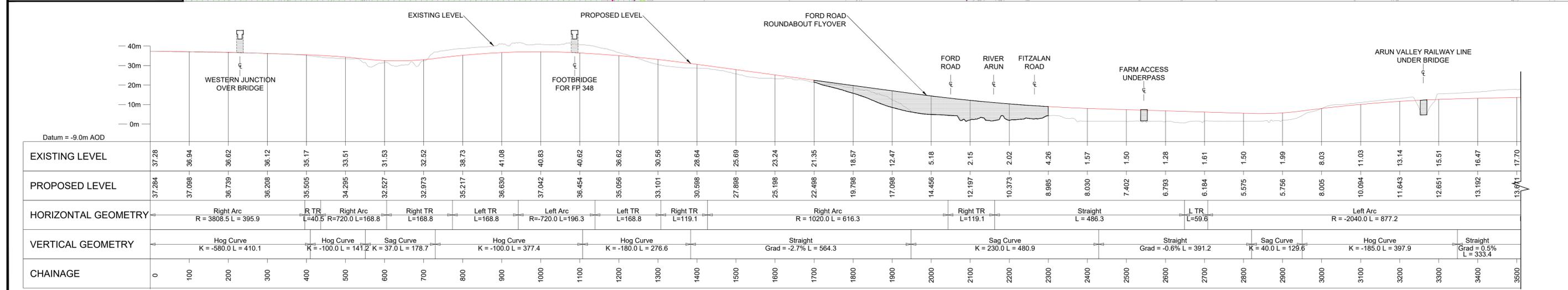
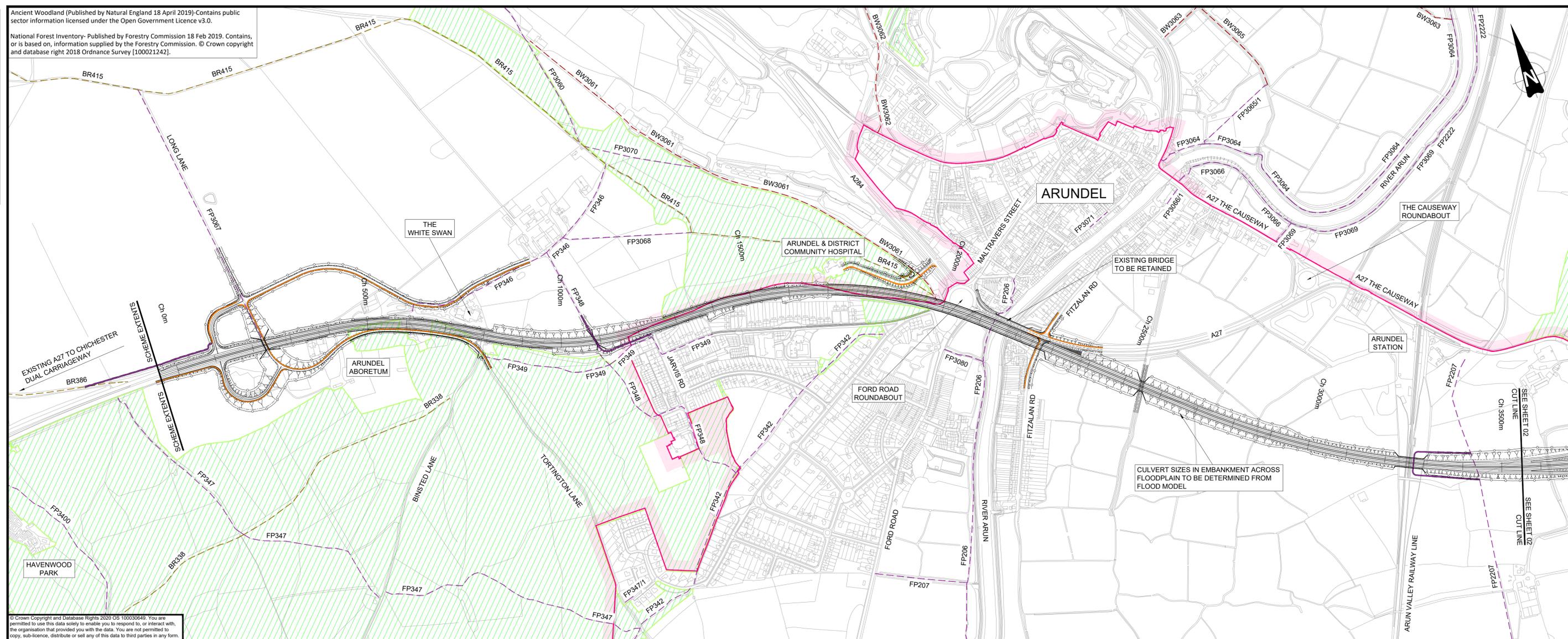


A27 Arundel Bypass Scheme Assessment Report

Appendix D - Scheme Option Drawings

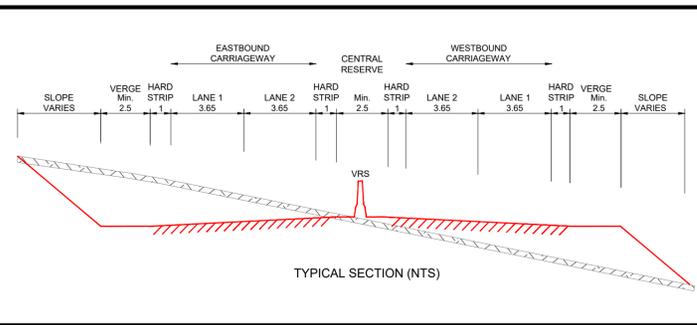
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KEY:

