Technical Note

UNDATED RECEIVED 2009

ATKINS

Project:	Pitchcombe Junction Revision A
Subject:	Development of Design Proposals Provided by Gloucestershire Highways

1. Introduction

Atkins were appointed by Gloucestershire Highways (GH) to investigate the feasibility of a proposed design to improve conditions at the Pitchcombe junction.

The proposed design was reviewed by Atkins in light of the related standards, mainly TD9/93 *Highway Link Design*, TD27/05 *Cross Sections and Headrooms* and TD 42/95 *Geometric Design of Major/Minor Priority Junctions*. The design proposals were also checked using both Autotrack and MX.

The aim of this technical note is to explain the issues related to implementing the design provided by GH.

This note should be read in conjunction with drawings 5064343_004/001, 5064343_004/002 and 5064343_004/003 as well as the design sketch provided by GH.

2. Background

The design proposals submitted by GH aim to increase junction visibility which is achieved through the following:

- Narrowing the northbound section of the A46 to one lane only by removing the A4173 off-slip. This would also prevent vehicles travelling southbound along the A46 from entering the Halfway Pitch.
- Incorporating the bus lay-by along the northbound lane of the A4173 into the carriageway space and relocating the bus lay-by. This aims to increase the space available for turning movements from Halfway Pitch into both the northbound and southbound lanes of the A46.
- Reducing carriageway levels south of the junction to improve forward visibility on the A46 and for southbound vehicles queuing at the junction.

3. Design Issues

3.1 Horizontal Alignment and Turning Movements

The proposed design was checked using Autotrack software to ensure that the following movements are achievable: the design vehicles were a 16.5 metres articulated vehicle and a fire tender.

- Right turn movement off the A4173 and onto the A46 southbound
- Right turn movement off the A46 southbound and onto the A4173 northbound
- Continuing left on the A4173 northbound off the A46 northbound
- Right turn out of Halfway Pitch onto the southbound lane of the A46 .Due to the presence of existing and proposed island this manoeuvre can only be achieved if vehicles initially make a left turn onto the A4173 before turning right onto the A46. It is suggested that hatched road markings are introduced along the top edge of the proposed island in order to encourage

vehicles to use the widened carriageway (including the incorporated bus lay-by space) and ultimately further facilitate this difficult manoeuvre.

It is important to note that the tracking of vehicle movements dictated the layout of the junction. This resulted in the size of the island being smaller than that proposed by GH and a very wide junction between the A46 and the A4173.

The tracking of the turning manoeuvres shows that all these movements can be accommodated within the existing carriageway boundary and no land acquisition will be necessary other than the incorporation of the bus lay-by. However, the vehicle movements are far from ideal and whilst technically possible some of the more difficult manoeuvres would be at the limit of the design vehicle's capability.

Two right turn bans will be required to enable this junction layout to work. They are the movement from the A46 southbound to Halfway Pitch and the movement out of Halfway Pitch southbound onto the A46. This latter movement could be accommodated by initially turning left onto the A4173 and heading north for a short distance before undertaking a 180° turn into the A4173 junction with the A46. This manoeuvre would be difficult for anything larger than a car and impossible for anything larger than a fire tender. Furthermore, if there is 1 or more vehicle already queuing at the A4173 southbound give way line then it is not possible for any vehicle to make this manoeuvre.

3.2 Vertical Alignment and Visibility

Forward visibility was checked along the A46. The existing K value at the junction site is 5 whereas design standard TD9/93 states that for this design speed the desirable minimum crest K is 55 with the one step below minimum crest K value to be 30. The design standard states that in some cases relaxations to standards are allowable for up to 2 steps below the desirable minimum values on all A-roads. However, it should be noted that the same design standard further states that relaxations to standards are not allowable in certain cases such as on approaches to junctions. Strictly in accordance with the standard the desirable minimum K value of 55 should therefore be applied at this junction.

Another important note is that the MX modelling shows that K values along the A46 are below standard at many other locations. This complicates the design further as the tie in points will need to be given extra thought in order to ensure that they meet the design standards.

