL and when the development will start. You will receive advice on the amount you have to pay and what you have to do and you can find more information about CIL on our websites here:

[CIL in Babergh](#) and [CIL in Mid Suffolk](#) or by contacting the Infrastructure Team on: infrastructure@baberghmidsuffolk.gov.uk

Philip Isbell

Professional Lead - Growth & Sustainable Planning

Date: 18 November 2016

R. Planning decision B/17/00441

Philip Isbell - Corporate Manager
Growth & Sustainable Planning

Babergh District Council
Corks Lane, Hadleigh, Ipswich IP7 6SJ

Website: www.babergh.gov.uk



PLANNING PERMISSION

TOWN AND COUNTRY PLANNING ACT 1990

**THE TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) (ENGLAND)
ORDER 2015**

Correspondence Address:

Boyer Planning
15 De Grey Square
De Grey Road
Colchester
Essex
CO4 5YQ

Applicant:

Abellio East Anglia Ltd
1 Ely Place
London
EC1N 6RY

Date Application Received: 10-Mar-17

Application Reference: B/17/00441

Date Registered: 16-Mar-17

Proposal & Location of Development:

MAJOR APPLICATION - Erection of light maintenance and train stabling depot to include a train maintenance building, train stabling sidings, a track connection to the existing main rail line, train washing facility, wheel lathe facility, new depot access road, administration offices, staff accommodation and associated staff and visitors car park.

Former Wardle Storeys, Factory Lane, Brantham,

Section A – Plans & Documents:

This decision refers to drawing no./entitled 00500A02 received 14/03/2017 as the defined red line plan with the site shown edged red. Any other drawing showing land edged red whether as part of another document or as a separate plan/drawing has not been accepted or treated as the defined application site for the purposes of this decision.

The plans and documents recorded below are those upon which this decision has been reached:

Defined Red Line Plan 00500 A02 - Received 14/03/2017
Floor Plan - Proposed 00510 A02 - Received 14/03/2017
Elevations - Proposed 00525 A02 - Received 14/03/2017
Elevations - Proposed 00530 A02 - Received 14/03/2017
Surface Water Drainage Strategy 00550 A01 - Received 14/03/2017
Highway Access Plan 47924-P-01 - Received 14/03/2017
Supporting Statement EXTERNAL LIGHTING REPORT rev 05 - Received 25/05/2017
Land Contamination Assessment LAND CONTAMINATION SUMMARY REPORT March 2017 - Received 14/03/2017
Noise Assessment NOISE ASSESSMENT PLAN - Received 14/03/2017

Supporting Statement SUSTAINABILITY REPORT - Received 14/03/2017
 Phasing Plan BRA-VCUK-SK-0001 REV 1 - Received 19/06/2017
 Noise Assessment NOISE IMPACT ASSESSMENT 01 REV A - Received 19/06/2017
 Plans - Proposed TRAIN WASH DETAILS - Received 14/06/2017
 Elevations - Proposed BRD-RPS-A-DRG-AV-12202 A01 - Received 13/06/2017
 Elevations - Proposed BRD-RPS-A-DRG-CT-12402 A01 - Received 13/06/2017
 Elevations - Proposed BRD-RPS-A-DRG-CW-12102 A01 - Received 13/06/2017
 Elevations - Proposed BRD-RPS-A-DRG-UF-12300 A01 - Received 13/06/2017
 Plans - Proposed E5778-PL-002 A - Received 13/06/2017
 Highway Access Plan 40443-C-250 A - Received 09/06/2017
 Highway Access Plan 40443-C-251 A - Received 09/06/2017
 Highway Access Plan 40443-C-252 A - Received 09/06/2017
 Supporting Statement BREEAM PRE-ASSESSMENT REPORT Rev 3.0 May 2017 - Received 07/06/2017
 Noise Assessment OPERATIONAL NOISE ASSESSMENT June 2017 - Received 06/06/2017
 Supporting Statement ENVIRONMENTAL MANAGEMENT PLAN 0.3 - Received 05/06/2017
 Cross Section 40443-C-64 - Received 02/06/2017
 Supporting Statement SUDS MAINTENANCE SCHEDULE - Received 02/06/2017
 Flood Risk Assessment 47924 Rev A - Received 02/06/2017
 Plans - Proposed 00555 A02 - Received 01/06/2017
 Surface Water Drainage Strategy 40443-C-50A - Received 31/05/2017
 Surface Water Drainage Strategy 40443-C-51B - Received 31/05/2017
 Surface Water Drainage Strategy 40443-C-52B - Received 31/05/2017
 Surface Water Drainage Strategy 40443-C-53C - Received 31/05/2017
 Highway Access Plan 40443-C-61 - Received 31/05/2017
 Cross Section 40443-C-62 - Received 31/05/2017
 Landscaping Plan E17806-TLP-001 - Received 26/05/2017
 Landscaping Plan E17806-TLP-002 - Received 26/05/2017
 Landscaping Plan E17806-TLP-003 - Received 26/05/2017
 General Details LUMINAIRE PLAN P115-2536-9 - Received 26/05/2017
 Ecological Survey/Report REPTILE AND BREEDING BIRDS ECO May 2017 - Received 26/05/2017
 Ecological Survey/Report PRELIMINARY ECOLOGICAL ASSESSMENT - Received 14/03/2017
 Site Plan BRD-RPS-A- DRG-ST-10000 P06 - Received 16/05/2017
 Site Plan BRD-RPS-A- DRG-ST-10001 P04 - Received 16/05/2017
 Site Plan BRD-RPS-A- DRG-ST-10002 P03 - Received 16/05/2017
 Site Plan BRD-RPS-A- DRG-ST-10020 P04 - Received 16/05/2017
 Drainage Details 40443-C-40A - Received 24/04/2017
 Transport Assessment REV A May 2017 - Received 31/05/2017

Section B:

Babergh District Council as Local Planning Authority, hereby give notice that **PLANNING PERMISSION HAS BEEN GRANTED** in accordance with the application particulars and plans listed in section A subject to the following conditions:

1. ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: COMMENCEMENT TIME LIMIT:

The development hereby permitted shall be begun not later than the expiration of three years from the date of this permission.

Reason - To comply with the requirements of Section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004

2. **APPROVED PLANS & DOCUMENTS**

The development hereby permitted shall be carried out in accordance with the drawings/documents listed under Section A above and/or such other drawings/documents as may be approved by the Local Planning Authority in writing pursuant to other conditions of this permission or such drawings/documents as may subsequently be approved in writing by the Local Planning Authority as a non material amendment following an application in that regard.

Reason - For the avoidance of doubt and in the interests of proper planning of the development.

3. **ONGOING RESTRICTION TO DEVELOPMENT: COMPLIANCE WITH PHASING PLAN**

The development shall be carried in accordance with the phasing plan BRA-VCUK-SK-0001 REV 1.

Reason- For the avoidance of doubt and in the interests of proper planning of the development.