- PROPOSED STRUCTURE
- ANCIENT WOODLAND
- NATIONAL FORESTRY INVENTORY
- EXISTING FOOTPATH
- EXISTING BRIDLEWAY
- EXISTING BYWAY
- SOUTH DOWNS NATIONAL PARK ON SHADED SIDE OF BOUNDARY
- PROPOSED FOOTPATH
- PROPOSED BRIDLEWAYS
- PROPOSED FOOTWAY
- INDICATIVE FENLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
Refer to Residual Hazard Drawings and Designer Risk Management Schedule.					
Rev.	Date	Description	Drawn	Eng Check	Authorised
P01	23/11/18	First Revision	DE	AH	SH
P02	05/02/19	Updated for 2nd Rev of Benchmark Quants	DE	RT	SH
P03	26/02/19	Changes to PRow and Floodplain Levels	SN	RT	SH
P04	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH
C01	12/07/19	Amended for DF2a	DE	RT	SH

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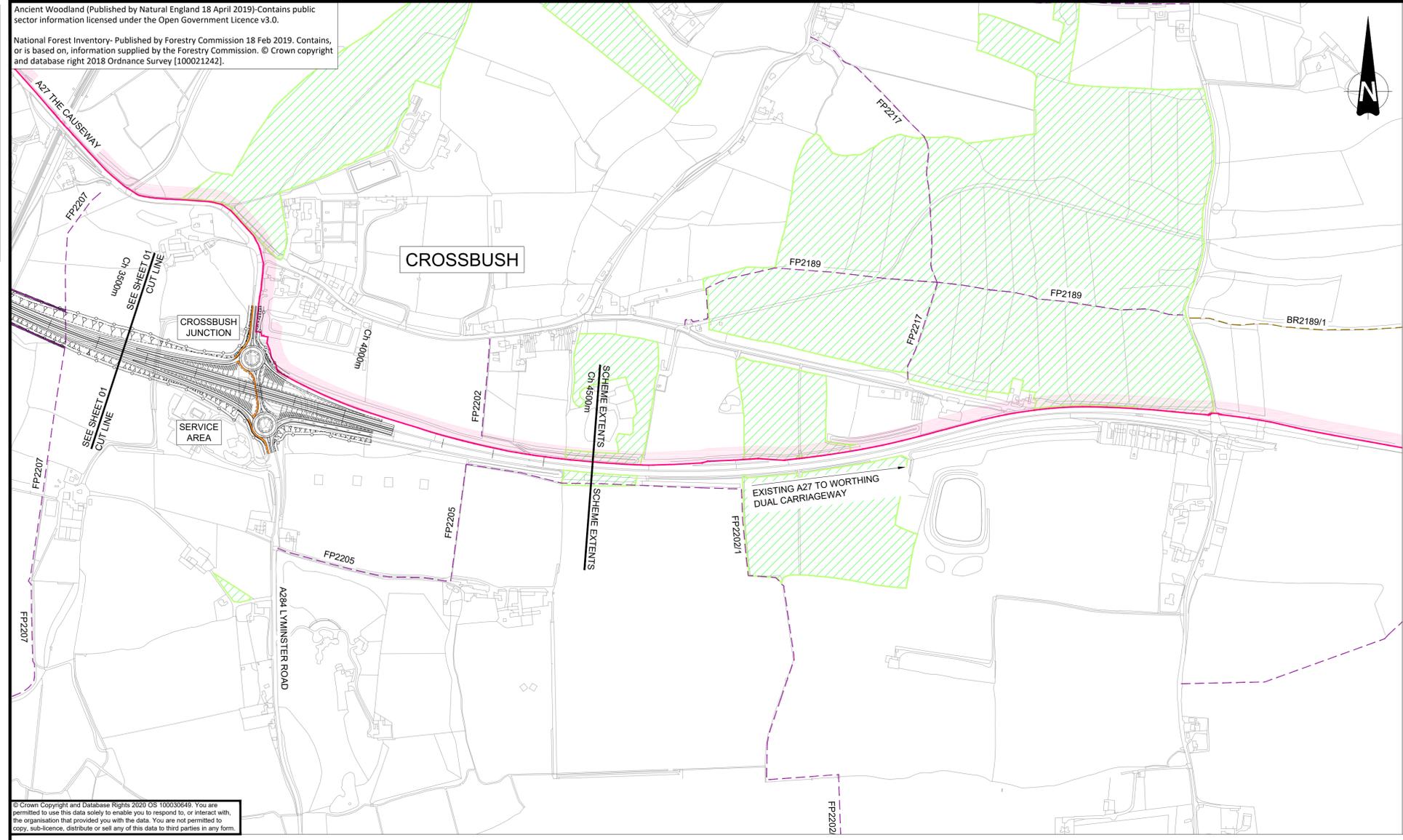
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Original Size	A1	Date	12/07/19	Date	15/07/19	
Disc. Check	S.Haagman	Authorised	M.Emery	Date	26/05/20	
Drawing Number	HE551523	Originator	WSP	Volume	HGN	
HE PIN	C1	Location	O5	VC	A1	
DR	CH	00001	Number	C01	Revision	

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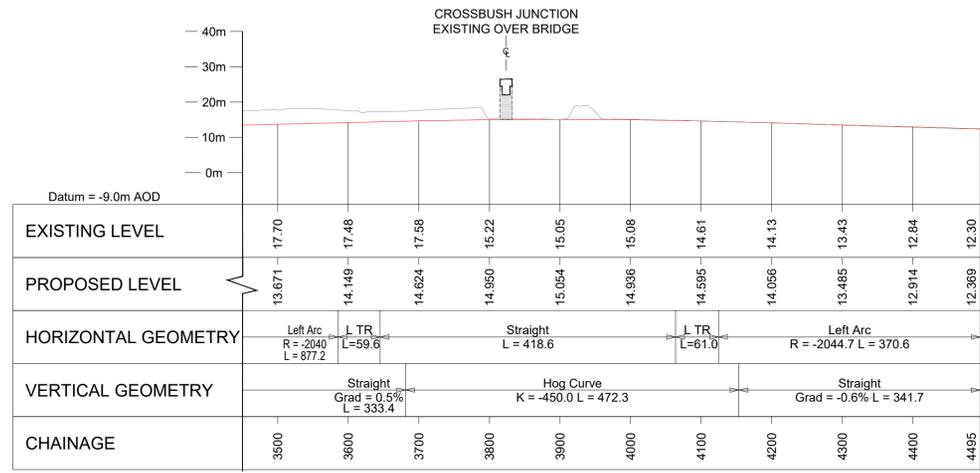
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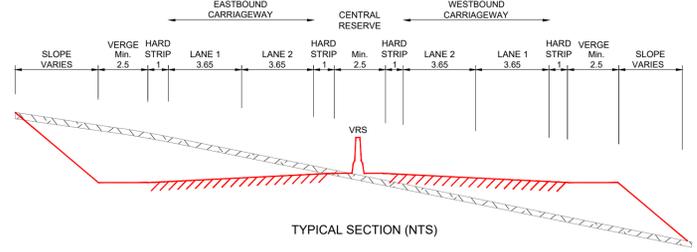
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- KEY:
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 - PROPOSED FOOTPATH
 - PROPOSED BRIDLEWAYS
 - PROPOSED FOOTWAY
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	23/11/18	First Revision	DE	AH	SH	...
P02	05/02/19	Updated for 2nd Rev of Benchmark Quants	DE	RT	SH	...
P03	26/02/19	Changes to PRoW and Floodplain Levels	SN	RT	SH	...
P04	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	...
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

