OBJ/36/W10/2

The Proposed Network Rail (Suffolk Level Crossing Reduction) Order
Department for Transport Reference: TWA/17/APP/04

Transport Proof of Evidence of John Russell

(APPENDICES)

OBJ/36/W10/2

for

The Ramblers' Association

motion

Document Control Sheet

Transport Proof of Evidence of John Russell (APPENDICES)

The Proposed Network Rail (Suffolk Level Crossing Reduction) Order TWA/17/APP/04

OBJ/36/W10/2 The Ramblers' Association

This document has been issued and amended as follows:

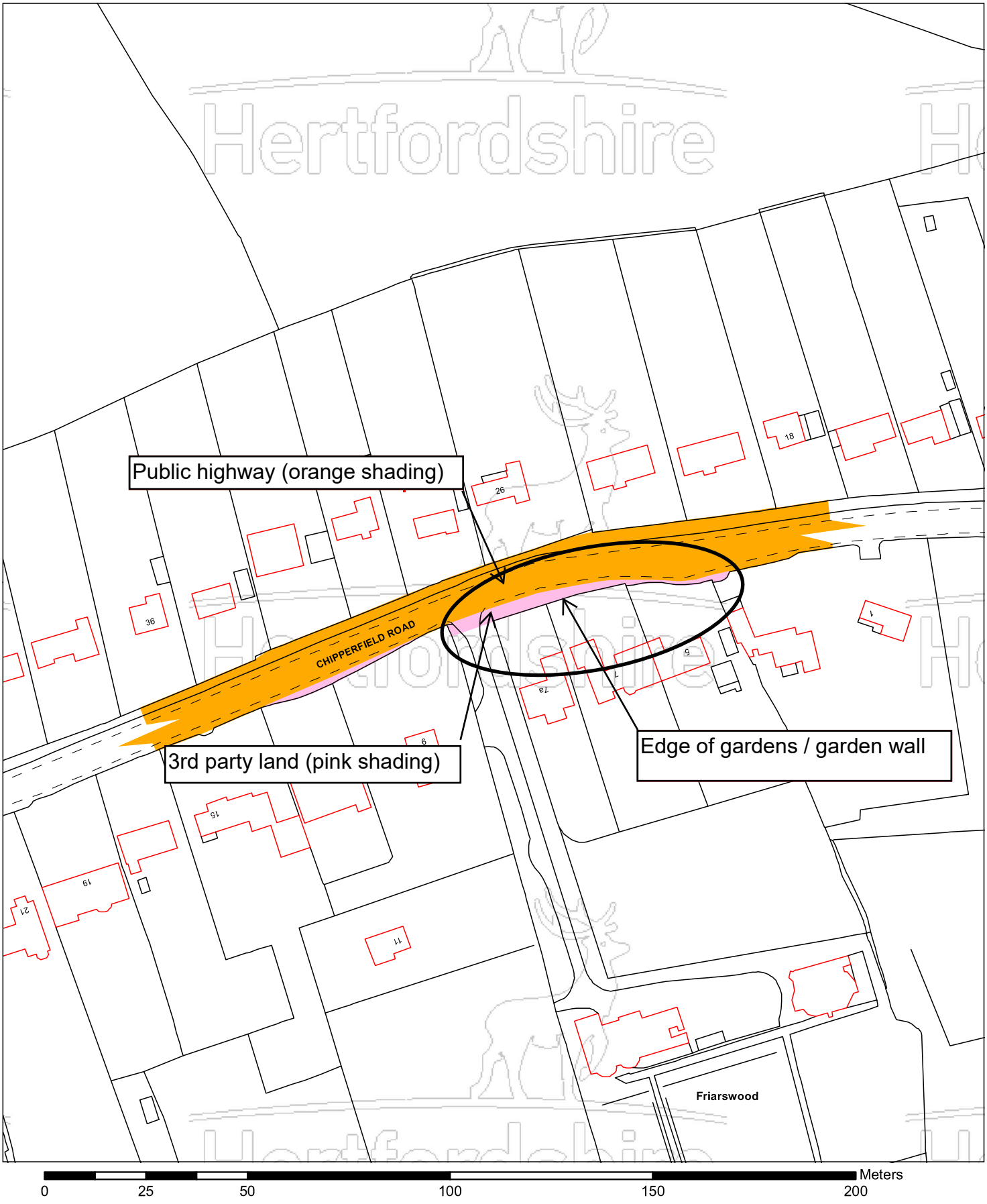
Date	Issue	Prepared by	Approved by
11/01/2018	1st Draft	JNR	JNR
15/01/2018	Final	JNR	JNR

Motion
84 North Street
Guildford
GU1 4AU
T 01483 531 300
E info@motion.co.uk
W www.motion.co.uk

Contents

APPENDIX OBJ/036/W10/2-1

Example of highway boundary data



Chipperfield Road
Kings Langley

For reference purposes only.
No further copies may be made.
Produced by Highway
Boundaries & Land Charges
Hertfordshire County Council
Date: 29/06/2017

Scale at A4

1:1,250

The Rights of Way information on this plan is based on information from the Definitive Map of Public Rights of Way. The accuracy of this plan cannot be guaranteed. If in doubt the Definitive Map should be consulted.

Hertfordshire

APPENDIX OBJ/036/W10/2-2

Highway design pedestrian walking speeds

Department for Transport

TRAFFIC ADVISORY LEAFLET 5/05

Part 4 of 4

Pedestrian Facilities at Signal-Controlled Junctions

This Leaflet is in four parts. This part includes Tables 1 and 2 referred to in parts 1 & 3 and the reference section

TABLE 1

Advantages and disadvantages of alternative orientation at staggered crossings

Stagger	Advantages	Disadvantages
Left / right*	■ Consistent with stand-alone crossings. ■ Encourages pedestrians to face oncoming vehicles. ■ Pedestrians on exit of junction are nearer to the junction, improving intervisibility.	■ Moves stop line and queue further from junction. ■ May increase intergreens and therefore lost time if crossing points, on all approaches, are not the same. ■ If a stop line were needed for the crossing on exit it would be very close to junction.
Right / left*	■ Brings the stop line nearer to the junction. ■ Moves the exit crossing away from the "side road" and allows drivers of turning vehicles longer to assess possible dangers. ■ Allows possible stop line for exit crossing to be a reasonable distance from junction.	■ Not consistent with stand-alone crossings. ■ Pedestrians not encouraged to face oncoming vehicles whilst walking between crossings. ■ May cause problems with intervisibility between "side road" and pedestrians.

* See layout drawings in Part 2

March 2005

Traffic Advisory Unit

Table 2

Period P	Farside Pedestrian Signal	Nearside Pedestrian Signal	Vehicle Signal	Farside Period (seconds)	Nearside Period (seconds)
1	Red Man	Red Man	Green	Dependant upon cycle time.	Dependant upon cycle time.
2	Red Man	Red Man	Amber	3	3
3	Red Man	Red Man	Red	Minimum to clear traffic in the junction.	Minimum to clear traffic in the junction.
4*	Green Man	Green Man	Red	6 - 12, depending upon carriageway width and pedestrian density.	4-9
5	Black-out (No Signal)	Red Man	Red	3-15**	1-5***
6	Red Man	Red Man	Red	1 - 3	0-30 (pedestrian extendable period)
7&8	Not applicable	Red Man	Red	-	See below
9	Red Man	Red Man	Red + Amber	2	2

* Values shown are for the standard fixed period. The green man can be further extended, see "Pedestrian Crossing Display Sequence" in Part 3, in which case the final extension period will be dependent on vehicular demands.

** Values shown are for the standard fixed period. The black-out can be extended in some cases, see TR 2210[24]. The walking speed for a pedestrian is taken as 1.2 metres/second. The time (in seconds) of periods 5 and 6 together should be equal to the width of the carriageway in metres divided by 1.2.

*** see below "Nearside Pedestrian Signals"

Nearside Pedestrian Signals

See sections on "Pedestrian Crossing Display Sequence" and "Nearside On-Crossing Detection" in Part 3

Since the introduction of Puffin stand-alone pedestrian crossings, the number of nearside pedestrian signals at signal-controlled junctions has been increasing. The below method of calculating timings has been tried at a number of junction installations and is recommended as advice.