4. **SPECIFIC RESTRICTION ON DEVELOPMENT: COMPLIANCE WITH ENVIRONMENT MANAGEMENT PLAN**

The development hereby approved shall be carried out in accordance with the Environmental Management Plan TW-ENV-PL-VA18-0011 R1.0 Revision 0.3 and the ecological mitigation as set out in the Reptile and breeding birds Ecological Appraisal dated May 2017 prepared by the Landscape Partnership.

Reason - In order to safeguard protected wildlife species and their habitats and to enable the Local Planning Authority to retain control over the development in the interests of amenity.

5. **ACTION REQUIRED PRIOR TO OCCUPATION: USE OF FIRE HYDRANTS**

Prior to the first occupation of the site, details of the provision of fire hydrants shall be submitted to and approved in writing by the Local Planning Authority. Once agreed the development will be carried out in accordance with these details.

Reason - To ensure the site is suitably served by fire hydrants.

6. **ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: FOUL WATER STRATEGY**

Prior to the digging of any foundations a foul water strategy shall be submitted to and approved in writing by the Local Planning Authority. No part of the site shall be occupied until the works have been carried out in accordance with the foul water strategy so approved unless otherwise approved in writing by the Local Planning Authority.

Reason -To prevent environmental and amenity problems arising from flooding.

7. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: FLOOD EVACUATION PLAN**

Prior to the first occupation of the site, a flood evacuation plan shall be submitted to and approved in writing by the Local Planning Authority.

Reason- To ensure the safety of the future occupiers of the site.

8. **ACTION REQUIRED PRIOR TO OCCUPATION OF SITE: BREEAM EXCELLENT**

Unless otherwise agreed in writing by the Local Planning Authority:

a) the development hereby permitted shall be built to a minimum sustainability standard of BREEAM Excellent (or its successor) as demonstrated by the submitted pre-assessment

b) the accommodation building included in the development shall not be occupied until a Post Construction Review (under BREEAM or its successor) has been carried out and a copy of the Final Certificate or the Assessor's final summary score sheet has been submitted to the Local Planning Authority verifying that the agreed standards have been met in respect of that building.

c) a copy of the Final Certificate, if it is not submitted prior to occupation, shall be submitted within six months following approval of the final summary score sheet.

Reason - To achieve sustainable development in accordance with Policy CS12 of the Core Strategy.

9. **ACTION REQUIRED IN ACCORDANCE WITH SPECIFIC TIMETABLE: CONTAMINATION**

Following the remediation of the site, as set out in Land Contamination Summary Report dated March 2017 (approved by condition 35 of planning permission B/15/00263/FUL), evidence shall be provided to the Local Planning Authority verifying that remediation has been carried out in accordance with the approved Remediation scheme prior to the first use/occupation of the development. In the event that contamination is found at any time when carrying out the approved development that was not previously identified it must be reported in writing immediately to the Local Planning Authority. An investigation and risk assessment must be undertaken in accordance with the requirements of this condition and where remediation is necessary a remediation scheme must be prepared in accordance with the requirements of this condition, which is subject to the approval in writing of the Local Planning Authority. Following completion of measures identified in the approved remediation scheme a verification report must be prepared, which is subject to the approval in writing of the Local Planning Authority in accordance with this condition.

Reason - To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other off site receptors.

10. **ON GOING REQUIREMENT OF DEVELOPMENT: COMPLIANCE WITH LIGHTING REPORT**

The development hereby approved shall be carried out in accordance with the external lighting report version 5 and drawing P115-2536 R10 and shall be retained as approved.

Reason- In the interests of amenity to reduce the impact of night time illumination of the character of the area and in the interests of biodiversity.

11. **ON GOING RESTRICTION ON DEVELOPMENT: NO BURNING**

No burning shall take place on the site at any time.

Reason- In the interests of amenity.

12. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: LANDSCAPING**

The proposed landscaping as shown on drawings E17806-TLP-003, E17806-TLP-002 and E17806-TLP-001 shall be carried out during the first planting season (October - March inclusive) following the first occupation of the maintenance building.

Reason- In the interests of visual amenity and the character and appearance of the area.

13. **ACTION REQUIRED PRIOR TO FIRST OCCUPATION: LANDSCAPE MANAGEMENT PLAN**

A landscape management plan, including long term design objectives, management responsibilities and maintenance schedules for all landscape areas as approved under Condition 11, shall be submitted to and approved, in writing, by the Local Planning Authority prior to the first occupation of the development. The landscape management plan shall be carried out entirely as approved in accordance with the details and timescales in the plan.

Reason - To ensure the proper management and maintenance of the approved landscaping in the interests of amenity and the character and appearance of the area.

14. **ONGOING REQUIREMENT OF DEVELOPMENT: SAFEGUARDING OF FOOTPATH 13**

Footpath 13 shall be safeguarded and remain unobstructed during the entire construction phase of the development hereby approved.

Reason- To ensure the footpath remains open.

15. **ONGOING RESTRICTION ON DEVELOPMENT: COMPLIANCE WITH FRA**

The agreed strategy for the disposal of surface water and the Flood Risk Assessment (FRA) (dated Ref 47924-Rev A March 2017) shall be implemented as approved and shall thereafter be managed and maintained in accordance with the approved strategy.

Reason- To ensure that the principles of sustainable drainage are incorporated into this proposal, to ensure that the proposed development can be adequately drained

16. **ACTION REQUIRED IN ACCORDANCE WITH SPECIFIC TIMETABLE: SUBMISSION OF SUDS**

The building hereby permitted shall not be occupied until details of all Sustainable Urban Drainage System components and piped networks have been submitted, in an approved form, to and approved in writing by the Local Planning Authority for inclusion on the Lead Local Flood Authority's Flood Risk Asset Register.

Reason- To ensure all flood risk assets and their owners are recorded onto the LLFA's statutory flood risk asset register

17. **ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: DETAILS OF CONSTRUCTION SURFACE WATER MANAGEMENT PLAN**

In accordance with the phasing plan BRA-VCUK-SK 001 REV1, before each phase details of a construction surface water management plan detailing how surface water will be managed for each phase on the application site during construction shall be submitted to and agreed in writing by the Local Planning Authority. The construction surface water management plan shall be implemented and thereafter managed and maintained in accordance with the approved plan. (For the purposes of this condition development shall not include demolition and remediation of the brownfield land forming part of the site.)

Reason- To ensure the development does not cause increased pollution of the watercourse (Cattawade Creek) in line with the River Basin Management Plan.

18. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: AGREEMENT OF LEVELS**

Prior to the construction of works above slab level, details of existing and proposed levels of the site, finished floor levels and identification of all areas of cut or fill as measured from a fixed off site datum point shall be submitted to and approved, in writing, by the Local Planning Authority. The development shall be carried out in its entirety in accordance with the levels agreed.