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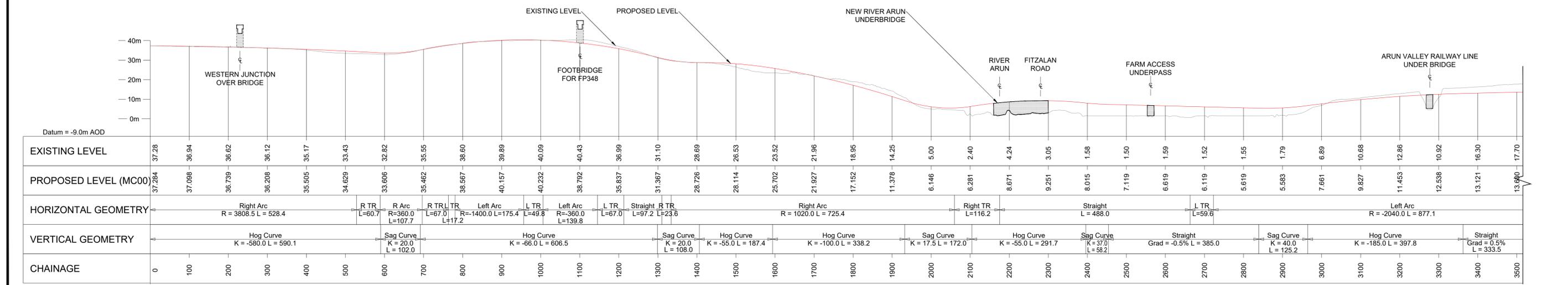
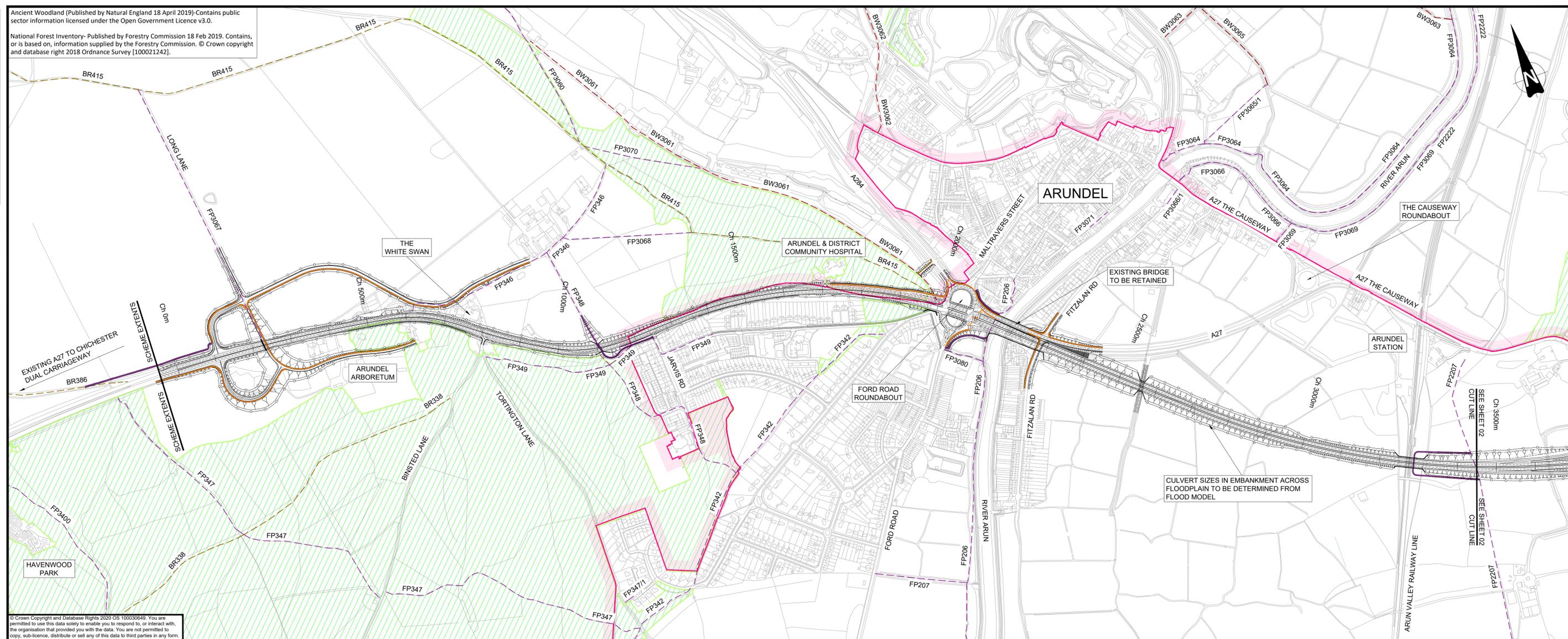
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Status: A2 Project Title: A27 ARUNDEL BYPASS