3.3 Earthworks

Notwithstanding the above comments a crest K value of 2 steps below desirable minimum was used for the design as this is the most likely scenario should it progress. Even with this relaxation in standard the earthworks would be prohibitively excessive. In the immediate region of the junction the reduction in level would be up to 2.2m. Clearly this is not possible due to the impact on the residential properties adjacent to the A46. If this design was to proceed it is likely that Halfway House and possibly Keston Lodge would need to be demolished or at the very least supported with a retaining structure. Such a structure would not only be expensive but would also need to provide space for parking and vehicular access to these two properties.

The impact on the surrounding land has not been modelled but this is also likely to be excessive. For example, the already steep Halfway Pitch would become even steeper and the land either side of it would need to be re-graded. Since this is already very steep it is possible that a retaining structure or an engineered slope may be required but information on ground conditions would be required to determine the full extent of any treatment.

The amended vertical alignment would require full carriageway construction of the A46 over a length of approximately 180m and would require a road closure to enable this. In addition the utility apparatus present in the carriageway or verges would need diversion. A budget cost estimate for this work has not been obtained but it is likely that diversionary works could run to tens if not hundreds of thousands of pounds.

3.4 Operation

In some respects the operation of the junction under the proposed scheme would not be that different from existing but in others it would be worse. The main reason for making changes to the junction is presumably to alleviate the difficulty experienced by southbound A4173 traffic trying to join the A46 southbound. The only benefit of the proposals to these drivers would be the increased visibility if the vertical alignment is amended. However, as has been clearly demonstrated, this aspect of the proposal is extremely unlikely to be taken forward. Without this there is little if any benefit in amending the horizontal alignment in line with the proposal.

The A46 southbound to A4173 northbound manoeuvre is currently not possible due to the geometry of the junction but this could be achieved with the proposed alignment. However, it is not clear what demand exists for this movement or even if this is a priority of the scheme. Traffic that needs to make this manoeuvre is currently making alternative arrangements and it is possible that the existing arrangements (such as using the local road network north of the junction to change routes or turning around at some point south of the junction) may be satisfactory in relation to the demand.

The movements into and out of Halfway Pitch would not change significantly but there would be a slight benefit for traffic turning south out of the junction onto the A46 since the junction would effectively be moved further north, giving a greater turning area. However, if the vertical alignment were to be amended then the side road would be even steeper and some of this already small benefit would be lost.

The main disadvantage of the proposal is for northbound vehicles on the A46 turning off onto the A4173. This manoeuvre would become unnecessarily complicated and potentially dangerous as vehicles would have to give way to southbound A46 to northbound A4173 traffic. Whilst this may not happen very often it is potentially a dangerous situation.

4. Conclusion

The following statements refer to the horizontal alignment proposals only as the shortcomings of the vertical alignment are self evident and need no further discussion.

Whilst the proposal would create some small benefits to the operation of this junction it would also introduce some much more significant disbenefits. It is difficult to see how developing this proposal could be justified as the net result would be a significantly more confusing and dangerous junction layout than exists at present. Whilst the existing layout is far from ideal it has functioned for many years and all regular users of this section of the network are familiar with its shortcomings and presumably make allowances for this in their driving. It is therefore strongly recommended that this proposal is not developed further as the existing layout is the better of the two options. There may be other more suitable improvement options that could offer significant benefits over the existing but this is beyond the scope of this note.