Reason - In order to secure a design in scale with development surrounding the site so as to protect the visual amenities and character of the area.

19. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: AGREEMENT OF MATERIALS, FINISHES AND BRANDING**

No development/works shall be commenced above slab level until precise details of the manufacturer and types and colours of the external facing and roofing materials of any building, including finishes and branding have been submitted to and approved, in writing, by the Local Planning Authority. Such materials as may be agreed shall be those used in the development and fully applied prior to the first use/occupation.

Reason - To secure an orderly and well designed finish sympathetic to the character of the area and in the interests of visual amenity.

20. **ACTION REQUIRED PRIOR TO THE FIRST OCCUPATION OF DEVELOPMENT: DETAILS OF BOUNDARY TREATMENTS**

Prior to the first occupation of the development precise details of the provision, siting, design and materials of boundary treatments shall have been submitted to and approved

in writing by the Local Planning Authority. Once approved the boundary treatments shall be carried out in accordance with these details.

Reason - In the interests of visual amenity and the character and appearance of the area.

21. **ONGOING RESTRICTION ON DEVELOPMENT: SHIFT PATTERN**

The shift pattern of the workforce shall not include start or finish times between 0730-0900 and 1600 -1730 to avoid peak travel times.

Reason- To avoid additional use of Factory Lane by vehicles in peak hours in the interests of highway safety.

22. **ACTION REQUIRED IN ACCORDANCE WITH SPECIFIC TIMETABLE: ROAD DETAILS**

Before the construction of the estate roads is commenced, details of the roads and footpaths, (including layout, levels, gradients, surfacing, lighting, highway drainage including levels and discharge points, traffic calming and means of surface water drainage), shall be submitted to and approved in writing by the Local Planning Authority.

Reason: In the interests of highway safety to ensure that roads/footways are constructed to an acceptable standard.

23. **ACTION REQUIRED PRIOR TO FIRST USE OF SITE: VISIBILITY SPLAYS**

Before the access is first used visibility splays shall be provided as shown on Drawing No. 40443-C-250 Rev A, 40443-C-251 Rev A and 40443-C252 Rev B and thereafter retained in the specified form. Notwithstanding the provisions of Part 2 Class A of the Town & Country Planning (General Permitted Development) Order 2015 (or any Order revoking and re-enacting that Order with or without modification) no obstruction over 0.6 metres high shall be erected, constructed, planted or permitted to grow within the areas of the visibility splays.

Reason: To ensure vehicles exiting the drive would have sufficient visibility to enter the public highway safely and vehicles on the public highway would have sufficient warning of a vehicle emerging in order to take avoiding action.

24. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: HIGHWAY IMPROVEMENTS**

Prior to the commencement of development other than the creation of a temporary or permanent access to the site a scheme and timetable for highway works associated with the site shall have been submitted to and agreed in writing by the local planning authority.

The scheme and timetable shall provide for :

[a] the provision of a temporary footway access along Factory Lane to a temporary vehicular access point to the site for the purposes of safe pedestrian access during the construction phase

[b] the provision of the new permanent vehicular access with associated drainage to serve the development to enable safe vehicular access to or from the site and cessation of the temporary construction access at the point of occupation and

[c] the widening and realignment of Factory Lane at least as far as the temporary access to enable safe access to / from the site for construction vehicles.

The works shall thereafter be delivered in accordance with the scheme and timetable.

Reason- To protect highway efficiency of movement and safety and to ensure that the proposal site is accessible by more sustainable modes of transport such as public transport, cycling and walking, in accordance with NPPF.

25. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: NEW VEHICULAR ACCESS

Before the new development is brought into first use the new vehicular access shall have been laid out and completed in all respects in accordance with Drawing No. 47924-P-01 in appendix C of the Transport Assessment and with an entrance width of 7.3 metres and been made available for use. Thereafter the access shall be retained in the specified form.

Reason: To ensure that the access is designed and constructed to an appropriate specification and is brought into use before any other part of the development is commenced in the interests of highway safety.

26. ACTION REQUIRED PRIOR TO THE COMMENCEMENT OF WORK: ROAD SAFETY AUDIT

The highway element of the development shall not commence until the Road Safety Audit (stages 1 and 2) process has been carried out in accordance with the Suffolk County Council Road Safety Audit Practice and Guidance and any necessary amendments or changes undertaken. The development shall not be [occupied / open for public access] until any requirements under stage 3 of the Road Safety Audit have been completed or a programme of remedial works has been agreed.

Reason: In the interests of highway safety to ensure the approved layout is properly designed.

27. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: CAR PARKING DETAILS

Prior to the digging of foundations details of the areas to be provided for the manoeuvring and parking of vehicles including electric vehicle charging points, powered two vehicle provision, secure covered cycle storage, car parking layout and surface treatment shall be submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be carried out in its entirety before the development is brought into use and shall be retained thereafter and used for no other purpose.

Reason: To ensure the provision and long term maintenance of adequate on-site space for the parking and manoeuvring of vehicles in accordance with Suffolk Guidance for Parking (2015) where on-street parking and manoeuvring would be detrimental to highway safety.

28. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: BINS

Prior to the digging of foundations details of the areas to be provided for storage and presentation of Refuse/Recycling bins shall be submitted to and approved in writing by the Local Planning Authority. The approved scheme shall be carried out in its entirety before the development is brought into use and shall be retained thereafter for no other purpose.

Reason: To ensure that refuse recycling bins are not stored on the highway causing obstruction and dangers for other users in the interests of highway safety.

29. **ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: CONSTRUCTION MANAGEMENT PLAN**

In accordance with the phasing plan BRA-VCUK-SK-0001 REV 1, before each phase a Construction Management Plan shall have been submitted to and approved in writing by the Local Planning Authority. Construction of the development shall not be carried out other than in accordance with the approved plan. The Construction Management Plan shall include the following matters:

- a) parking and turning for vehicles of site personnel, operatives and visitors
- b) loading and unloading of plant and materials
- c) piling techniques
- d) storage of plant and materials
- e) programme of works (including measures for traffic management and operating hours)
- f) provision of boundary hoarding and lighting
- g) details of proposed means of dust suppression
- h) details of measures to prevent mud from vehicles leaving the site during construction
- i) haul routes for construction traffic on the highway network
- and j) monitoring and review mechanisms.
- k) Details of deliveries times to the site during construction phase
- l) details of means to prevent the discharge of surface water from the development onto the highway
- m) details of the highway permanent or temporary improvements to Factory Lane necessary for to allow all road users safe use of Factory Lane during the construction phase access including pedestrian access between Cattawade Street and the Public Rights of Way network east of Factory Lane
- n) details of arrangements for the control and monitoring of noise and vibration

Reason: In the interest of highway safety to avoid the hazard caused by mud on the highway and to ensure minimal adverse impact on the public highway during the construction phase.