P1 to P8 used in the following formula refer to the periods defined originally in LTN 2/95[6], Tables 5 & 6. Note: In this method, Periods P7 and P8 have been incorporated in Period P6 and should both be set to 0 seconds.

See "Pedestrian Crossing Display Sequence" in Part 3 with reference to parallel facilities and UTC.

Some controllers may be configured to operate the pedestrian period in a consecutive mode, whilst others operate in a concurrent mode. In the former, the variable extension (P6) starts at the end of the minimum extension period (P5) and in the latter, P6 starts at the same time as P5. Whichever mode is used, it is important to ensure that pedestrians always have sufficient time to cross the carriageway.

In the following formulae:

L is the width of the carriageway in metres;

1.2 is the pedestrian walking speed (85% of pedestrians) in metres/sec;

Pc represents the pedestrian "comfort factor". A suitable value for Pc should be carefully selected to reflect local characteristics of the pedestrians using the crossing (young, elderly, proximity to school, etc) and the width of the crossing. From experience so far, 3 seconds is a reasonable base setting which can be fine tuned on site if necessary. Time-of-day adjustments can be made during configuration to cater for special local needs and **P5** represents a fixed minimum

APPENDIX OBJ/036/W10/2-3

Executive Summary from research on walking speeds

Transport Research Laboratory
Creating the future of transport



PUBLISHED PROJECT REPORT PPR700

A Review of Pedestrian Walking Speeds and Time Needed to Cross the Road

M Crabtree, C Lodge and P Emmerson

Prepared for: Living Streets

Quality approved:

Mark Crabtree (Project Manager) — Mark Crabtree

Jim Binning (Technical Referee) — J C Binning

Disclaimer

Contents amendment record

This report has been amended and issued as follows:

Version	Date	Description	Editor	Technical Referee
1	21/5/14	Draft version sent to client	MC	JB
2	28/8/14	Final version	MC	JB

Executive Summary

Introduction

Living Streets has commissioned the Transport Research Laboratory (TRL) to undertake research to consider the appropriateness of the current method of calculating the time needed for pedestrians to cross a road at signal controlled pedestrian crossings both stand alone and at junctions.

Context

Musselwhite et al (2011) refer to the World Health Organisation (WHO, 1999) saying that maintaining mobility in later life is important for maintaining health and wellbeing. Furthermore, both physical and mental health benefits are derived from increased activity. It therefore follows that the maintenance of mobility is seen as good and to be encouraged.

Safety is also a concern. In the UK, older people represent around 16% of the population, yet around 43% of all pedestrians killed (DfT, 2009).

Whether they are stand alone or part of signal controlled junctions, signal controlled pedestrian crossings work on the following principles:

- Pedestrians press a button to demand the relevant pedestrian phase;
- When the demand matures into the pedestrian phase the pedestrian is invited to start crossing by an illuminated green man;
- Following the green man period is the clearance period. The period is intended to be long enough for pedestrians who have started to cross, during the green man period, to complete their crossing. The time of this clearance period depends on the width of the road and is calculated as per DfT advice (DfT, 2009). For most crossing types the clearance period is calculated on the basis of the minimum walking speed of $1.2ms^{-1}$.

The origins of the value for minimum speed and its use in the UK are unknown. LePlante (2007) reviewed research conducted in 1952 by James Exnicios and it appears that this is where the speed of 4 ft/sec ($1.22ms^{-1}$) used in the USA and a 15^{th} percentile figure of 3.5 ft/sec ($1.07ms^{-2}$) came from. The research noted lower speeds for other pedestrian groups such as the elderly with a 15^{th} percentile figure of 3.0 ft/sec ($0.92ms^{-1}$) quoted.

Since the 1960s the average age of the UK population has increased leading to a greater proportion of older people. Many older people are unable to walk at $1.2ms^{-1}$. Additionally, roads are many times busier now, which means that there are fewer opportunities to cross roads in the absence of signal control. Additional issues with sight and mobility, combined with today's busier roads, mean that more pedestrians become reliant on signal controlled crossings and pedestrian facilities at junctions.

If pedestrians feel that there is not enough time to cross the road using signal controlled crossings, they may feel disinclined to use them. This may cause them to avoid going out, or use other forms of transport to undertake journeys that would otherwise be possible on foot.

The DfT document 'WebTAG' (https://www.gov.uk/transport-analysis-guidance-webtag) gives guidance for calculating the cost of traffic using the road network. This is used in calculating the overall cost-benefit ratio of new road schemes. Pedestrians are rarely included in appraisals and there appears to be no requirement for this. If 'WebTAG' values were included, pedestrian time would be valued at less than other road users due to a built in assumption that walking tends to be carried out by people with lower incomes. Therefore, the appraisal process does not appear to be geared up to encouraging walking – rather the opposite.

Increasing the clearance period will give people longer to complete their crossing, assuming everything else remains the same. The consequences of increasing the clearance period would be increased delay to motorised traffic, which may be substantial when the network is operating close to capacity. Encouraging modal shift – and increasing the clearance time may help this – could reduce the impact on motorised traffic. Providing slower pedestrians with longer to complete their crossing will improve perceived safety and amenity for them, though the effect on the behaviour of other pedestrians is not known.

Research undertaken in this project

The research consisted of:

- a literature review that concentrated on walking speeds and the consequences of giving pedestrians insufficient time to cross the road;
- a modelling exercise to consider the cost of delay to all road users (including pedestrians);
- consideration of the effects of implementing the current WebTAG guidelines on the net results of the modelling process

Limitations

In order to encourage walking, the speeds that are relevant to this study are for those who find it difficult to complete their crossing in time, and would also consider walking if the issue was resolved. The speed should also be representative of the speed achieved under the conditions to which they apply. None of the data gathered captured those key requirements. Rather they mostly measure:

- the speed of pedestrians actually using the crossing (thereby have made the choice to walk already),

  or, less frequently:

- the speed of people who would never use pedestrian crossings, for a multitude of reasons (e.g. medical conditions including mental illness) even if the clearance period was sufficiently generous.

Literature review

Walking speeds

The average walking speeds found in the literature search ranged between 0.54ms^{-1} for women over 80 (Dunbar et al, 2004) and 1.31ms^{-1} (Knoblauch et al, 1996) with many examples between. Most of the data have been captured from measurements of pedestrians actually crossing the road. As already mentioned, this will tend to exclude people who would be interested in walking if the time available to cross at signal controlled crossings was longer. However, it is not clear to what extent the speeds are representative of the speeds that people could achieve if they needed to. Nevertheless, there is a clear indication that 1.2ms^{-1} is more often than not likely to be inadequate for older people.

Safety and encouragement

One of the aims of making walking safer and more comfortable is to encourage walking as a means of transport for a whole host of reasons. Nothing was found that addresses this issue. Consequently it is impossible to say to what extent people may be encouraged to walk should they be allowed more time to complete their crossing. People do complain about the issue, however, so it seems likely that some may choose to walk more often, particularly if a crossing they would use frequently has the issue addressed.

These are the issues that may arise if clearance periods were increased:

- Significant delay to traffic when networks are close to or oversaturated;
- Extra delay to pedestrians due to longer cycle times that will be necessary to reduce the consequences of increasing clearance periods which may lead to more pedestrians crossing in gaps and increased risk taking in general;
- Safety issues if the changes are not made – slow pedestrians will continue to take longer to cross than their time available;
- Different pedestrian crossing types – a change in the clearance period will have different consequences on the different crossing types.

Attitudinal surveys

Maxwell et al (2012) reported on a trial comparing a standard Puffin with the same on one with far-side pedestrian aspects added. Considering the standard Puffin only, one statement to which participants were asked to respond to was 'I feel hurried when on the crossing'. Sixty one percent disagreed or strongly disagreed, 21% were neutral, and 18% agreed/strongly agreed. When it was put to participants that the 'Green man time was long enough', 59% agreed/strongly agreed, 18% neutral, 22% disagreed or strongly disagreed

Hoxie and Rubenstein (1994) conducted a study of one intersection in Los Angeles, California, USA where 73 people took part with a mean age of 77 years. Seventy four percent considered themselves to be in danger when they crossed the junction: 46% crossed daily and 43% were aware that they did not get to the opposite side before the light changed. Eighteen had fallen over in the past year.