Rev A

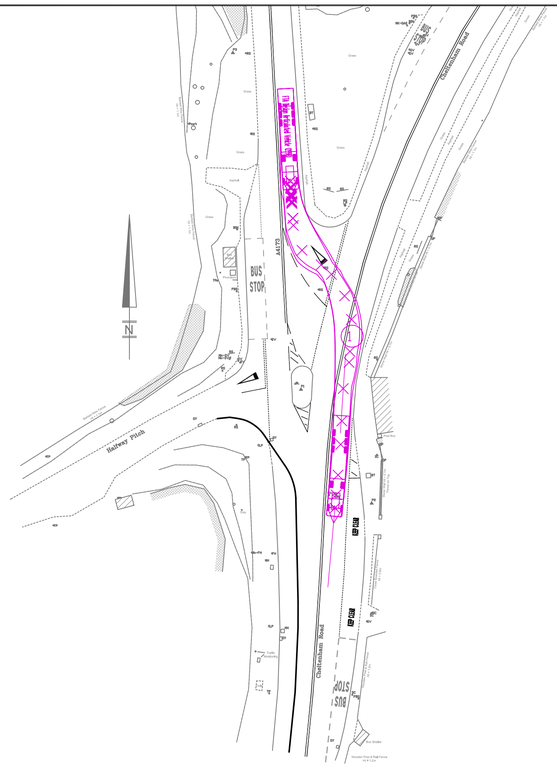
Drawing Number 5064343_004/001

Status P

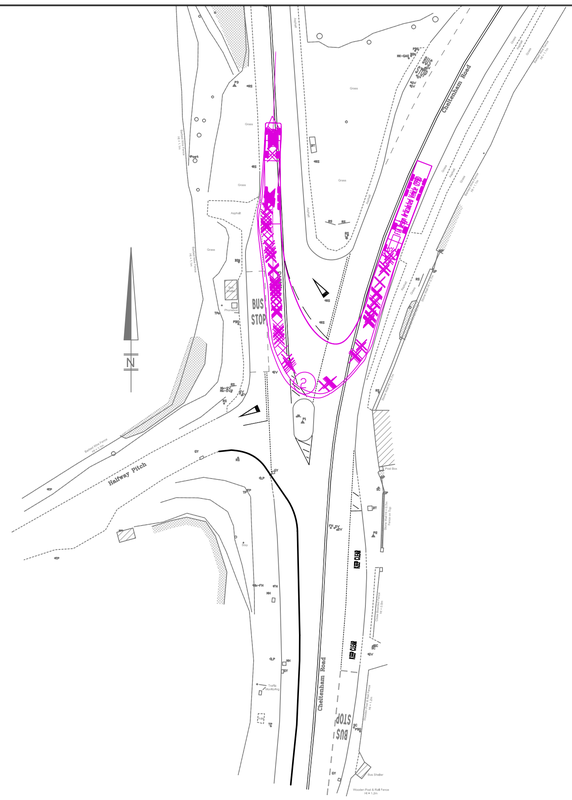
DO NOT SCALE

100 0 10

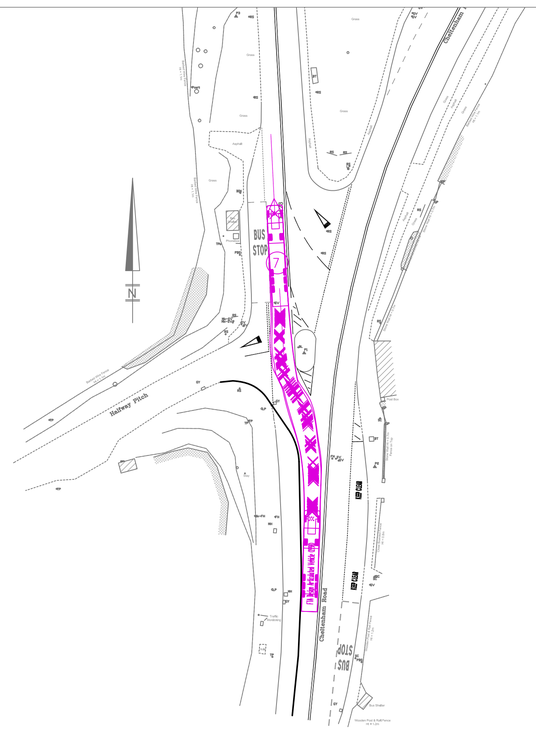
A1



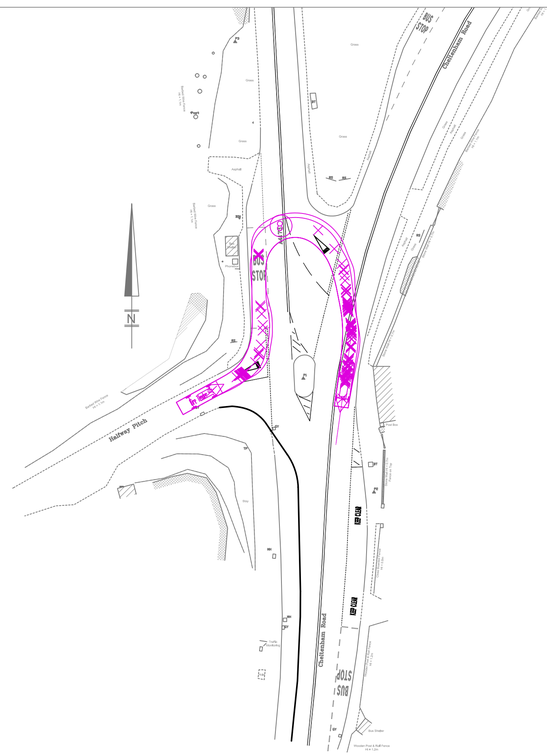
A4173 SB TO A46 SB. 16.5m ARTICULATED



A46 SB TO A4173 NB. 16.5m ARTICULATED



A46 NB TO A4173 NB. 16.5m ARTICULATED



HALFWAY PITCH TO A46 SB. FIRE TENDER VEHICLE

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Date: Apr 02, 2009 - 4:53pm Plotted by: iles2557