30. **ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: SUBMISSION OF GANTRY DETAILS**

Prior to its installation, details of the proposed services gantry shall be submitted to and approved in writing by the Local Planning Authority. Once agreed the gantry shall be built in accordance with these details.

Reason- In order to secure a design in scale with development surrounding the site so as to protect the visual amenities and character of the area.

31. **ONGOING RESTRICTION OF DEVELOPMENT: CONSTRUCTION HOURS**

The permitted hours of work when noise can be audible at a construction site boundary are:

MONDAY TO FRIDAY 8:00am to 6:00pm

SATURDAY 8:00am to 1:00pm

SUNDAY AND BANK HOLIDAYS No work allowed

Any noisy operations outside these hours cannot be undertaken without prior approval of the Environmental Services department and permission is only granted in exceptional circumstances, e.g. emergency works, in which case the Environmental Health Section should be contacted as soon as possible.

Reason- In the interests of amenity.

32. ONGOING RESTRICTION ON DEVELOPMENT: SOUND MITIGATION

The development hereby approved shall be carried out in accordance with the sound mitigation set out in Noise Impact Assessment Revision A dated June 2017 prepared by Create Consulting Engineers Limited.

Reason- In the interests of the amenity of nearby residents.

33. ACTION REQUIRED PRIOR TO FIRST USE OF SITE: LIGHTING DESIGN SCHEME

Prior to the first use of the site, a lighting design scheme for biodiversity shall be submitted to and approved in writing by the local planning authority. The scheme shall identify those features on site that are particularly sensitive for bats and that are likely to cause disturbance along important routes used for foraging; and show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications) so that it can be clearly demonstrated that areas to be lit will not disturb or prevent bats using their territory.

All external lighting shall be installed in accordance with the specifications and locations set out in the scheme and maintained thereafter in accordance with the scheme. Under no circumstances should any other external lighting be installed without prior consent from the local planning authority

Reason- To conserve and enhance bats and allow the LPA to discharge its duties under the UK Habitats Regulations and s17 Crime & Disorder Act.

SUMMARY OF POLICIES WHICH ARE RELEVANT TO THE DECISION:

NPPF - National Planning Policy Framework

CS01 - Applying the presumption in Favour of Sustainable Development in Babergh

CS02 - Settlement Pattern Policy

CS03 - Strategy for Growth and Development

CS10 - Brantham Regeneration Area Allocation

CS12 - Design and Construction Standards

CS14 - Green Infrastructure

CS15 - Implementing Sustainable Development

CS21 - Infrastructure Provision

EM06 - Land at Brantham Industrial Area

CR02 - AONB Landscape
CN01 - Design Standards
CN03 - Open Space within Settlements
CN06 - Listed Buildings - Alteration/Ext/COU

NOTES:

1. The applicant is advised that consideration should be given to flooding proofing measures to reduce the impact of flooding when it occurs.
2. Any works to a watercourse may require consent under section 23 of the Land Drainage Act 1991
3. Any discharge to a watercourse or groundwater needs to comply with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003
4. Any discharge of surface water to a watercourse that drains into an Internal Drainage Board catchment may be subject to payment of a surface water developer contribution
5. It is an OFFENCE to carry out works within the public highway, which includes a Public Right of Way, without the permission of the Highway Authority. The works within the public highway will be required to be designed and constructed in accordance with the County Council's specification.
The applicant will also be required to enter into a legal agreement under the provisions of Section 278 of the Highways Act 1980 relating to the construction and subsequent adoption of the highway improvements. Amongst other things the Agreement will cover the specification of the highway works, safety audit procedures, construction and supervision and inspection of the works, bonding arrangements, indemnity of the County Council regarding noise insulation and land compensation claims, commuted sums, and changes to the existing street lighting and signing

Babergh and Mid Suffolk District Councils have adopted Community Infrastructure Levy (CIL) charging which affects planning permissions granted on or after 11th April 2016 and permitted development commenced on or after 11th April 2016. If your development is for the erection of a new building, annex or extension or the change of use of a building over 100sqm in internal area or the creation of a new dwelling or holiday let of any size your development may be liable to pay CIL and you must submit relevant documents to our Infrastructure Team telling us more about your development, who will pay CIL and when the development will start. You will receive advice on the amount you have to pay and what you have to do and you can find more information about CIL on our websites here:

CIL in Babergh and CIL in Mid Suffolk or by contacting the Infrastructure Team on:
infrastructure@baberghmidsuffolk.gov.uk

This relates to document reference: B/17/00441

Signed: Philip Isbell

Dated: 28th June 2017

**Corporate Manager
Growth & Sustainable Planning**

Important Notes to be read in conjunction with your Decision Notice

Please read carefully

This decision notice refers only to the decision made by the Local Planning Authority under the Town and Country Planning Acts and DOES NOT include any other consent or approval required under enactment, bylaw, order or regulation.

Please note: depending upon what conditions have been attached to the decision, action may be required on your part before you can begin your development. Planning conditions usually require that you write to the Local Planning Authority and obtain confirmation that you have discharged your obligations. You should read your decision notice in detail and make a note of the requirements placed on you by any conditions. **If you proceed with your development without complying with these conditions you may invalidate your permission and put your development at risk.**

Discharging your obligations under a condition:

You should formally apply to discharge your conditions and the relevant application forms are available on the Council's website. The Local Planning Authority has 8 weeks to write to you after you submit the details to discharge your conditions. You should always account for this time in your schedule as the Local Planning Authority cannot guarantee that conditions can be discharged quicker than this. A fee is applicable for the discharge of planning conditions.

Building Control:

You are reminded that the carrying out of building works requires approval under the Building Regulations in many cases as well as a grant of planning permission. If you are in doubt as to whether or not the work, the subject of this planning permission, requires such approval, then you are invited to contact the Building Control Section of Babergh and Mid Suffolk District Councils.

Appeals to the Secretary of State:

- If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.
- As this is a decision on a planning application relating to the same or substantially the same land and development as is already the subject of an enforcement notice [reference], if you want to appeal against your local planning authority's decision on your application, then you must do so within 28 days of the date of this notice.*
- If an enforcement notice is served relating to the same or substantially the same land and development as in your application and if you want to appeal against your local planning authority's decision on your application, then you must do so within: 28 days of the date of service of the enforcement notice, or within 6 months [12 weeks in the case of a householder appeal] of the date of this notice, whichever period expires earlier.*
- As this is a decision to refuse planning permission for a householder application, if you want to appeal against your local planning authority's decision then you must do so within 12 weeks of the date of this notice.*
- As this is a decision to refuse planning permission for a minor commercial application, if you want to appeal against your local planning authority's decision then you must do so within 12 weeks of the date of this notice.*
- As this is a decision to refuse express consent for the display of an advertisement, if you want to appeal against your local planning authority's decision then you must do so within 8 weeks of the date of receipt of this notice.*
- If you want to appeal against your local planning authority's decision then you must do so within 6 months of the date of this notice.*
- Appeals can be made online at: <https://www.gov.uk/planning-inspectorate>.
If you are unable to access the online appeal form, please contact the Planning Inspectorate to obtain a paper copy of the appeal form on tel: 0303 444 5000.
- The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.