Drawing Title				
ENGINEERING LAYOUT OPTION 1 V5 SHEET 2 OF 2				
Scale	Drawn	Eng. Check	Disc. Check	Authorised
1:5000	D.Eddy	R.Tattersall	S.Haagman	M.Emery
Original Size	Date	Date	Date	Date
A1	12/07/19	15/07/19	15/07/19	26/05/20
Drawing Number			Design Stage	
HE PIN HE551523			2	
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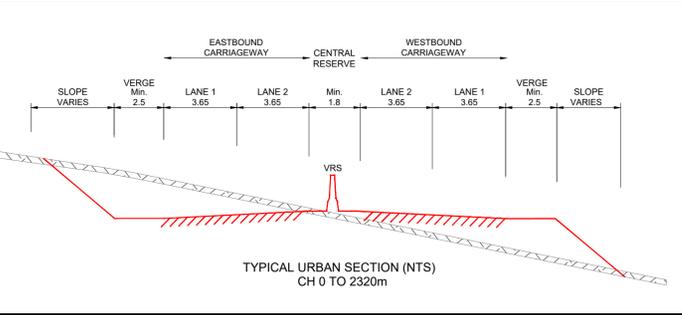


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KEY:

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- EXISTING BYWAY
- SOUTH DOWNS NATIONAL PARK ON SHADED SIDE OF BOUNDARY
- PROPOSED FOOTPATH
- PROPOSED BRIDLEWAYS
- PROPOSED FOOTWAY
- INDICATIVE FENLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Disc Check	Eng Check	Authorised
P01	11/01/19	First Revision	DE	RT	SH	...
P02	28/02/19	Changes to PRoW and Floodplain Levels	SN	RT	SH	...
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	...
P04	12/07/19	Amended for DF2a	DE	RT	SH	...
C01	21/08/19	Typical section alteration	DE	RT	SH	ME

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Status: A2

Project Title: A27 ARUNDEL BYPASS

Drawing Title: ENGINEERING LAYOUT OPTION 1 V9 SHEET 1 OF 2

Scale: 1:5000

Drawn: D.Eddy

Eng. Check: R.Tattersall

Disc. Check: S.Haagman

Authorised: M.Emery

Original Size: A1

Date: 21/08/19

Date: 27/08/19

Date: 27/08/19

Date: 26/05/20

Drawing Number: HE551523

HE PIN: WSP

Originator: HGN

Volume: 2

C1 O9 VC A1 DR CH 00001

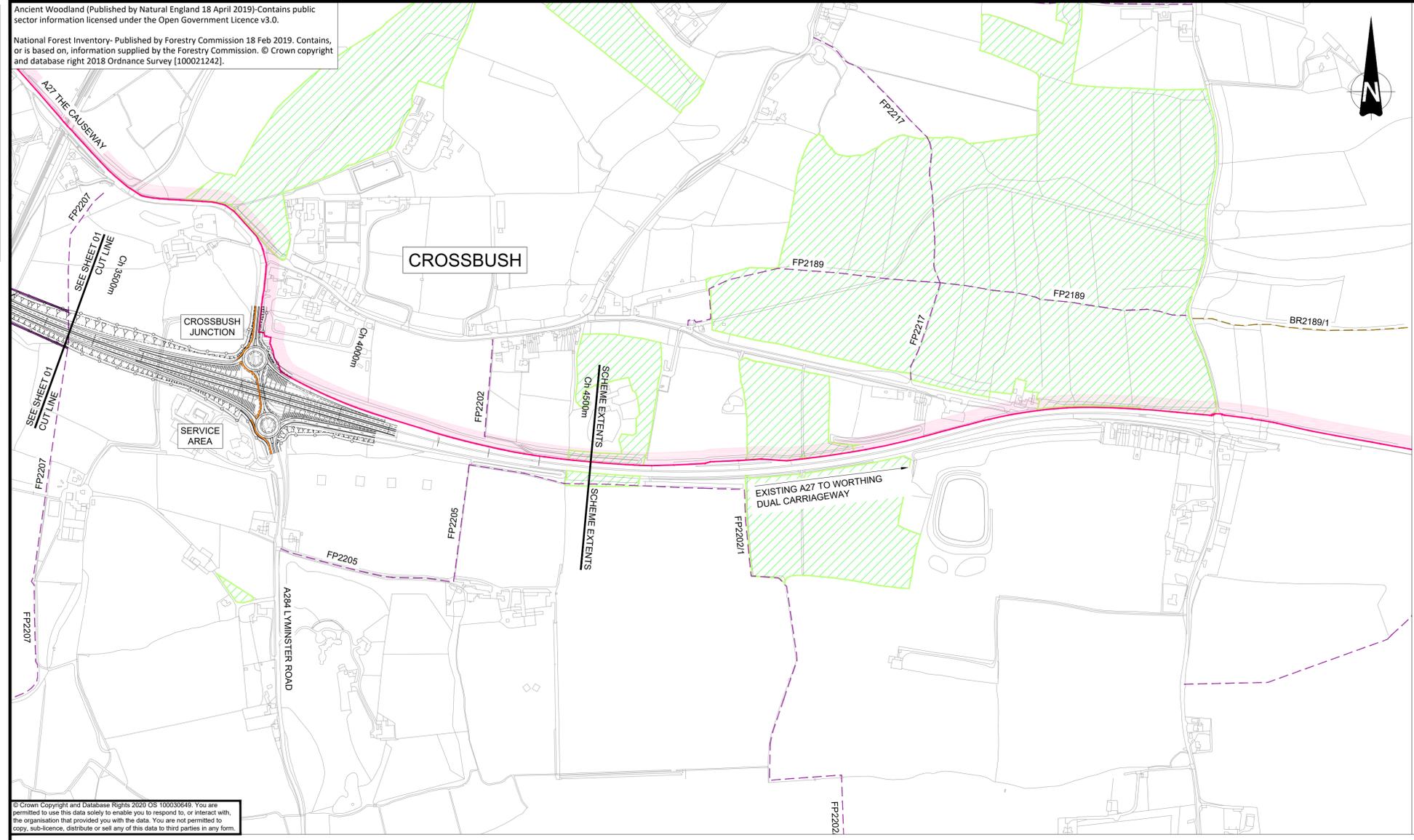
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Revision: C01