Mathieson et al (2013) reported on a European project SaMERU - Safer Mobility for Elderly Road Users. Amongst the findings for Puffins and Junctions, 62% of respondents agreed when asked 'are longer crossing times required?'

Technical changes required

In the majority of cases, most signal controllers would require a PROM (Programmable Read Only Memory) change to allow for an increase in the clearance period. This can be undertaken at a modest cost. However, this may not be the only cost. The consequences of making changes to the operational efficiency of a junction (as opposed to standalone crossing) will need to be considered. This in itself will require time even if it proves that the junction or network will operate satisfactorily. If operational efficiency is compromised unacceptably, further work to mitigate the consequences will be required.

The degree to which network efficiency changes after the introduction of an increased clearance period depends both on the nature of the junctions within the network, the

network itself and traffic intensities. Increasing clearance periods will always reduce network capacity (all other things being equal). This is unavoidable. However, at low to medium traffic intensities, the increase in delay to road users could be minimal. Closer to saturation though and the reduction in capacity will lead to a large increase in queuing delay. This may be offset to some extent if modal shift away from motorised vehicles is achieved.

Potential solutions

Attempts to use technology to make pedestrian crossings more user-friendly have been tried with varying degrees of success. Puffin crossings were found to be 19% safer than Pelican crossings (Maxwell et al, 2011). PCaTS proved very popular with users (York et al, 2009) although such crossings are not compatible with variable clearance periods, as provided by Puffin crossings, and are likely to encourage pedestrians to look at the countdown display rather than observe vehicles. A more recent application of technology (under trial at the time of writing) is using detectors to count pedestrians, such that the invitation period can be varied. This may help slower pedestrians who join the back of a crowd by helping them to become established on the crossing before the green man ends.

Government policy on the issue of pedestrian crossings has been clear in favouring Puffin crossings and Puffin facilities at junctions for many years. Policy has stopped short of insisting that Puffins are used in place of Pelicans. However, DfT have recently announced that Pelicans are to be 'phased out' as part of a consultation exercise on the new Traffic Signs, Regulations and General Directions (TSRGD). A complication is that TfL are keen to use countdown timers, currently an increasingly common sight at junctions in London, at standalone crossings. It remains to be seen how this unfolds.

Conclusion and Recommendations

From the literature it would appear that the current assumed walking speed of $1.2ms^{-1}$ is higher than can be achieved by a significant and growing proportion of the population. However, the consequences of reducing the assumed speed need to be considered carefully. Therefore the following recommendations are made.

1. There is a clear indication that $1.2ms^{-1}$ cannot be achieved by a proportion of the population, particularly the elderly. There is an increasing need to addressed this issue.
2. Further research would be required to estimate the number of people affected by the clearance period particularly those who would choose to walk if more time was allowed. Once the estimated number is known it will be possible to consider and quantify those benefits in terms of costs. WebTAG considers the cost of walking as less than that of driving which reduces the impact of and discourages walking interventions. Costs should be made more equitable and there should be a requirement to include pedestrians in all appraisal processes.
3. Wider implementation of Puffin crossings (and the equivalent PedEX crossings that utilise on-crossing detection to vary the clearance period).
4. Implement longer maximum periods at Puffin crossings.

5. Employ technology to detect pedestrians to vary the time they have to cross. For example the technology that TfL is trialling at the time of writing to detect the number of pedestrians waiting to cross and varying the invitation to cross period. This approach allows the use of countdown timers as the clearance period is not varied.
6. Increasing the clearance period would address the issue of walking speeds being lower than 1.2ms^{-1}. However, behavioural changes could result which may have an impact on safety. Therefore, the most important next step would be to assess the safety impact of lengthening clearance times, both with respect to crossings with fixed clearance periods and those with variable times up to a maximum.

References

DfT (Department for Transport) 2009. Road Casulaties Great Britain 2008. London: Department for Transport

Dunbar G, Carol A. Holland and Elizabeth A. Maylor E A (2004). Older Pedestrians: A Critical Review of the Literature. University of Warwick. Department for Transport: London.

Hoxie R E, Rubenstein L Z. Are older pedestrians allowed enough time to cross intersections safely? J Am Geriatr Soc. 1994 Mar;42(3):241-4

LaPlante J, Kaeser T (2007). A history of pedestrian signal walking speed assumptions. Presented at the 3rd urban street symposium

Mathieson et al (2013). Safer Mobility for Elderly Road Users. European Commission.

http://ec.europa.eu/transport/road_safety/pdf/projects/sameru_final_report.pdf

Maxwell A, J Kennedy, I Routledge, P Knight, K Wood. Puffin pedestrian crossing accident study. TRL published report prepared for the DfT 2011

Musselwhite, C (2014). Environment-person interactions enabling walking in later life. Unpublished 1

Transport for London (2005). Puffin and Pelican Crossings - Views of Pedestrian Users - Report of Research Findings.

WHO (World Health Organisation) 1999 Charter on Transport, Environment and Health.

York I, S Ball, R Beesley, D Webster, P Knight and J Hopkin (2009). Pedestrian Countdown at Traffic Signal Junctions (PCaTS) - Road Trial. TRL Project Report TfL 2489

APPENDIX OBJ/036/W10/2-4

Extract from MfS Regarding footway widths

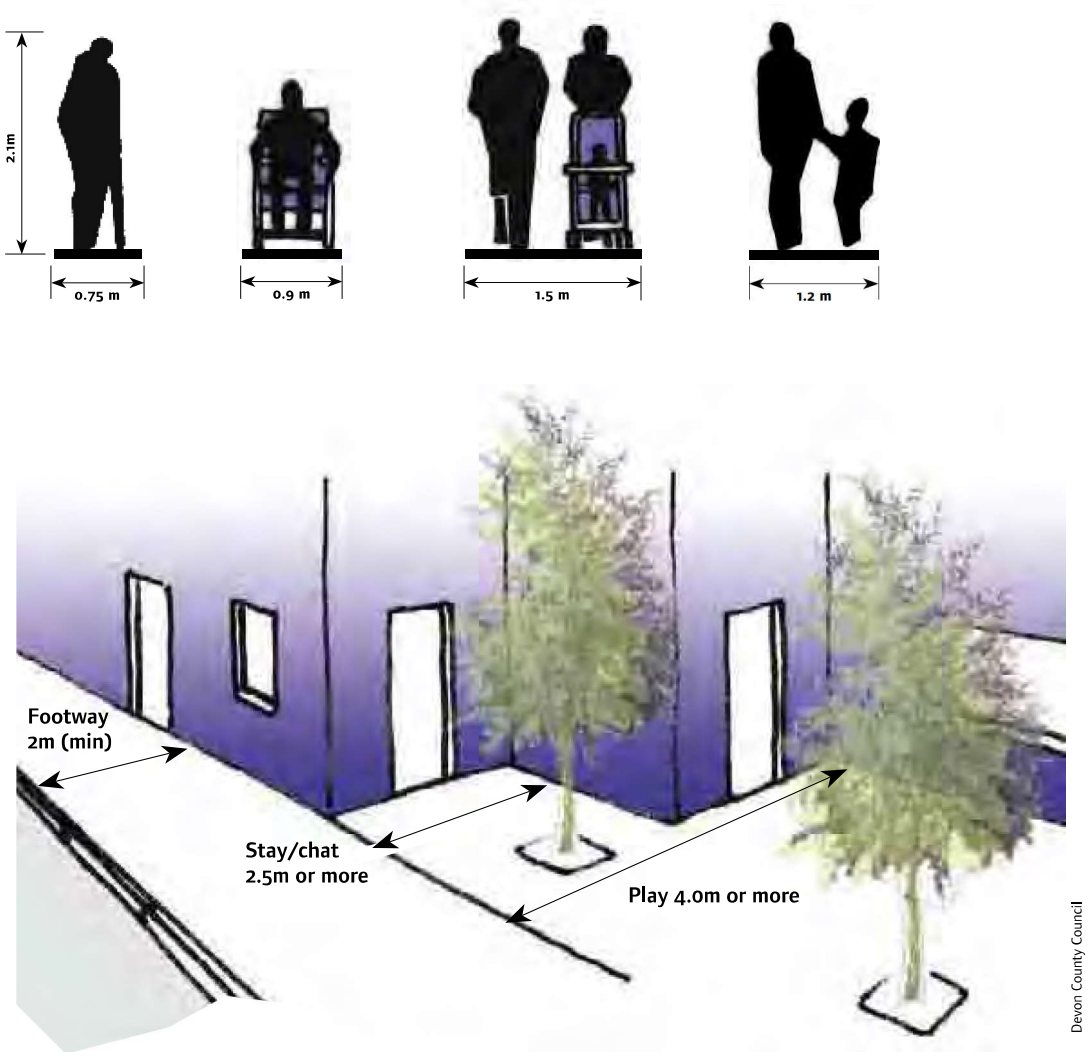


Figure 6.8 The footway and pedestrian areas provide for a range of functions which can include browsing, pausing, socialising and play.