The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

S. Planning decision 0764/15

**Mid Suffolk District Council Planning Control Department
131 High Street Needham Market IP6 8DL**

**OUTLINE PLANNING PERMISSION
Town and Country Planning Act 1990
THE TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT
PROCEDURE) (ENGLAND) ORDER 2015**

Date of Application: 02 March 2015
Date Registered: 26 May 2015

REFERENCE: 0764 / 15

Documents to which this decision relates: **Defined Red Line Plan:**

The defined Red Line Plan for this application is Drawing 1:1000 OS Plan received 2nd March 2015 only. This drawing is the red line plan that shall be referred to as the defined application site. Any other drawings approved or refused that may show any alternative red line plan separately or as part of any other submitted document have not been accepted on the basis of defining the application site.

Approved Plans and Documents:

Flood Risk Assessment, Phase One Habitat Survey, 1:1000 site plan received 2nd March 2015

Highway and Transportation Review, Reptile and Great Crested Newt Surveys, Invertebrate Study, Envirocheck Report, Sketch Block Plan 2 1947/SK/02 Rev B, received 14th May 2015

Planning, Design, Access, Construction and Heritage Statement, received 20th May 2015

Sketch block plan 1047/SK/01 B, Phase One Habitat Survey received 21st May 2015

Application forms, received 3rd June 2015

Sharps Redmore Report, Phase 1 Contaminated Land Assessment, received 21st July 2015

Sketch block plan 1047/SK/02, received 10th September 2015

Existing vertical alignment IT1527/SK/04 A, Proposed footpath IT1527/SK/03 Rev B, received 21st September 2015

Flood Risk Assessment, received 30th October 2015

CORRESPONDENCE ADDRESS:

Edward Gittins & Associates
Unit 5 Patches Yard
Cavendish Lane
Glemsford
Sudbury, Suffolk
CO10 7PZ

NAME AND ADDRESS OF APPLICANT:

Mrs C A Abbott
c/o Agent

PROPOSED DEVELOPMENT AND LOCATION OF THE LAND:

Application for Outline Planning Permission for the erection of up to 47No. dwellings with attenuation basin

- Land on the west side of Broad Road, Bacton

The Council, as local planning authority, hereby gives notice that **OUTLINE PLANNING PERMISSION HAS BEEN GRANTED** in accordance with the application particulars and plans submitted subject to the following conditions:

1. ACTION REQUIRED IN ACCORDANCE WITH A SPECIFIC TIMETABLE: TIME LIMIT FOR RESERVED MATTERS APPLICATION

Application for approval of reserved matters must be made not later than the expiration of three years beginning with the date of this permission, and the development must be begun not later than the expiration of two years from the final approval of the reserved matters or, in the case of approval on different dates the final approval of the last such matter to be approved.

Reason – Required to be imposed pursuant to Section 92 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004

2. ACTION REQUIRED PRIOR TO COMMENCEMENT OF WORKS: PRE-COMMENCEMENT CONDITION: APPROVAL OF RESERVED MATTERS

Before any development is commenced, approval of the details of the appearance, scale and layout of the building(s), the means of access thereto and the landscaping of the site (hereinafter called "the reserved matters") shall be obtained in writing from the Local Planning Authority.

Reason – To enable the Local Planning Authority to secure an orderly and well designed development in accordance with the character and appearance of the neighbourhood and in accordance with the Development Plan. This condition is required to be agreed prior to the commencement of any development in accordance with proper planning principles to allow public engagement on the outstanding reserved matters and ensure no significant adverse harm results.

3. LISTING OF APPROVED PLANS & DOCUMENTS

The development hereby permitted shall be carried out in accordance with the following approved documents or such other drawings/documents as may be approved by the Local Planning Authority in writing pursuant to other conditions of this permission; or such drawings/documents as may subsequently be approved in writing by the Local Planning Authority as a non material amendment following an application in that regard :

Defined Red Line Plan:

The defined Red Line Plan for this application is Drawing 1:1000 OS Plan received

2nd March 2015 only. This drawing is the red line plan that shall be referred to as the defined application site. Any other drawings approved or refused that may show any alternative red line plan separately or as part of any other submitted document have not been accepted on the basis of defining the application site.

Approved Plans and Documents:

Flood Risk Assessment, Phase One Habitat Survey, 1:1000 site plan received 2nd March 2015

Highway and Transportation Review, Reptile and Great Crested Newt Surveys, Invertebrate Study, Envirocheck Report, Sketch Block Plan 2 1947/SK/02 Rev B, received 14th May 2015

Planning, Design, Access, Construction and Heritage Statement, received 20th May 2015

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Application forms, received 3rd June 2015

Sharps Redmore Report, Phase 1 Contaminated Land Assessment, received 21st July 2015

Sketch block plan 1047/SK/02, received 10th September 2015

Existing vertical alignment IT1527/SK/04 A, Proposed footpath IT1527/SK/03 Rev B, received 21st September 2015

Flood Risk Assessment, received 30th October 2015

Reason - For the avoidance of doubt and in the interests of proper planning of the development.

4. ACTION REQUIRED PRIOR TO THE COMMENCEMENT OF DEVELOPMENT - ARCHAEOLOGICAL WORKS

No development shall take place within the whole site until the implementation of a programme of archaeological work has been secured, in accordance with a Written Scheme of Investigation which has been submitted to and approved in writing by the Local Planning Authority. The scheme of investigation shall include an assessment of significance and research questions; and:

- a. The programme and methodology of site investigation and recording.
- b. The programme for post investigation assessment.
- c. Provision to be made for analysis of the site investigation and recording.
- d. Provision to be made for publication and dissemination of the analysis and records of the site investigation.
- e. Provision to be made for archive deposition of the analysis and records of the site investigation.
- f. Nomination of a competent person or persons/organisation to undertake the works set out within the Written Scheme of Investigation.
- g. The site investigation shall be completed prior to development, or in such other

phased arrangement, as agreed and approved in writing by the Local Planning Authority.

Reason - To safeguard archaeological assets within the approved development boundary from impacts relating to any groundworks associated with the development scheme and to ensure the proper and timely investigation, recording, reporting and presentation of archaeological assets affected by this development. This condition is required to be agreed prior to the commencement of any development to ensure matters of archaeological importance are preserved and secured early to ensure avoidance of damage or loss due to the development and/or its construction. If agreement was sought at any later stage there is an unacceptable risk of loss and damage to archaeological and historic assets.

5. ACTION REQUIRED PRIOR TO THE FIRST OCCUPATION OF DEVELOPMENT - ARCHAEOLOGICAL WORKS

No dwelling shall be occupied until the site investigation and post investigation assessment has been completed, submitted to and approved in writing by the Local Planning Authority, in accordance with the programme set out in the Written Scheme of Investigation approved under condition 4 and the provision made for analysis, publication and dissemination of results and archive deposition.