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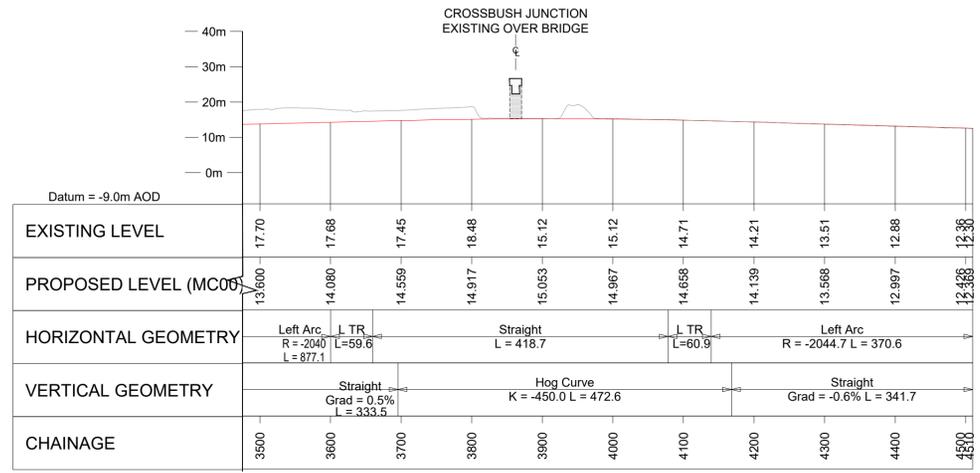
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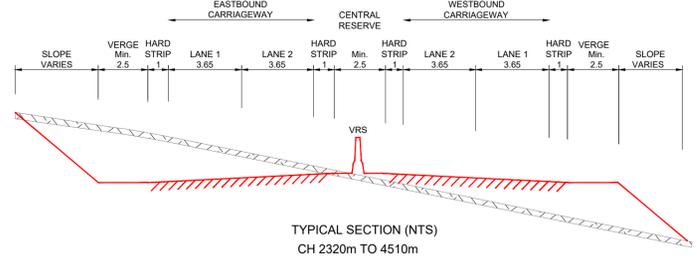
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 - PROPOSED BRIDLEWAYS
 - PROPOSED FOOTWAY
 - INDICATIVE FENCLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	11/01/19	First Revision		DE	RT	SH
P02	28/02/19	Changes to PRoW and Floodplain Levels		SN	RT	SH
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a		DE	RT	SH
P04	12/07/19	Amended for DF2a		DE	RT	SH
C01	21/08/19	Typical section alteration		DE	RT	SH

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Status: **A2** Project Title: **A27 ARUNDEL BYPASS**