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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING SIGNIFICANT RESIDUAL RISKS

CONSTRUCTION
(ENTER "NONE" IF APPLICABLE)

MAINTENANCE/CLEANING
(ENTER "NONE" IF APPLICABLE)

USE
(ENTER "NONE" IF APPLICABLE)

DECOMMISSIONING/DEMOLITION
(ENTER "NONE" IF APPLICABLE)

Stat	Purpose of Issue	Date	Auth
A	FIRST ISSUE	04/09	AIH

Rev	Description	By	Date	Chk'd	Auth
A	FIRST ISSUE	SI	04/09	DM	AIH

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Client

Project
PITCHCOMBE JUNCTION IMPROVEMENTS

Title
SWEPT PATH ANALYSIS

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	1:500	SI Date 04/09	DM Date 04/09	AIH Date 04/09

Status	Drawing Number	Rev
P	5064343_004/001	A

Rev A

Drawing Number 5064343_004/002

Status P

DO NOT SCALE

100 0 10

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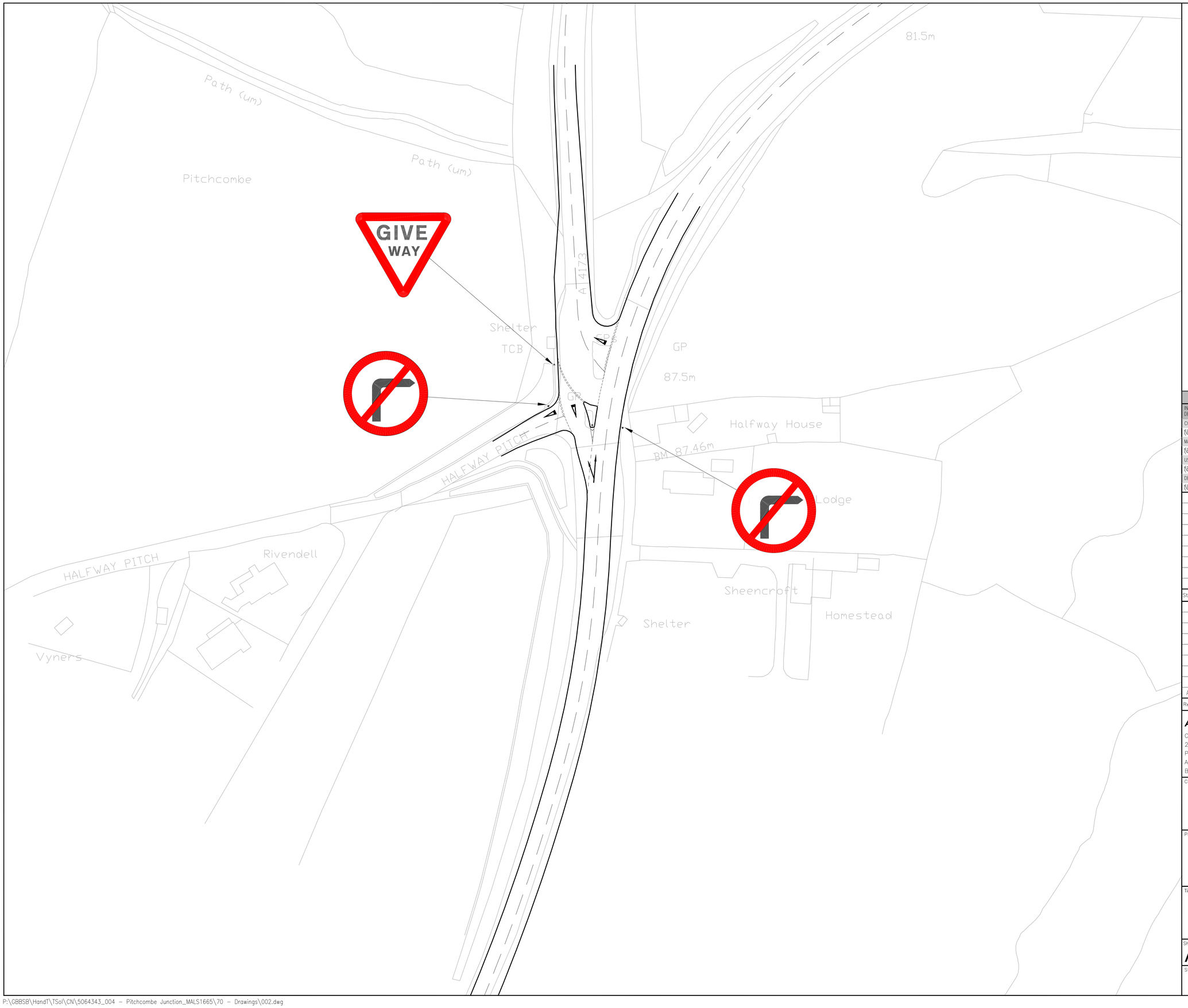