Reason - To safeguard archaeological assets within the approved development boundary from impacts relating to any groundworks associated with the development scheme and to ensure the proper and timely investigation, recording, reporting and presentation of archaeological assets affected by this development.

6. ACTION REQUIRED CONCURRENT WITH RESERVED MATTERS - SURFACE WATER DRAINAGE DETAILS

Concurrent with the reserved matters application(s) a surface water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority.

The scheme shall be in accordance with the approved Flood Risk Assessment (FRA) and shall include

1. A surface water drainage strategy with dimensioned drawings showing all aspects of the surface water drainage system.
2. If the use of infiltration is not possible then modelling or similar assessment shall be submitted to demonstrate that the surface water discharge to the receiving watercourse, up to the 1 in 100yr +CC rainfall event, will be restricted to 2l/s/ha or QBAR (5 l/s) for the critical duration as specified in the FRA.
3. Modelling of the surface water drainage scheme to show that the attenuation/infiltration features will contain the 1 in 100yr rainfall event including climate change.
4. Modelling of the pipe network in the 1 in 30yr rainfall event to show no above ground flooding
5. Modelling of the volumes of any above ground flooding from the pipe network in a 100yr + climate change rainfall event, along with topographic plans showing where water will flow and be stored to ensure there is no flooding to buildings on the site and there is no flooding in the immediate area due to

offsite flows.

6. If exceedance is being designed into the surface water system, then topographic plans shall be submitted depicting all exceedance flow paths and demonstration that the flows would not flood buildings or flow offsite. If exceedance routes are to be directed to SuDS features then the potential additional volume of surface water must be included within the design of the surface water system.
7. Infiltration systems shall only be used where it can be demonstrated that they will not pose a risk to groundwater quality or any Source Protection Zones. Likewise SuDS features should demonstrate betterment to water quality, especially if discharging to watercourse
8. Details of adoption and maintenance on all SuDS features for the lifetime of the development. Submission of an operation and maintenance schedule.

The details as may be agreed shall be implemented in full in accordance with the approved scheme.

Reason - To prevent flooding by ensuring the satisfactory storage and disposal of surface water from the site for the lifetime of the development.

7. ACTION REQUIRED PRIOR TO COMMENCEMENT: FOOTWAY SCHEME

Prior to the commencement of development a scheme providing for a footway connection to the village centre and associated priority system (indicatively shown on drawing no. IT1527/SK/03 Rev. B) shall be submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure pedestrian safety and to provide suitable sustainable links for the development.

8. ACTION REQUIRED PRIOR TO FIRST OCCUPATION: FOOTWAY

No dwelling shall be occupied until the proposed footway connection to the village centre and associated priority system (as shown on drawing no. IT1527/SK/03 Rev.B having been revised as required by the Highway Authority) has been provided in accordance with details which previously shall have been submitted to and approved in writing by the Local Planning Authority under condition 7.

Reason: To ensure pedestrian safety and to provide suitable sustainable links to the development.

9. ACTION REQUIRED PRIOR TO FIRST OCCUPATION - FOOTWAY

No dwelling shall be occupied until a footway has been provided and made functionally available along the site frontage adjacent to Broad Road and street lighting has been installed and is operational between and including the junction between the site access and Broad Road and the junction between Pound Lane and Broad Road in accordance with details which previously shall have been submitted to and approved in writing by the Local Planning Authority.

The footway shall thereafter be retained in its approved form.

Reason: To provide a safe pedestrian access in the interests of the sustainability of the development.

10. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT - PRE COMMENCEMENT CONDITION: DETAILS OF PROPOSED ACCESS REQUIRED.

Prior to the commencement of development details of the proposed access (including the position of any gates to be erected and visibility splays provided) shall be submitted to and approved in writing by the Local Planning Authority. The approved access shall be laid out and constructed in its entirety prior to any other part of the development taking place. The access shall be retained thereafter in its approved form.

Reason - To ensure that the access is designed and constructed to an appropriate specification and made available for use at an appropriate time in the interests of highway safety. This condition is required to be agreed prior to the commencement of any development to ensure highway safety is secured early for both development and its construction. If agreement was sought at any later stage there is an unacceptable risk to highway and public safety.

11. ACTION REQUIRED PRIOR TO FIRST USE OF ACCESS: HIGHWAYS - PROVISION OF VISIBILITY SPLAYS

Before the access is first used visibility splays shall be provided in accordance with details previously approved in writing by the Local Planning Authority and thereafter shall be retained in the approved form.

Notwithstanding the provisions of Part 2 Class A of the Town and Country Planning (General Permitted Development) (England) Order 2015 no obstruction over 0.6 metres high shall be erected, constructed, planted or permitted to grow within the areas of the visibility splays.

Reason: To ensure vehicles exiting the drive would have sufficient visibility to enter the public highway safely, and vehicles on the public highway would have sufficient warning of a vehicle emerging to take avoiding action.

12. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT: REFUSE BINS AND COLLECTION AREAS

Before the development is commenced details of the areas to be provided for storage of Refuse/Recycling bins shall be submitted to and approved in writing by the Local Planning Authority.

The areas shall be provided and made functionally available prior to the first occupation of the associated dwelling and subsequently retained thereafter for no other purpose.

Reason: To ensure that refuse recycling bins are not stored on the highway causing obstruction and dangers for other users.

13. **ACTION REQUIRED CONCURRENT WITH RESERVED MATTERS - PRE COMMENCEMENT CONDITION: PROVISION OF ROADS AND FOOTWAYS.**

Concurrent with reserved matters application(s) details of the estate roads and footways, (including layout, levels, gradients, surfacing and means of surface water drainage), shall be submitted to and approved in writing by the Local Planning Authority.

Reason: To ensure that roads/footways are constructed to an acceptable standard.

14. **SPECIFIC RESTRICTION ON DEVELOPMENT: PROVISION OF ROADS AND FOOTWAYS.**

No dwelling shall be first occupied until the carriageways and footways serving that dwelling have been constructed to at least bindercourse level in accordance with the approved details except with the written agreement of the Local Planning Authority.

Reason - To ensure that satisfactory access is provided for the safety of residents and the public.

15. **ACTION REQUIRED PRIOR TO COMMENCEMENT OF DELIVERY OF MATERIALS**

All HGV traffic movements to and from the site over the duration of the construction period shall be subject to a Deliveries Management Plan which shall be submitted to the planning authority for approval a minimum of 28 days before any deliveries of materials commence.

No HGV movements shall be permitted to and from the site other than in accordance with the routes defined in the Plan.

The site operator shall maintain a register of complaints and record of actions taken to deal with such complaints at the site office as specified in the Plan throughout the period of occupation of the site.