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.

APPENDIX OBJ/036/W10/2-5

Correspondence with Inquiry regarding Road Safety Audit

Mrs Joanna Vincent
Personna Associates Ltd.
1st Floor
Bailey House
4-10 Barttelot Road
Horsham
West Sussex, RH12 1DQ

84 North Street,
Guildford GU1 4AU

tel: 01483 531300
email: info@motion.co.uk

www.motion.co.uk

Our ref. Rasuff/1711055/JNR

16th November 2017

Dear Mrs Vincent

OBJ/36
The Proposed Network Rail (Suffolk Level Crossing Reduction) Order
Planning Reference: DPI/V3500/17/13

I have been reviewing the Stage 1 Road Safety Audit (RSA) reports submitted by Network Rail in support of the Proposed Network Rail (Suffolk Level Crossing Reduction) Order (hereafter referred to as "the Order").

I have copied below at Exhibit JNR1 the title page of the Stage 1 RSA for Suffolk (August 2016).

Exhibit JNR1

Title: **Transport & Works Act Order (TWAO) Anglia Route GRIP 2 Review**
Document: **Suffolk Stage 1 Road Safety Audit**
Report Number: **367516/RPT015 Revision A**
Cover Date: **August 2016**
Revision record

Revision	Date	Originator	Checker	Approver	Description
A	08/08/2016	R J Collins / T J Blaney	A J Coleman	J A Castle	First Draft
B	17/10/2016	T Blaney	S J Tilbrook	J Smith	Response to DRN comments

I have copied below at Exhibit JNR2 the title page of the Stage 1 RSA designer's response for Suffolk (November 2016).

Exhibit JNR2

Title: **Transport & Works Act Order (TWAO) Anglia Route GRIP 2 Review**
Document: **Suffolk Stage 1 Road Safety Audit Response Report**
Report Number: **367516/RPT020 Revision B**

motion

Cover Date: **November 2016**

Revision record

Revision	Date	Originator	Checker	Approver	Description
A	09/09/2016	Wahiba Jennane	Steve Price	Sue Tilbrook	First Draft
B	08/11/2016	Wahiba Jennane	Steve Price	Sue Tilbrook	Response to comments

The Suffolk Stage 1 Road Safety Audit Response Report (Exhibit JNR2) ("Response Report") refers on page 1 to the Stage 1 Road Safety Audit reports 354763/RPT220A and 367516/RPT015B. These two reports have not been included with the other Road Safety Audit reports in NR16 and I have not, therefore, had access to them.

Stage 1 Road Safety Audit reference 354763/RPT220A appears to be a further iteration of the 354763/RPT219 Revision A report which is included in NR16 but which is then not referred to either in the GRIP 2 audit or Response Report. However report 354763/RPT220A has not been provided to the Inquiry and so the conclusions of the Response Report cannot be verified.

Stage 1 Road Safety Audit report reference 367516/RPT015B does not appear to fully align with the document referenced 367516/RPT015 Revision A. However noting that the revision record within report 367516/RPT015 Revision A refers to revisions "A" and "B" I assume that the report reference is a typing error. I add that the description under Revision B states "Response to DRN comments". No explanation of who or what "DRN" is is given nor does "DRN" appear to be any member of the audit team. An explanation of who or what "DRN" is should be sought.

I would draw your attention to the fact that the Stage 1 Road Safety Audit report reference 367516/RPT015 Revision A has "S J Tilbrook" as the approver, and the Response Report states that "Sue Tilbrook" is the approver. This may be a coincidence but this suggests that the same person has approved both the most recent Audit (367516/RPT015 Revision A) and the designer's response to this Audit.

I also note that the Road Safety Audit Brief prepared for the Stage 1 Road Safety Audit report reference 367516/RPT015 Revision A has the contact person of the Design Organisation as "Jason Smith" and the Stage 1 Road Safety Audit report reference 367516/RPT015B states that "J Smith" is the approver. Again this may be a coincidence but this suggests that the same person from the Design Organisation has been involved in preparing the Audit Brief and undertaking the audit itself.

Referring to the Design Manual for Roads and Bridges, Volume 5 Assessment and Preparation of Road Schemes, Sections 2 Preparation and Implementation, Part 2, HD 19/03 Road Safety Audit paragraph 1.6 states in full:

"*It is recommended that Design Teams include staff with Road Safety Engineering experience to ensure that safety issues are considered during design. However, road safety engineers within the Design Team will not be permitted to be part of the Road Safety Audit Teams due to their 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 should not be considered to be a satisfactory or acceptable substitute for undertaking a Road Safety Audit.*"

The above document also defines in paragraph 1.21

"*Audit Team: A team that works together on all aspects of the audit, independent of the Design Team and approved for a particular audit by the Project Sponsor on behalf of the Overseeing Organisation. The team shall comprise a minimum of two persons with appropriate levels of training, skills and experience in Road Safety Engineering work and/or Accident Investigation. The members of the Audit Team may be drawn from within the Design Organisation or from another body*".

Given this clear and unequivocal guidance for road safety audits which has been developed to ensure that the audit team is independent, I would be deeply concerned if S J Tilbrook and Sue Tilbrook transpired to be the same person and / or J Smith and Jason Smith transpired to be the same person as this would be in direct contravention of established guidance. Should this be the case, then I would advise that the RSA1 reports should not be relied on by the Inspector at all, as they would clearly have been checked and approved by people who are members of the design team and therefore not an independent road safety audit.

If, in the alternative, the Response Report is not designed to respond to Stage 1 Road Safety Audits references 354763/RPT219A and 367516/RPT015 Revision A, then I formally request that Network Rail provide the appropriate Response Report to these audits and/or the missing Audits, along with an explanation as to which audit reports/response report Network Rail seeks to rely on at the Inquiry and, if relevant, why the correct audits/response report was not included in the Inquiry documentation. I request that Network Rail respond as a matter of urgency to allow objectors to prepare their evidence for the Inquiry.