Drawing Title: **ENGINEERING LAYOUT OPTION 1 V9 SHEET 2 OF 2**

Scale: 1:5000	Drawn: D.Eddy	Eng. Check: R.Tattersall	Disc. Check: S.Haagman	Authorised: M.Emery
Original Size: A1	Date: 21/08/19	Date: 27/08/19	Date: 27/08/19	Date: 26/05/20

Drawing Number: HE551523
HE PIN: C1 09 VC
Originator: WSP
Volume: HGN
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Role: DR CH
Number: 00002
Revision: C01

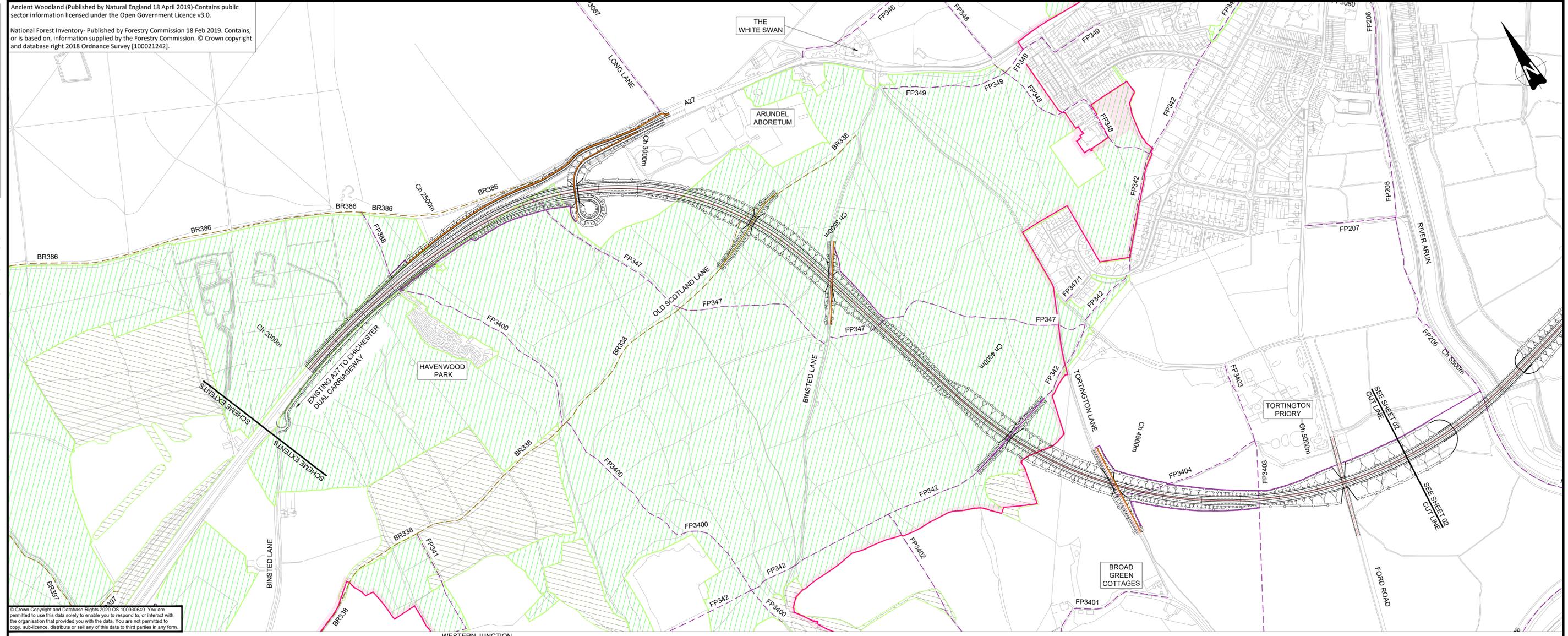
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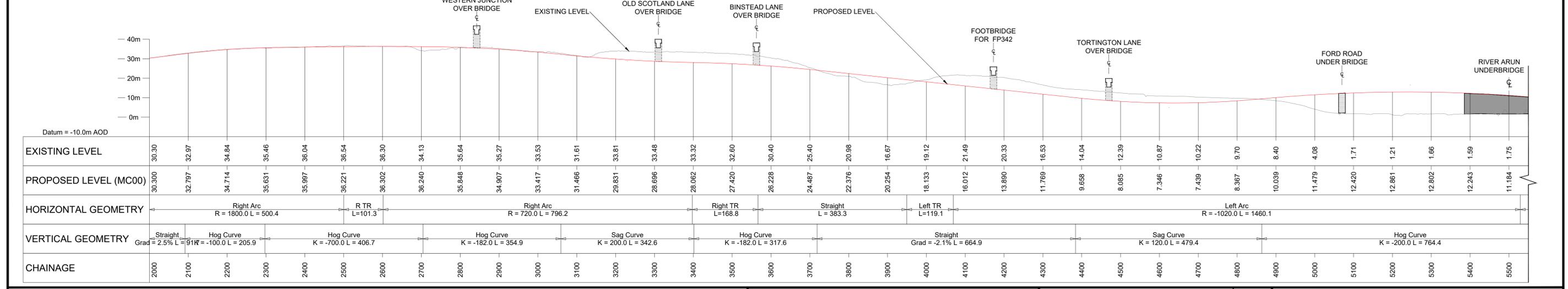
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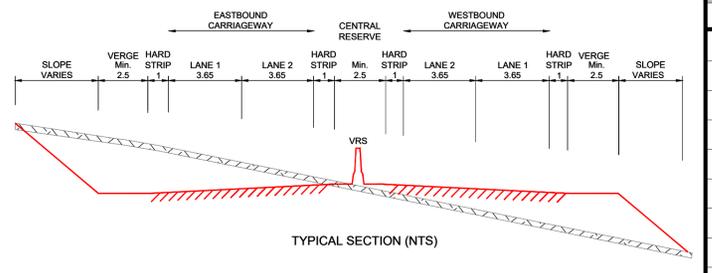