Reason: To reduce and / or remove as far as is reasonably possible the effects of HGV traffic in sensitive areas.

16. **ACTION REQUIRED PRIOR TO USE/OCCUPATION - HIGHWAYS: PROVISION OF PARKING.**

Concurrent with the submission of reserved matters application(s) a scheme for the purposes of manoeuvring and parking of vehicles including secure cycle parking shall be submitted to and approved in writing by the Local Planning Authority.

Prior to the first occupation of the dwelling to which it relates the parking and turning area(s) shall be provided and made functionally available. Thereafter that area(s) shall be retained and remain free of obstruction except for the purpose of manoeuvring and parking of vehicles.

Reason - To ensure the provision of adequate on-site space for the parking and

manoeuvring of vehicles where on-street parking and manoeuvring would otherwise be detrimental to highway safety.

17. SOUND INSULATION

Prior to the commencement of development a scheme shall be submitted to and approved in writing by the Local Planning Authority demonstrating the achievement of sound insulation against external noise to achieve internal noise levels not exceeding 30dB LAeq (night) and 45dB L_{Amax} (measured with F time weighting) for bedrooms and 35dBA LAeq (day) for other habitable rooms, with windows shut and other means of ventilation provided.

The scheme shall also demonstrate where external private amenity space is provided that levels do not exceed 55dB LA eq (day).

The scheme shall be implemented in full prior to the first occupation of any dwelling and thereafter retained, unless otherwise agreed in writing by the Local Planning Authority.

Reason: To avoid any significant adverse impacts from external noise on the occupiers and habitation of the proposed dwellings.

18. ACTION REQUIRED CONCURRENT WITH RESERVED MATTERS - PRE COMMENCEMENT CONDITION: CONTAMINATION

Concurrent with the first reserved matters application a detailed contamination survey including any remediation works shall be submitted to and approved in writing by the Local Planning Authority.

Any remediation required shall be undertaken fully in accordance with the contamination survey approved by the Local Planning Authority.

Reason - To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other off site receptors. This condition is required to be agreed prior to the commencement of any development to ensure health and safety is secured early for both development and its construction including the health of all workers during all phases of construction. If agreement was sought at any later stage there is an unacceptable risk to health and safety.

19. ACTION REQUIRED IN ACCORDANCE PRIOR TO THE COMMENCEMENT OF DEVELOPMENT: DETAILS OF ILLUMINATION

Prior to commencement of any phase of the development, a lighting design scheme with additional reference to biodiversity shall be submitted to and approved in writing by the local planning authority. The scheme shall

- a) Identify those features on site that are particularly sensitive for bats and that are likely to cause disturbance along important routes used for foraging; and
- b) Show how and where external lighting will be installed (through the provision of appropriate lighting contour plans and technical specifications which shall include lux levels of the lighting to be provided) so that it can be clearly demonstrated that areas

to be lit will not disturb or prevent bats using their territory and that areas to be lit have reasonably minimised light pollution, through the use of minimum levels of lighting and features such as full cut off cowls and LED.

All external lighting shall be installed in accordance with the specifications and locations set out in the scheme and maintained thereafter in accordance with the scheme.

There shall be no other means of external lighting installed and/or operated on/at the site unless otherwise agreed in writing by the Local Planning Authority.

Reason: To minimise the impact of the proposal on the character of the landscape, local visual amenity and the dark skies character of the countryside.

**20. ACTION REQUIRED PRIOR TO COMMENCEMENT OF DEVELOPMENT:
LANDSCAPE PROTECTION**

Any trees shrubs or hedgerows within, or at the boundary of, the development area or phase that are to be retained, shall be protected in accordance with a scheme of tree protection, (BS5837:2012), that shall have been agreed in writing with the Local Planning Authority prior to commencement of that area or phase.

The Local Planning Authority shall be advised in writing that the protective measures/fencing within a development area/phase have been provided before any equipment, machinery or materials are brought onto the site for the purposes of development and shall continue to be so protected during the period of construction and until all equipment, machinery and surplus materials have been removed from that development area/phase.

Within the fenced area no work shall take place; no materials shall be stored; no oil or other chemicals shall be stored or disposed of; no concrete, mortar or plaster shall be mixed; no fires shall be started; no service trenches shall be dug; no soil shall be removed or ground level changed at any time, without the prior written consent of the Local Planning Authority.

Reason: To minimise the impact of the proposal on the character of the landscape and local visual amenity.

**21. ACTION REQUIRED CONCURRENT WITH RESERVED MATTERS:
CONSTRUCTION MANAGEMENT TO BE AGREED**

Concurrent with submission of reserved matters, no development shall take place (including vegetation clearance or ground works) until a construction environmental management plan (CEMP) shall be submitted to and be approved in writing by the local planning authority. The content of the CEMP shall include the following

- a) Risk assessment of potentially damaging construction activities
- b) Identification of "biodiversity protection zones"
- c) Practical measures to avoid or reduce impacts during construction
- d) Location and timing of sensitive works to avoid harm to biodiversity features
- e) Times during construction when specialist ecologist need to be present on site to oversee works
- f) Responsible persons and lines of communication
- g) Use of protective fences , exclusion barriers and warning signs

The approved plan shall be adhered to and implemented in full throughout the construction period for all phases strictly in accordance with the approved reserved matters, unless otherwise agreed in writing by the local planning authority.

Reason - To minimise detriment to nearby residential and general amenity by controlling the construction process to achieve the approved development.

22. ACTION REQUIRED PRIOR TO THE COMMENCEMENT OF DEVELOPMENT: CONSTRUCTION MANAGEMENT TO BE AGREED

Prior to first occupation of any phase, a Landscape and Ecological Management Plan (LEMP) shall be submitted to and be approved in writing by the local planning authority. The content of the LEMP shall include the following:

- a) Description and evaluation of the features to be managed
- b) Aims and objectives of management
- c) Appropriate management options for achieving aims and objectives
- d) Prescriptions for management actions
- e) Preparation of a work schedule (including annual work plan capable of being rolled forward over a five year period)
- f) Details of the body or organisation responsible for implementation of the plan
- g) Ongoing monitoring and remedial measures

The LEMP shall also include details of the legal and funding mechanisms by which the long term implementation of the plan will be secured by the developer with the management body responsible for its delivery. The plan shall also set out how contingencies and/or remedial action will be identified, agreed and implemented so that the development still delivers the fully functioning biodiversity objectives of the originally approved scheme. The approved plan will be implemented in accordance with the approved details.

Reason - To minimise detriment by controlling the construction process to achieve the approved development.

23. RESTRICTION ON WORKING/DELIVERY TIMES

Unless otherwise agreed in writing no construction works or deliveries shall be undertaken at or to the site except within the hours of 0800 hrs to 1800hrs Mondays to Fridays and 0800hrs and 1300hrs on Saturdays. No such activities shall take place on Sundays, Bank Holidays or Public Holidays.