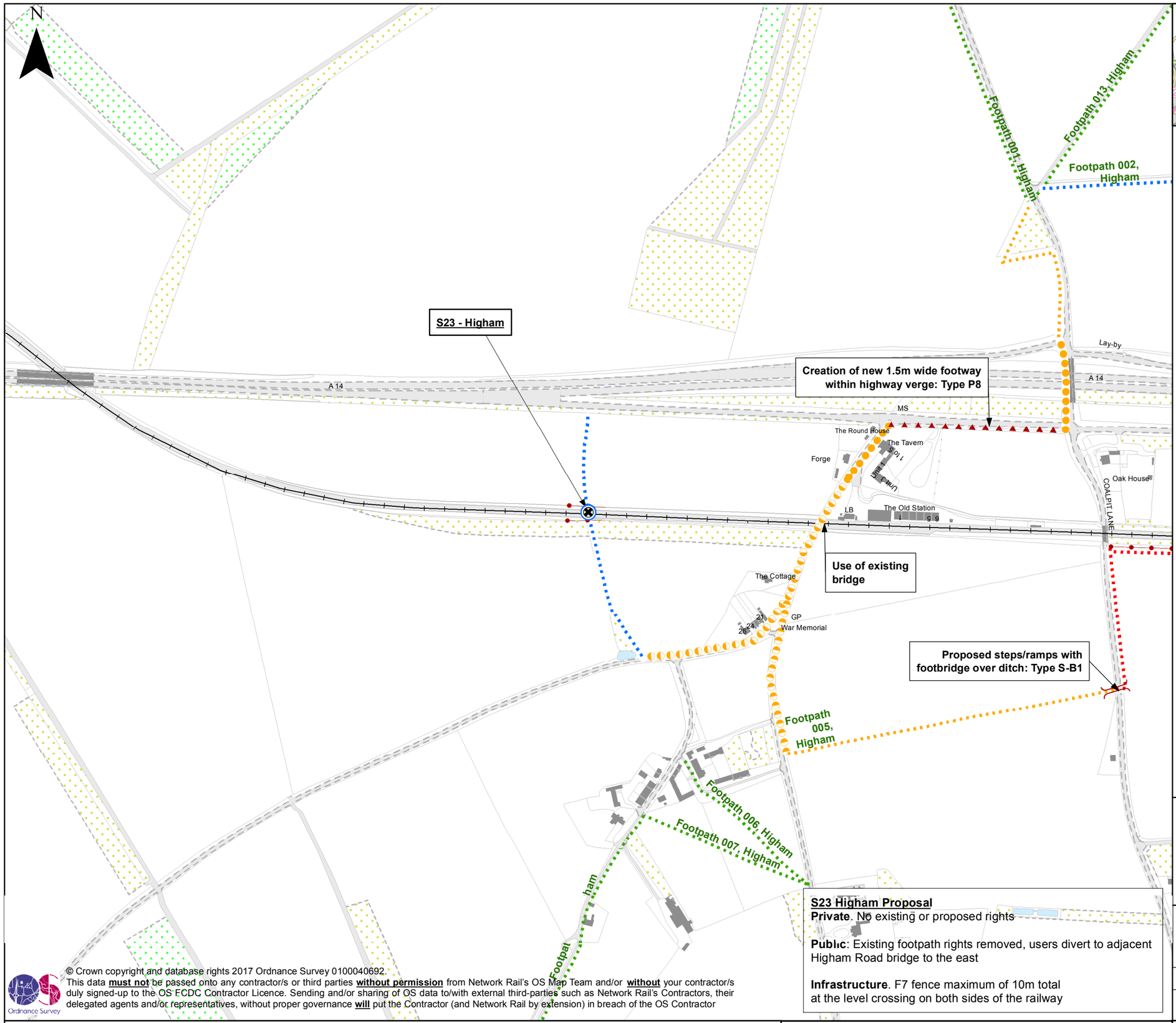
Kindly ensure that a copy of this letter is drawn to the attention of the Inspector. Copies have been sent to Winkworth Sherwood (on behalf of Network Rail) and Andrew Woodin at Suffolk County Council.

Yours sincerely

John Russell
Technical Director
E jrussell@motion.co.uk

APPENDIX OBJ/036/W10/2-6

Plans of proposed diversion routes



SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Byway open to all traffic (public)
- Bridleway (public)
- Road / Track (private)
- Restricted byway (public)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Motorised Only Diversion Route
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

NetworkRail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S23 - Higham
Suffolk - Higham CP
Post Code IP286NJ

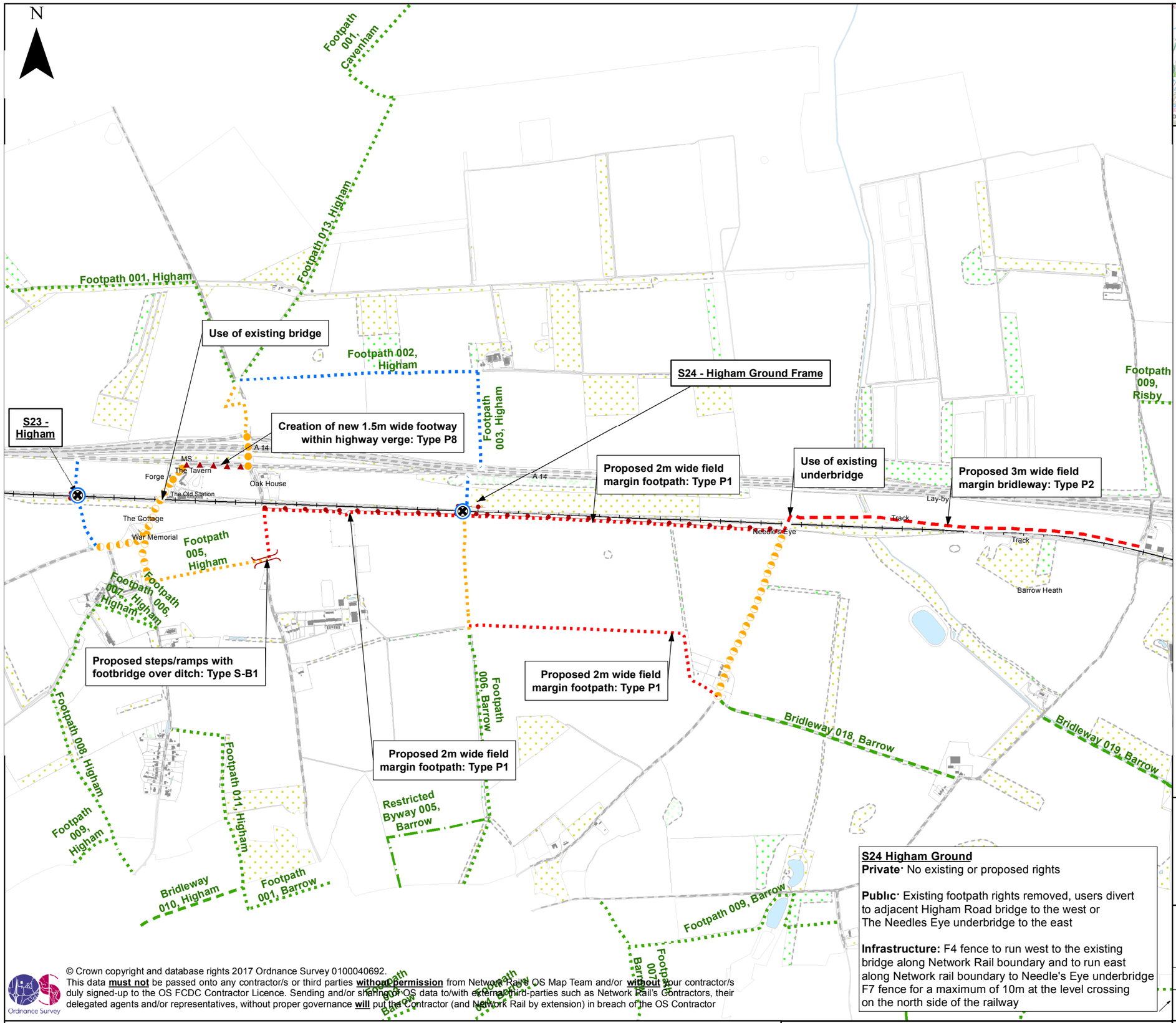
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

Scale at A3
NTS

Drawing No.
MMD-367516-S23-GEN-005

0 0.125 0.25 Kilometers

P:\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk_RD.mxd



SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Bridleway (public)
- Restricted byway (public)
- Byway open to all traffic (public)
- Road / Track (private)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)
- Motorised Only Diversion Route

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

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

Network Rail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S24 - Higham Ground Frame
Suffolk - Barrow CP
Post Code IP286NS