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KEY:
 PROPOSED STRUCTURE
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 NATIONAL FORESTRY INVENTORY
 EXISTING FOOTPATH
 EXISTING BRIDLEWAY
 EXISTING BYWAY
 SOUTH DOWNS NATIONAL PARK ON SHADED SIDE OF BOUNDARY
 PROPOSED FOOTPATH
 PROPOSED BRIDLEWAYS
 PROPOSED FOOTWAY
 INDICATIVE FENLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION						
Refer to Residual Hazard Drawings and Designer Risk Management Schedule.						
Rev.	Date	Description	Drawn	Disc. Check	Authorised	Status
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P02	28/02/19	Changes to PRow and Floodplain Levels	SM	RT	SH	...
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	...
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

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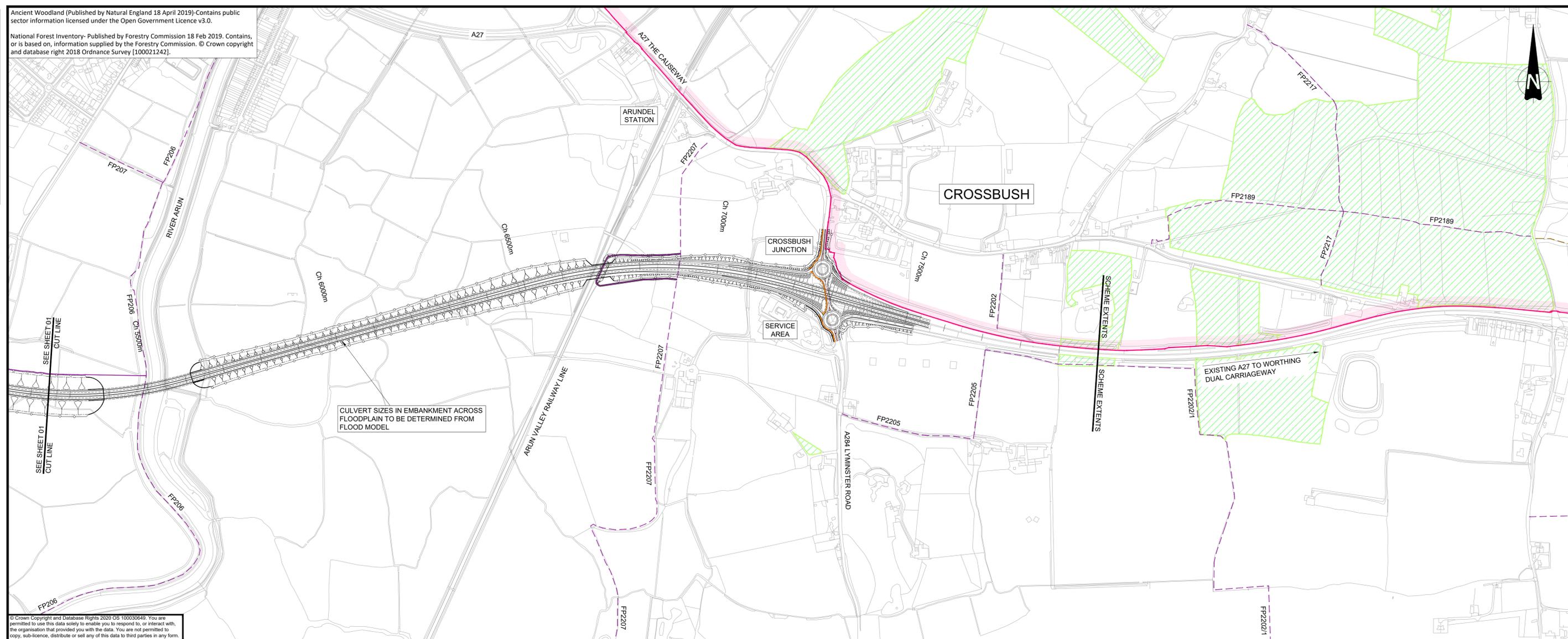
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Project Title		A27 ARUNDEL BYPASS			
Drawing Title		ENGINEERING LAYOUT OPTION 3 V1 SHEET 1 OF 2			
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Disc. Check	S.Haagman	Date	15/07/19	Date	26/05/20
Authorised	M.Emery	Design Stage	2		
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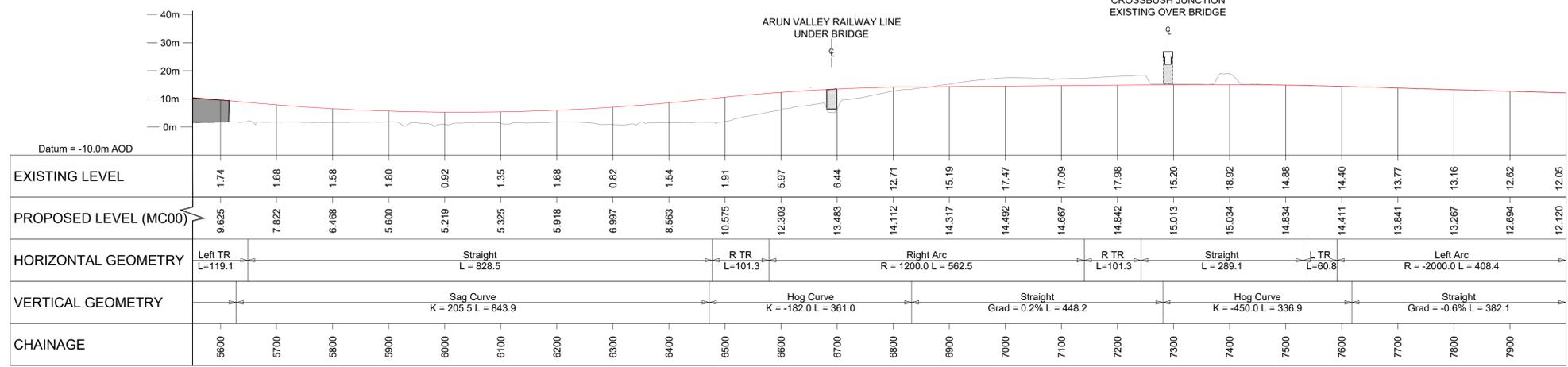
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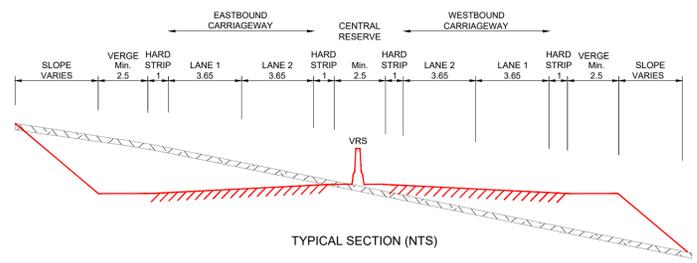
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 - PROPOSED BRIDLEWAYS
 - PROPOSED FOOTWAY
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
 Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	23/11/18	First Revision			DE	RT SH ...
P02	28/02/19	Changes to PRow and Floodplain Levels			SM	RT SH ...
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a			DE	RT SH ...
C01	12/07/19	Amended for DF2a			DE	RT SH ME