NOTE:
NEW SIGNING ONLY SHOWN REVIEW OF EXISTING SIGNING AND NEW SIGNING REQUIREMENTS WILL BE UNDERTAKEN AT THE NEXT STAGE OF DESIGN

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
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MAINTENANCE/CLEANING
{CONTR 'NONE' IF APPLICABLE}
USE
{CONTR 'NONE' IF APPLICABLE}
DECOMMISSIONING/DEMOLITION
{CONTR 'NONE' IF APPLICABLE}

Stat	Purpose of Issue	Date	Auth

Rev	Description	By	Date	Chk'd	Auth
A	FIRST ISSUE	SI	04/09	DM	AIH

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Project
PITCHCOMBE JUNCTION IMPROVEMENTS

Title
REVIEW OF DESIGN PROPOSALS SUBMITTED BY GLOUCESTERSHIRE HIGHWAYS

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	1:500	SI Date 04/09	DM Date 04/09	AIH Date 04/09

Status	Drawing Number	Rev
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Date: Apr 02, 2009 - 5:44pm Plotted by: iles2557

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Rev A

Drawing Number 5064343_004/003

Status

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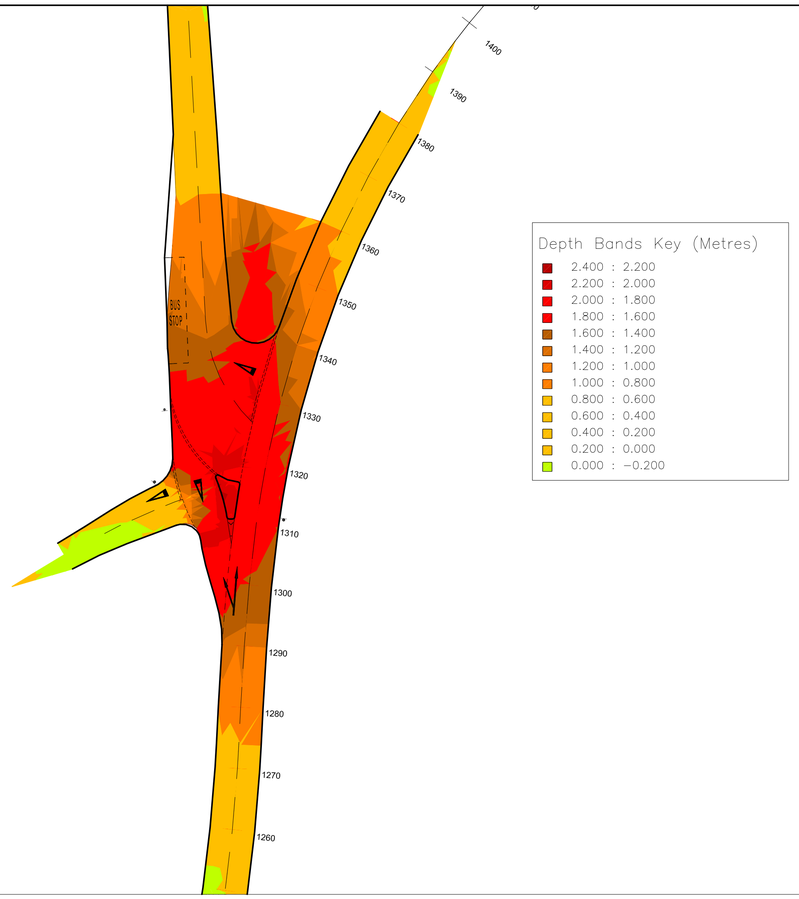
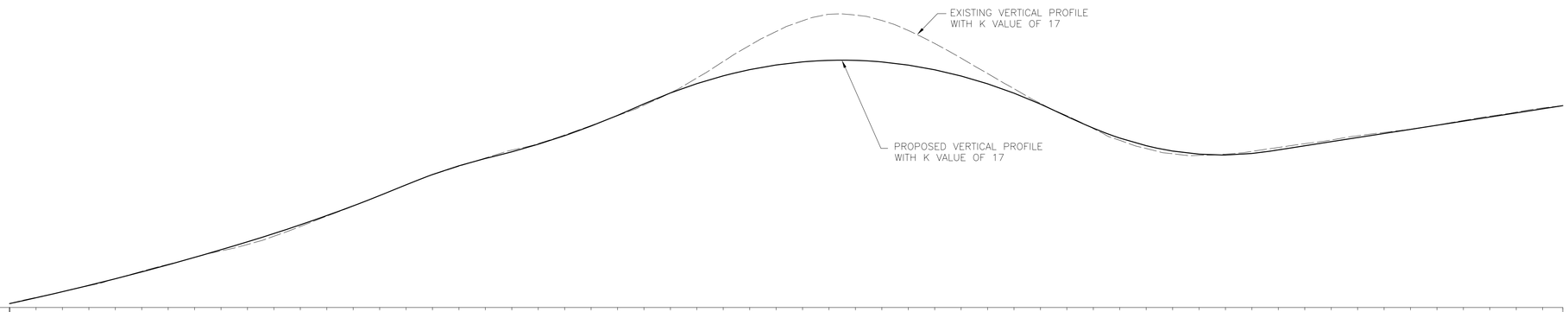


Depth Bands Key (Metres)

2.400	2.200
2.200	2.000
2.000	1.800
1.800	1.600
1.600	1.400
1.400	1.200
1.200	1.000
1.000	0.800
0.800	0.600
0.600	0.400
0.400	0.200
0.200	0.000
0.000	−0.200

EXTENT OF EARTHWORKS TO ACHIEVE K VALUE OF 17
SCALE 1:500



LONGSECTION ALONG A46
SCALE H=1:1000, V=1:100

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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(CONTER 'NONE' IF APPLICABLE)

USE
(CONTER 'NONE' IF APPLICABLE)

DECOMMISSIONING/DEMOLITION
(CONTER 'NONE' IF APPLICABLE)

Stat	Purpose of Issue	Date	Auth
A	FIRST ISSUE	SI 04/09	DM AIH

Rev	Description	By	Date	Chk'd	Auth

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Client

Project
PITCHCOMBE JUNCTION IMPROVEMENTS

Title
REVISED VERTICAL ALIGNMENT AND RESULTING EARTHWORKS

Sheet Size	Original Scale	Designed/Drawn	Checked	Authorised
A1	AS SHOWN	SI Date 04/09	DM Date 04/09	AIH Date 04/09