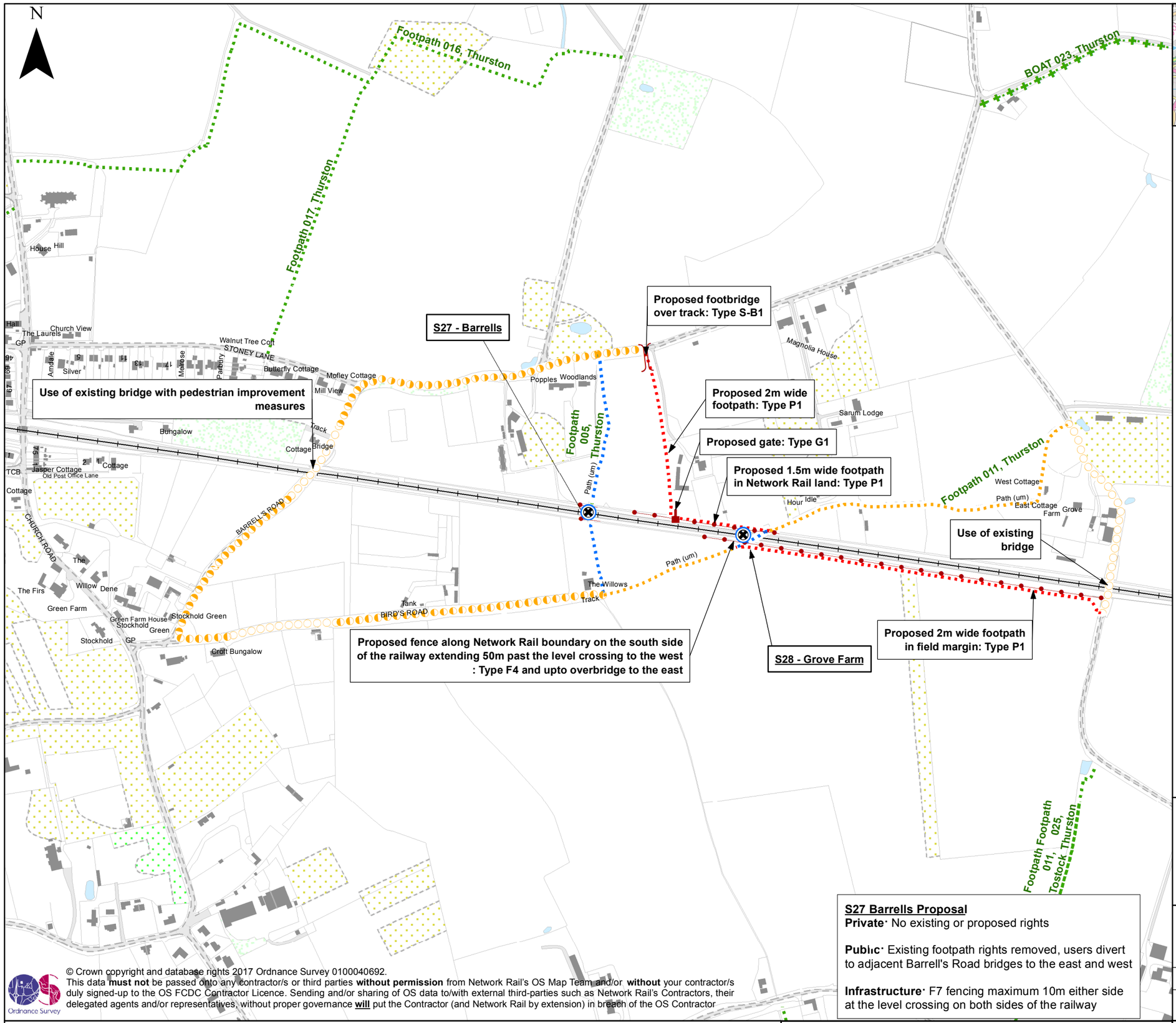
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

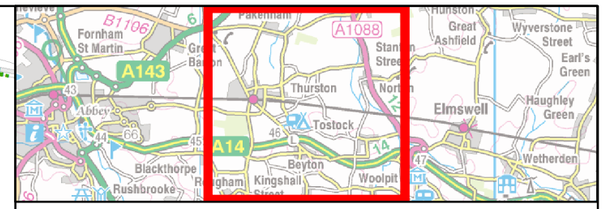
Scale at A3
NTS

Drawing No.
MMD-367516-S24-GEN-005

0 0.35 0.7 Kilometers

\\UKLEEDDC01\Projects\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk.mxd





SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Byway open to all traffic (public)
- Bridleway (public)
- Road / Track (private)
- Restricted byway (public)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Motorised Only Diversion Route
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

S27 Barrells Proposal

Private: No existing or proposed rights

Public: Existing footpath rights removed, users divert to adjacent Barrell's Road bridges to the east and west

Infrastructure: F7 fencing maximum 10m either side at the level crossing on both sides of the railway

NetworkRail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S27 - Barrells
Suffolk - Thurston CP
Post Code IP313RJ

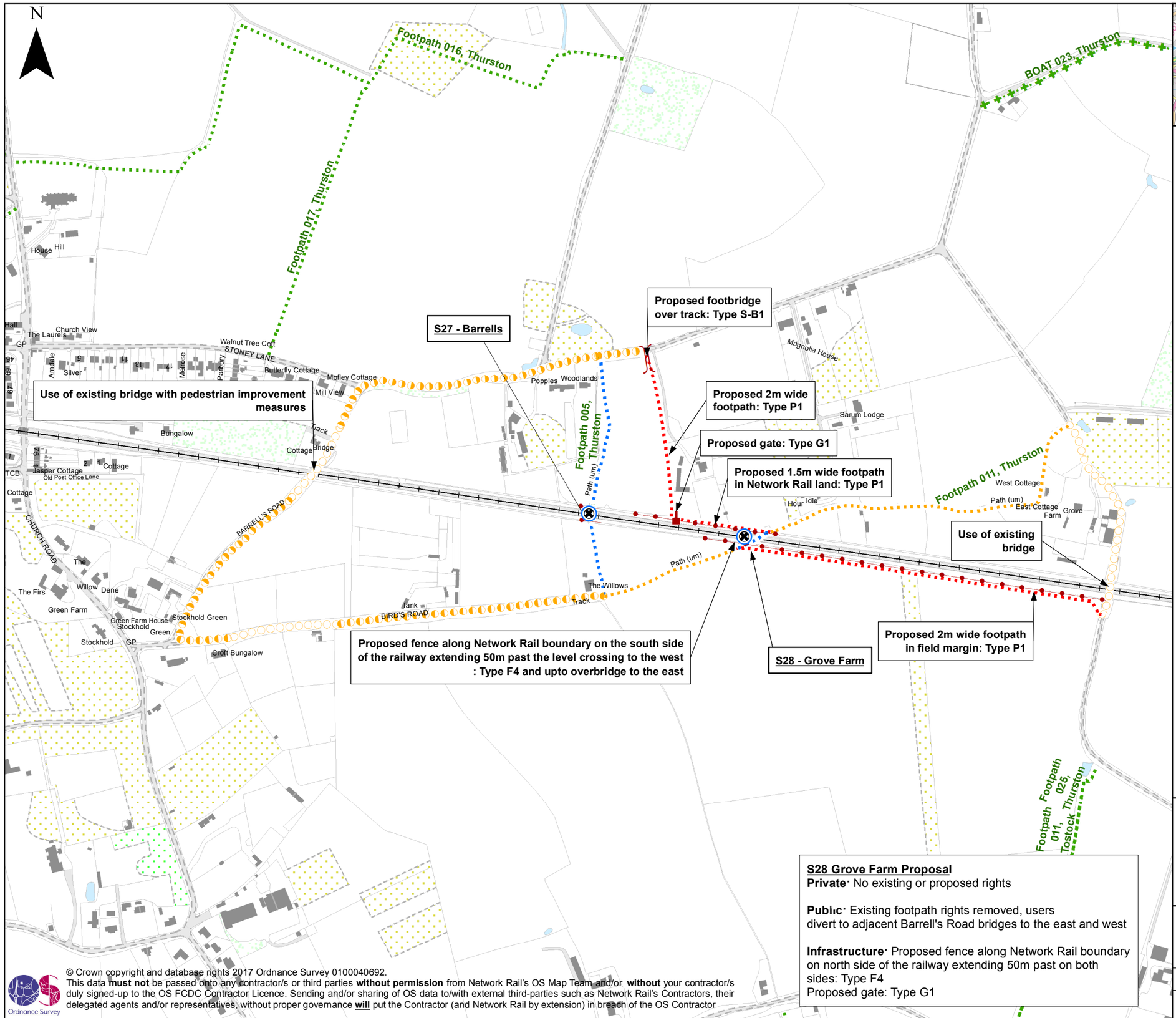
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

Scale at A3
NTS

Drawing No.
MMD-367516-S27-GEN-005

0 0.125 0.25 Kilometers

P:\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk.mxd



SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Byway open to all traffic (public)
- Bridleway (public)
- Road / Track (private)
- Restricted byway (public)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Motorised Only Diversion Route
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