Reason – In order to protect the amenities of residential uses within close proximity.

24. ACTION REQUIRED PRIOR TO THE COMMENCEMENT OF DEVELOPMENT: FIRE HYDRANTS

Prior to the commencement of development a scheme for the installation of fire hydrants shall be submitted to and approved in writing by the Local Planning Authority. The fire hydrant/s shall be installed in full accordance with the approved scheme prior to the first occupation of the development hereby permitted.

Reason - In the interests of the safe occupation of the development and avoiding undue pressure on the emergency services.

SUMMARY OF POLICIES AND PROPOSALS WHICH ARE RELEVANT TO THE DECISION:

1. This permission has been granted having regard to policy(ies)

COR1 - CS1 SETTLEMENT HIERARCHY
COR2 - CS2 DEVELOPMENT IN THE COUNTRYSIDE & COUNTRYSIDE VILLAGES
COR5 - CS5 MID SUFFOLKS ENVIRONMENT
COR8 - CS8 PROVISION AND DISTRIBUTION OF HOUSING
COR9 - CS9 DENSITY AND MIX
CSFR-FC1 - PRESUMPTION IN FAVOUR OF SUSTAINABLE DEVELOPMENT
CSFR-FC1.1 - MID SUFFOLK APPROACH TO DELIVERING SUSTAINABLE DEVELOPMENT
CSFR-FC2 - PROVISION AND DISTRIBUTION OF HOUSING
COR6 - CS6 SERVICES AND INFRASTRUCTURE
COR7 - CS7 BROWN FIELD TARGET
COR4 - CS4 ADAPTING TO CLIMATE CHANGE

of the Mid Suffolk Core Strategy Document, and to all other material considerations. The carrying out of the development permitted, subject to the conditions imposed, would accord with those policies and in the opinion of the Local Planning Authority there are no circumstances which otherwise would justify the refusal of permission.

2. This permission has been granted having regard to policy(ies)

GP1 - DESIGN AND LAYOUT OF DEVELOPMENT
H13 - DESIGN AND LAYOUT OF HOUSING DEVELOPMENT
H14 - A RANGE OF HOUSE TYPES TO MEET DIFFERENT ACCOMMODATION NEEDS
H15 - DEVELOPMENT TO REFLECT LOCAL CHARACTERISTICS
H4 - PROPORTION OF AFFORDABLE HOUSING IN NEW HOUSING DEVELOPMENT
H7 - RESTRICTING HOUSING DEVELOPMENT
T9 - PARKING STANDARDS
T10 - HIGHWAY CONSIDERATIONS IN DEVELOPMENT
T11 - FACILITIES FOR PEDESTRIANS AND CYCLISTS
H3 - HOUSING DEVELOPMENT IN VILLAGES
H16 - PROTECTING EXISTING RESIDENTIAL AMENITY
H3 - HOUSING DEVELOPMENT IN VILLAGES

of the Mid Suffolk Local Plan, and to all other material considerations. The carrying out of the development permitted, subject to the conditions imposed, would accord with those policies and in the opinion of the Local Planning Authority there are no circumstances which otherwise would justify the refusal of permission.

3. This permission has been granted having regard to policy(ies)

NPPF - NATIONAL PLANNING POLICY FRAMEWORK

of the Planning Policy Statement, and to all other material considerations. The carrying out of the development permitted, subject to the conditions imposed, would accord with those policies and in the opinion of the Local Planning Authority there

are no circumstances which otherwise would justify the refusal of permission.

4.

NOTES:

1. **Summary Reason(s) for Approval**

The proposal has been assessed with regard to adopted development plan policies, the National Planning Policy Framework and all other material considerations.

The principle of residential development is required to be considered in relation to the NPPF and a presumption in favour of sustainable development. Comments received from statutory consultees and third parties have been given careful consideration in relation to the material considerations of the case. The site is located outside of a settlement boundary but the proposed development includes a new footpath link that is considered to allow the development to be well related to services and facilities in the main village. The details of the proposed highway alterations necessary to facilitate a new footpath are considered to be acceptable and protect highway safety. Although outside of the settlement boundary, the proposed development is not considered to give rise to significant adverse impacts that cannot reasonably be overcome by conditions or further details in any subsequent application for reserved matters.

Taking all relevant matters into account the proposal is considered to be acceptable subject to appropriate conditions.

Statement of positive and proactive working in line with the National Planning Policy Framework (NPPF):

The NPPF encourages a positive and proactive approach to decision taking, delivery of sustainable development, achievement of high quality development and working proactively to secure developments that improve the economic, social and environmental conditions of the area:

While the applicant did not take advantage of the service, the Council provides a duty planning officer and pre-application advice service prior to the submission of any application. The opportunity to discuss a proposal prior to making an application allows potential issues to be raised and addressed pro-actively at an early stage, potentially allowing the Council to make a favourable determination for a greater proportion of applications than if no such service was available.

2. The development is likely to require approval from Natural England, a copy of the licence for Great Crested Newts or evidence that this is not necessary should be provided to the Local Planning Authority prior to the commencement of development.

This species are fully protected by the Wildlife and Countryside Act (1981) and the responsibility for complying with this lies with the developer.

3. It is an OFFENCE to carry out works within the public highway, which includes a Public Right of Way, without the permission of the Highway Authority. Any conditions which involve work within the limits of the public highway do not give

the applicant permission to carry them out. Unless otherwise agreed in writing all works within the public highway shall be carried out by the County Council or its agents at the applicant's expense.

The County Council's Central Area Manager should be contacted at Phoenix House, 3 Goddard Road, Ipswich IP1 5NP. Telephone 01473 341414.

A fee is payable to the Highway Authority for the assessment and inspection of both new vehicular crossing access works and improvements deemed necessary to existing vehicular crossings due to proposed development.

4. The Local Planning Authority recommends that developers of housing estates should enter into formal agreement with the Highway Authority under Section 38 of the Highways Act 1980 relating to the construction and subsequent adoption of Estate roads.

5. Note: The works within the public highway will be required to be designed and constructed in accordance with the County Council's specification.

The applicant will also be required to enter into a legal agreement under the provisions of Section 278 of the Highways Act 1980 relating to the construction and subsequent adoption of the highway improvements. Amongst other things the Agreement will cover the specification of the highway works, safety audit procedures, construction and supervision and inspection of the works, bonding arrangements, indemnity of the County Council regarding noise insulation and land compensation claims, commuted sums and changes to the existing street lighting and signing.

6. This planning permission has been granted having regard to a related Section 106 planning obligation. Reference should be made to that planning obligation in conjunction with this decision notice.

This relates to document reference: 0764 / 15

Signed: Philip Isbell

Dated: 05 April 2016

**Corporate Manager
Development Management**

**MID SUFFOLK DISTRICT COUNCIL, 131 HIGH STREET, NEEDHAM MARKET, IPSWICH
IP6 8DL**