Status	Drawing Number	Rev
P	5064343_004/003	A

File: 003.dwg Date: Apr 02, 2009 - 4:58pm Plotted by: iles2557

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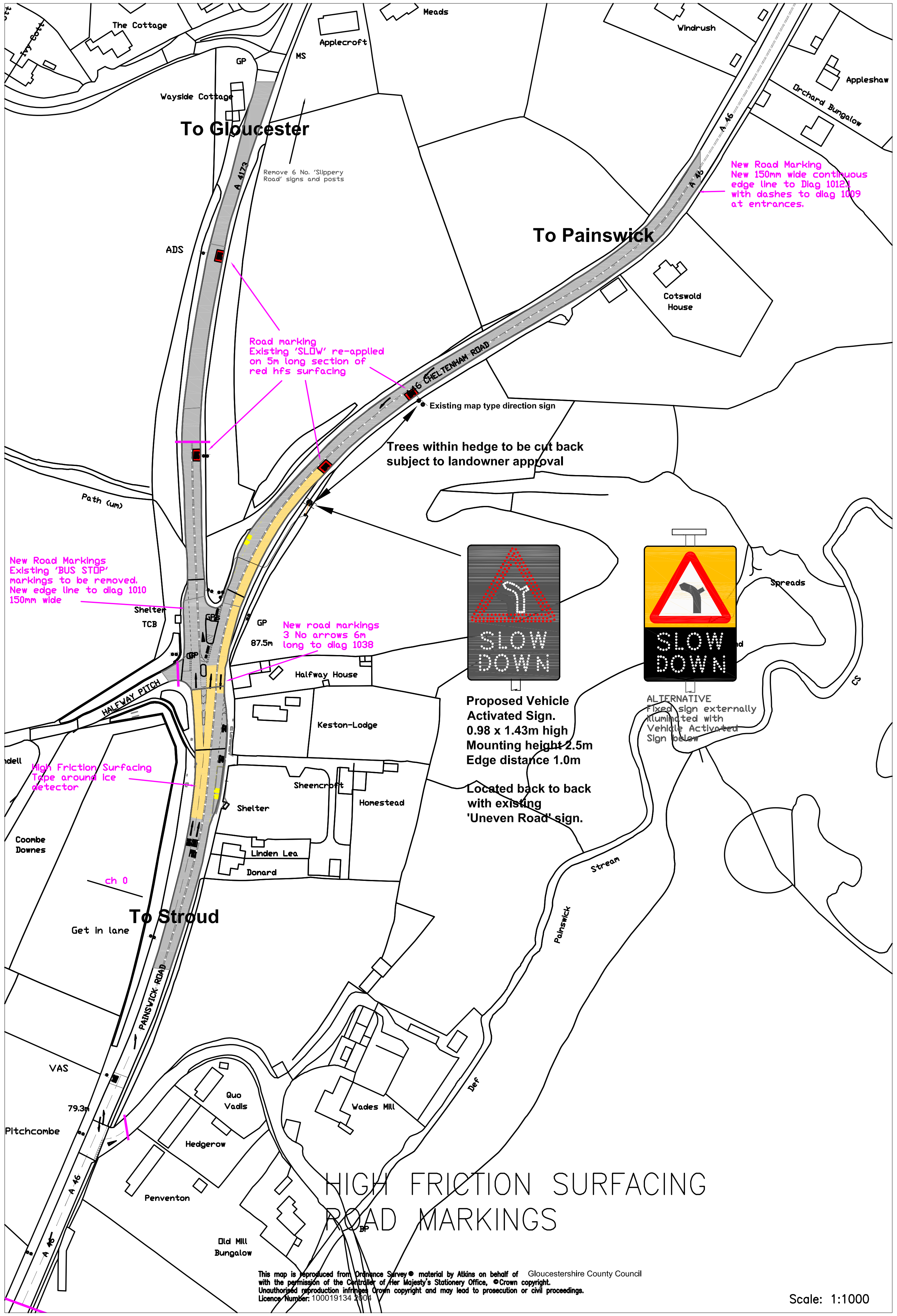