S28 Grove Farm Proposal

Private: No existing or proposed rights

Public: Existing footpath rights removed, users divert to adjacent Barrell's Road bridges to the east and west

Infrastructure: Proposed fence along Network Rail boundary on north side of the railway extending 50m past on both sides: Type F4
Proposed gate: Type G1

NetworkRail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S28 - Grove Farm
Suffolk - Thurston CP
Post Code IP313SF

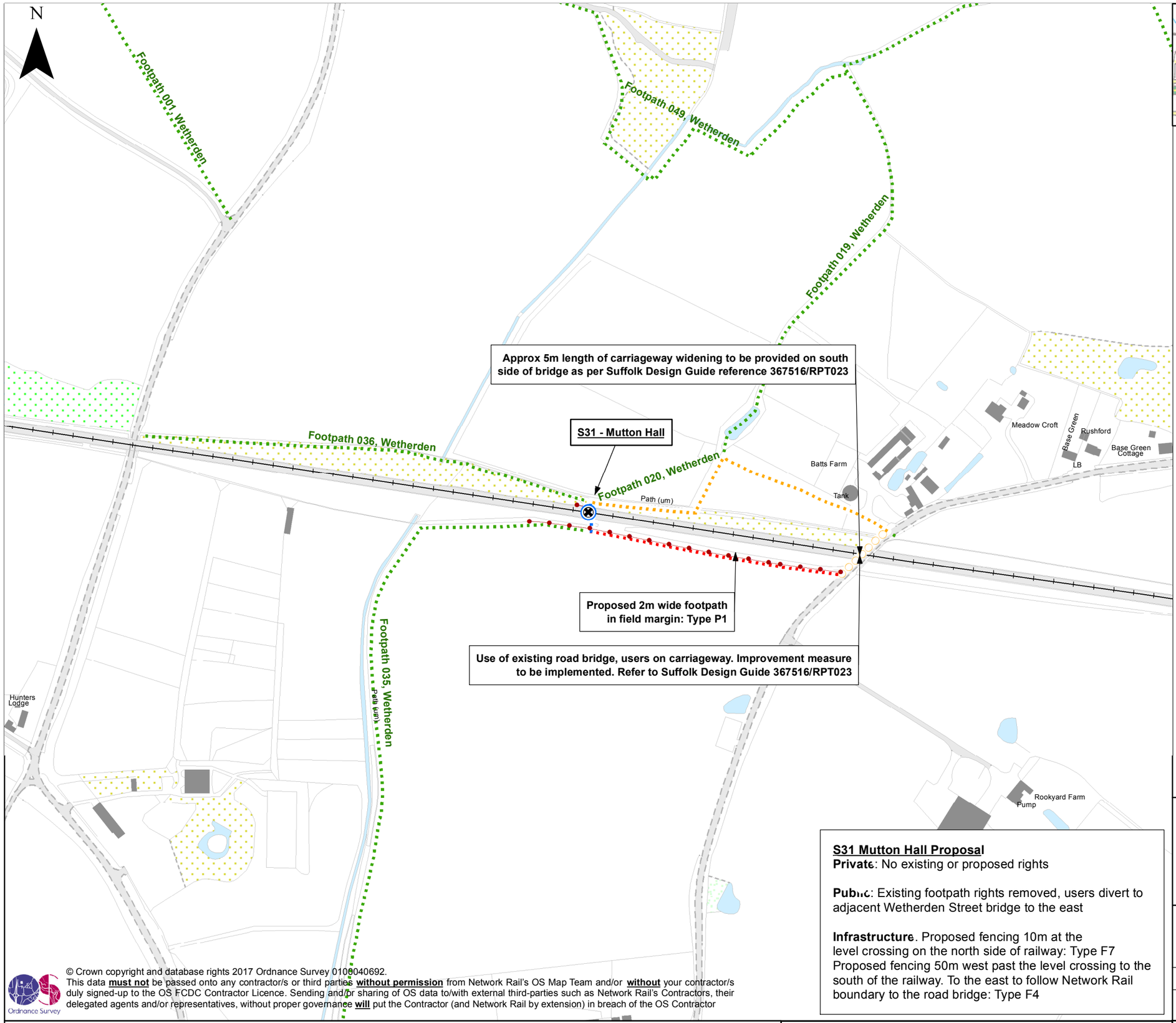
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

Scale at A3
NTS

Drawing No.
MMD-367516-S28-GEN-005

0 0.125 0.25 Kilometers

P:\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk.mxd



SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Bridleway (public)
- Restricted byway (public)
- Byway open to all traffic (public)
- Road / Track (private)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)
- Motorised Only Diversion Route

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

S31 Mutton Hall Proposal

Private: No existing or proposed rights

Public: Existing footpath rights removed, users divert to adjacent Wetherden Street bridge to the east

Infrastructure. Proposed fencing 10m at the level crossing on the north side of railway: Type F7
Proposed fencing 50m west past the level crossing to the south of the railway. To the east to follow Network Rail boundary to the road bridge: Type F4

NetworkRail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S31 - Mutton Hall
Suffolk - Wetherden CP
Post Code IP143LS

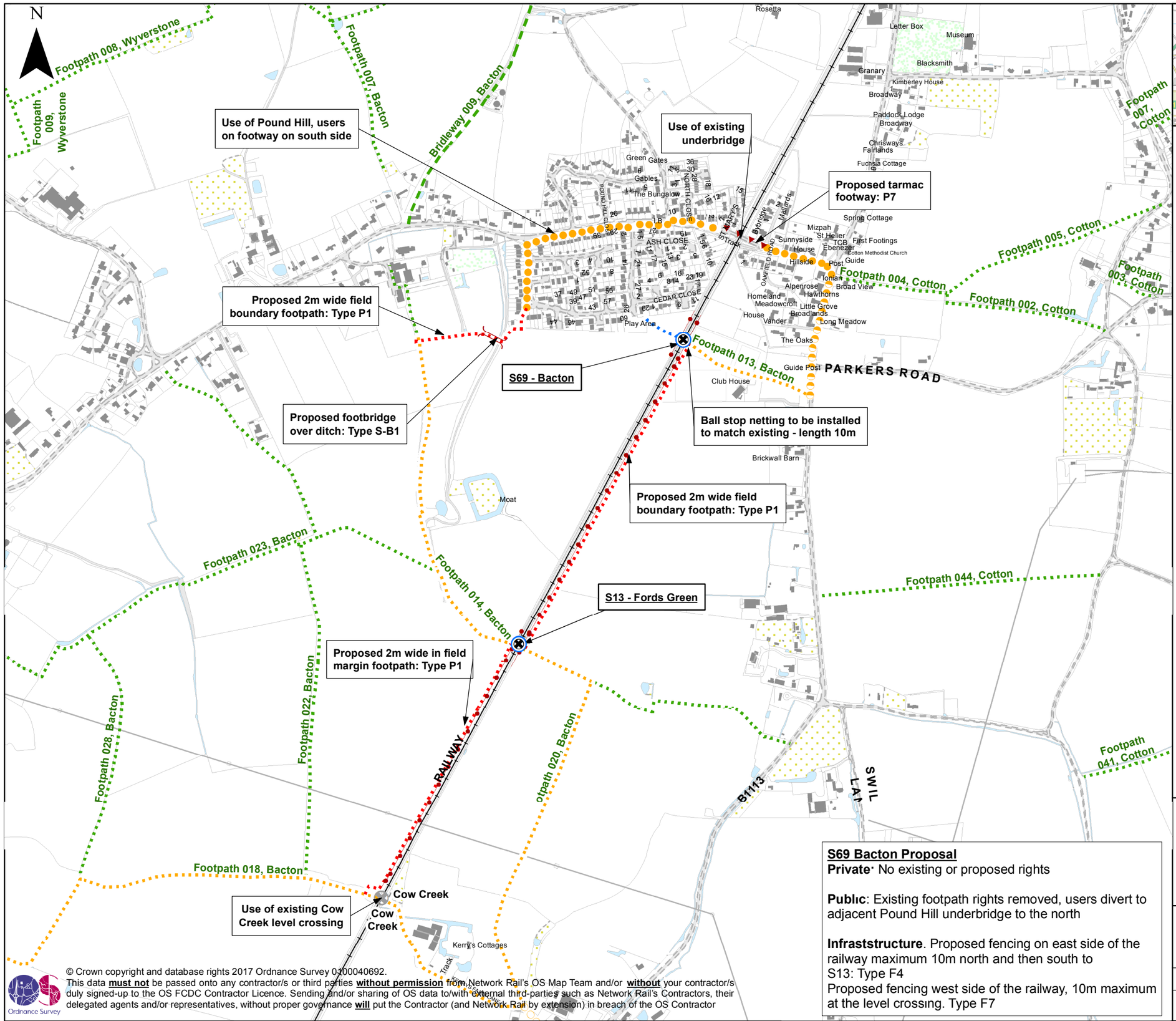
Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

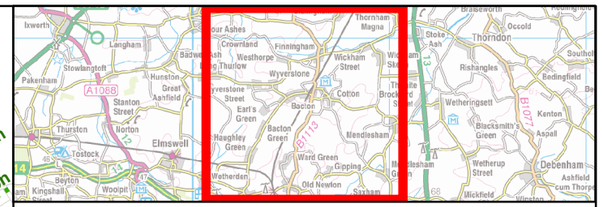
Scale at A3
NTS

Drawing No.
MMD-367516-S31-GEN-005

0 0.075 0.15 Kilometers

P:\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk.mxd





SECTION 1: LEVEL CROSSINGS

- Rights to be modified as part of this project
- Rights not modified as part of this project

The above symbols indicate existing level crossing locations.
The ring colours are as per section 4 below.

SECTION 2: TYPE OF RIGHT OF WAY (excluding adopted highway)

- Footpath (public)
- Byway open to all traffic (public)
- Bridleway (public)
- Road / Track (private)
- Restricted byway (public)

The line styles above illustrate the type of right of way extant or proposed.
The colour is per section 4 below.

SECTION 3: PROPOSED USE OF ADOPTED HIGHWAY

- Footway Available
- Motorised Only Diversion Route
- Verge Available (No Footway)
- Carriageway Available (No Footway or Verge)

Where the proposals may divert users onto an adopted highway, the above symbols denote where a footway is available, a verge only, or if neither a footway or verge is available and pedestrians would need to walk in the carriageway.

SECTION 4: PROPOSED STATUS CHANGE

- No change and not part of diversion
- Use of existing right of way as part of diversion
- Change of status to existing right of way
- Closure of existing right of way
- Creation of new right of way

The above colours apply to sections 1, 2 and 3 above.

SECTION 5: ASSOCIATED INFRASTRUCTURE (Indicative features)

- Fencing (tie into existing)
- Gates
- Bridges
- Footway
- Future developments by Third Party projects where planning details are available
- Railway

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.

S69 Bacton Proposal

Private: No existing or proposed rights

Public: Existing footpath rights removed, users divert to adjacent Pound Hill underbridge to the north

Infraststructure. Proposed fencing on east side of the railway maximum 10m north and then south to
S13: Type F4
Proposed fencing west side of the railway, 10m maximum at the level crossing. Type F7

NetworkRail

MOTT MACDONALD

Anglia Level Crossing Reduction Strategy

Design Freeze Proposals

S69 - Bacton
Suffolk - Bacton CP
Post Code IP14 4NS

Rev	Date	Description	Dwn	E Chk	Ch'k'd	App'd
P3A	Mar 2017	For Information	WC	SRP	SJT	JAS

Scale at A3
NTS

Drawing No.
MMD-367516-S69-GEN-005

0 0.175 0.35 Kilometers

P:\Leeds\Eastern\367516 - GRIP 2-4 - Anglia Level Crossings.JAS\GIS\Design\Design Freeze Plans\04 MXDs\New Format DF\P3\Suffolk\367516 Design Freeze Proposal Plans - Alternative Format Suffolk_RD.mxd

APPENDIX OBJ/036/W10/2-7

Extract from MfS regarding carriageway widths

Communities and Local Government

Department for Transport

Manual for Streets

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Communities and Local Government

Department for Transport

Manual for Streets

thomas telford publishing

Published by Thomas Telford Publishing, Thomas Telford Ltd, 1 Heron Quay, London E14 4JD. www.thomastelford.com

Distributors for Thomas Telford books are
USA: ASCE Press, 1801 Alexander Bell Drive, Reston, VA 20191-4400, USA
Japan: Maruzen Co. Ltd, Book Department, 3–10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103
Australia: DA Books and Journals, 648 Whitehorse Road, Mitcham 3132, Victoria

First published 2007

Published for the Department for Transport under licence from the Controller of Her Majesty's Stationery Office

A catalogue record for this book is available from the British Library

ISBN: 978-0-7277-3501-0

Printed and bound in Great Britain by Maurice Payne Colourprint Limited using material containing at least 75% recycled fibre.

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

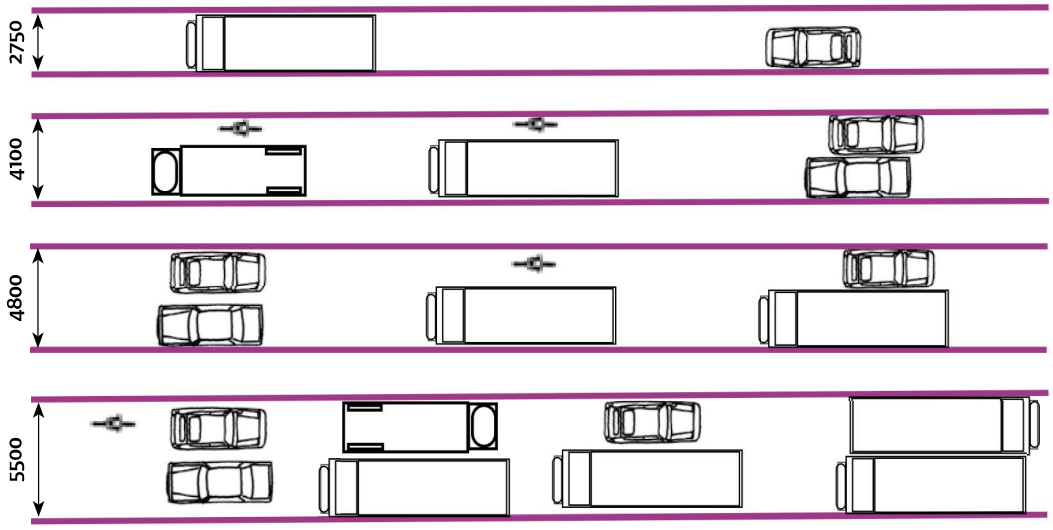


Figure 7.1 Illustrates what various carriageway widths can accommodate. They are not necessarily recommendations.

APPENDIX OBJ/036/W10/2-8

Extract from DMRB regarding visibility requirements

VOLUME 6 ROAD GEOMETRY
SECTION 1 LINKS

PART 1

TD 9/93 - AMENDMENT NO 1

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.

INSTRUCTIONS FOR USE

This amendment is to be incorporated in the Manual.

1. Remove existing contents page for Volume 6, and insert new contents page for Volume 6, dated February 2002.
2. Remove existing cover sheet for Highway Link Design and insert new cover sheet.
3. Remove existing TD 9/93 contents sheet and insert new TD 9/93 Amdt No 1 contents sheet.
4. Remove existing “Detailed contents of Chapters 1-8” sheet and insert new sheet dated February 2002.
5. Remove existing Chapter 0 “Foreword” pages 0/1, 0/2 and 0/3 and insert pages 0/1 and 0/2 dated February 2002.
6. Remove existing Chapter 5 (including Annexes B and C), and insert new Chapter 5.
7. Insert the Amendment Sheet at the front of the document after the new cover sheet.
8. Enter details of Amendment No 1 on Registration of Amendment sheet and sign and date to confirm the amendment has been incorporated.
9. Remove sheets 9/1 and 10/1 and insert new sheets dated February 2002.
10. 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.

DESIGN MANUAL FOR ROADS AND BRIDGES

TD 9/93
Incorporating
Amdt No 1 dated
February 2002

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.

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 V^2/R values shown in Table 3 above simply represent a convenient means of identifying the relative levels of design parameters, irrespective of Design Speed.