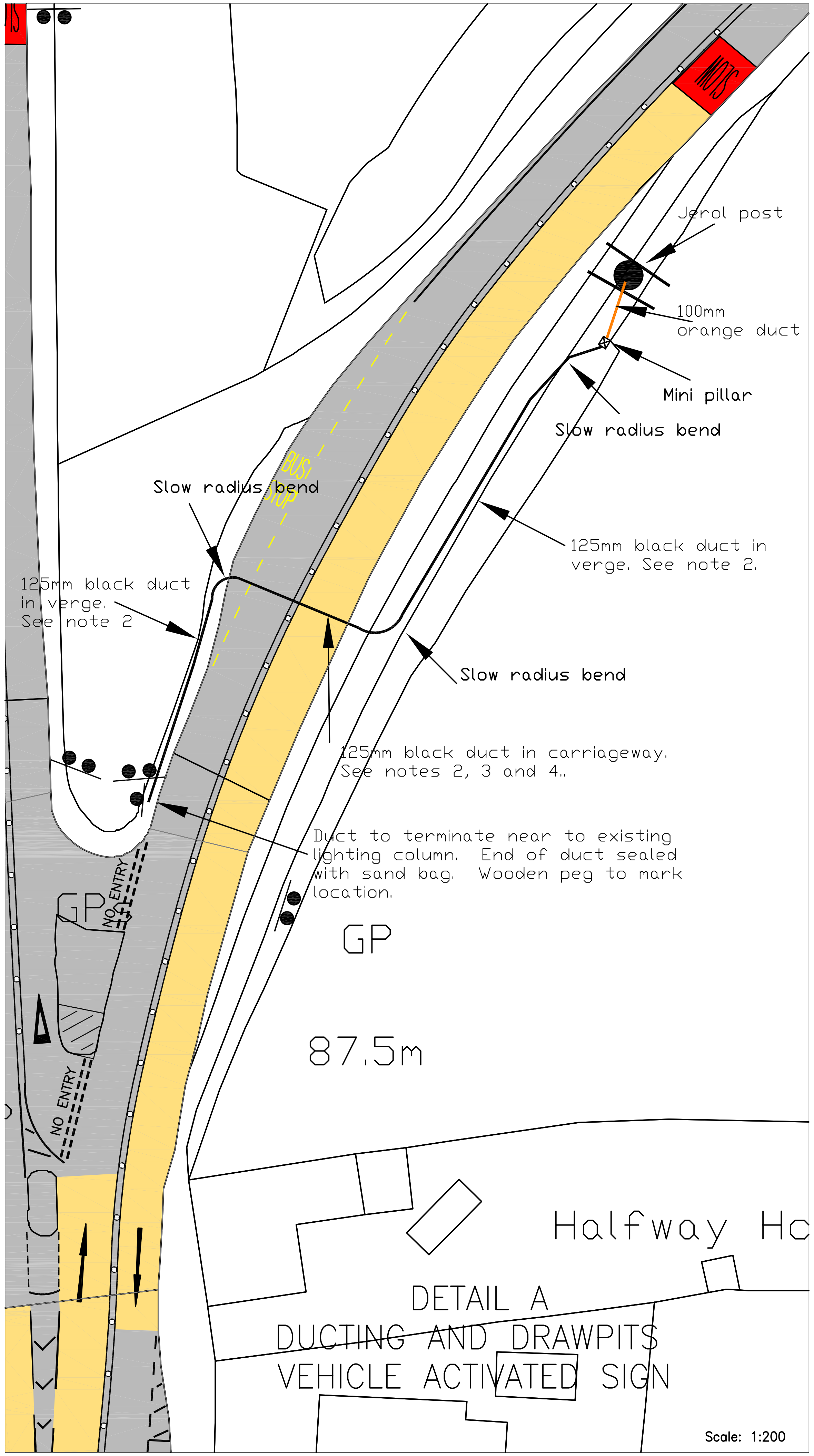

Key:

- Limit of road markings work. See Note 1
- Buff coloured 'cold apply' resin high friction surface PSV 70
- Red coloured thermoplastic traffic calming material.

Notes:

1. Modifications to road markings are indicated in blue text. . . ALL OTHER MARKINGS TO BE REFRESHED
2. Black ducts must be stamped with the text 'ELECTRIC' in addition to hazard warning tape.
   Ducting in verge to have 450mm cover.
   Ducting in carriageway to have 750mm cover.
   Draw chord to be included.
3. For details of ducting refer to standard drawing GH/HSD/500/10 Rev A.
   For details of reinstatement refer to DTp specification for reinstatement in highways.
   NRSWA flexible road Type 0 all permanent reinstatement.
   AC 14mm Close Surf 100/150 P PSV 65, AAV 14.
4. Whilst undertaking surfacing course of duct trench, 2No. core holes on A46 Stroud Approach also need improved reinstatement.

Rev	By	Chkd	Apprvd	Date	Description
-	-	-	-	-	-

Gloucestershire HIGHWAYS
Gloucestershire County Council & Atkins

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Project
Pitchcombe Junction
-
-

Drawing
General Arrangement
-
-

Drawn by:	MS	Date:	-
Checked by:	AH	Date:	-
Approved by:	AJF	Date:	-

Drawing No. SD.25238.40.011
Revision -
Drawing Scale: As Shown

Drawing file path & name: S:\SchemeDelivery\25000 Improvements\25238 - Pitchcombe Junction\40 Drawings\Acad\user\Mike\ Pitchcombe.dwg
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User and Plot Date: mikesmith - 25.6.2010 - 5.6 pm