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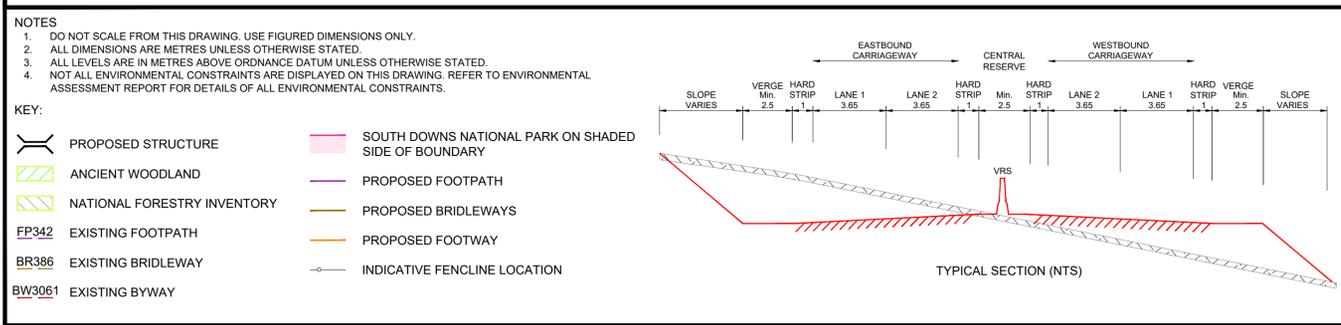
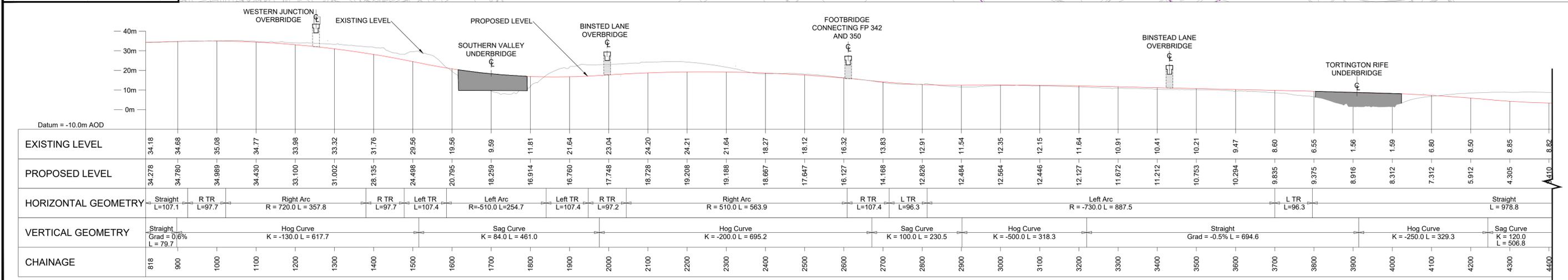
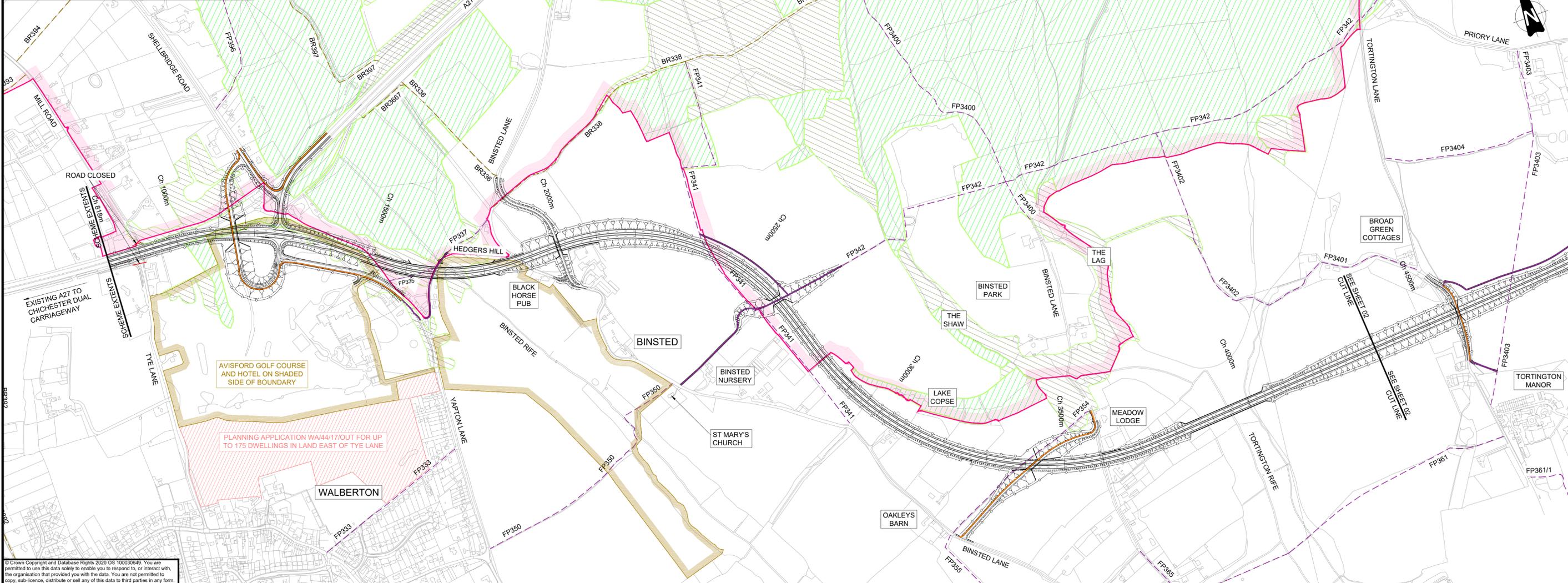
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Status	A2	Project Title	A27 ARUNDEL BYPASS						
Drawing Title	ENGINEERING LAYOUT OPTION 3 V1 SHEET 2 OF 2								
Scale	1:5000	Drawn	D.Eddy	Eng. Check	R.Tattersall	Disc. Check	S.Haagman	Authorised	M.Emery
Original Size	A1	Date	12/07/19	Date	15/07/19	Date	15/07/19	Date	26/05/20
Drawing Number	HE551523	Originator	WSP	Volume	HGN	Design Stage	2		
Location	C3 O3 VA	Type	A2 DR CH	Number	00004	Revision	C01		

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Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	23/11/18	First Revision		DE	SM	SH
P02	04/02/19	Updated for 2nd Rev of Benchmark Quants		SM	RT	SH
P03	26/02/19	Changes to PRow and Floodplain Levels		SN	RT	SH
P04	24/05/19	Updates to Crossbush Junction for Design Fix 2a		DE	RT	SH
C01	12/07/19	Amended for DF2a		DE	RT	SH

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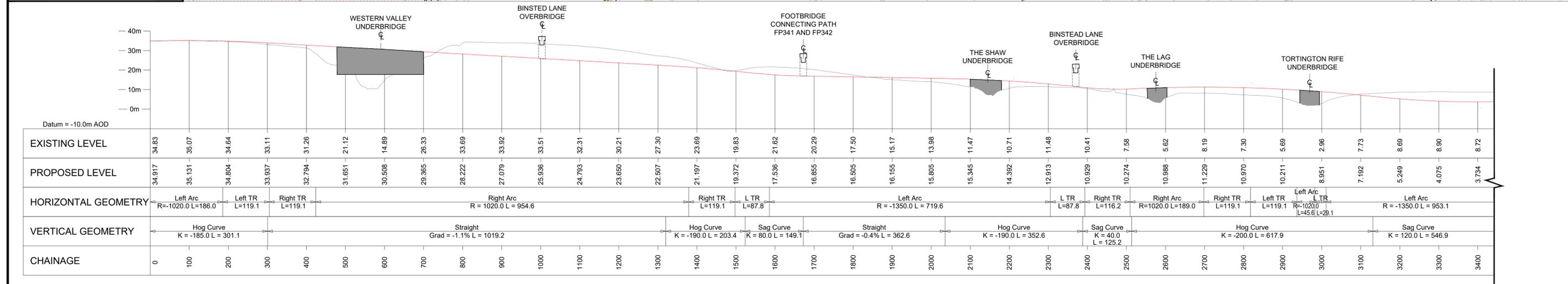
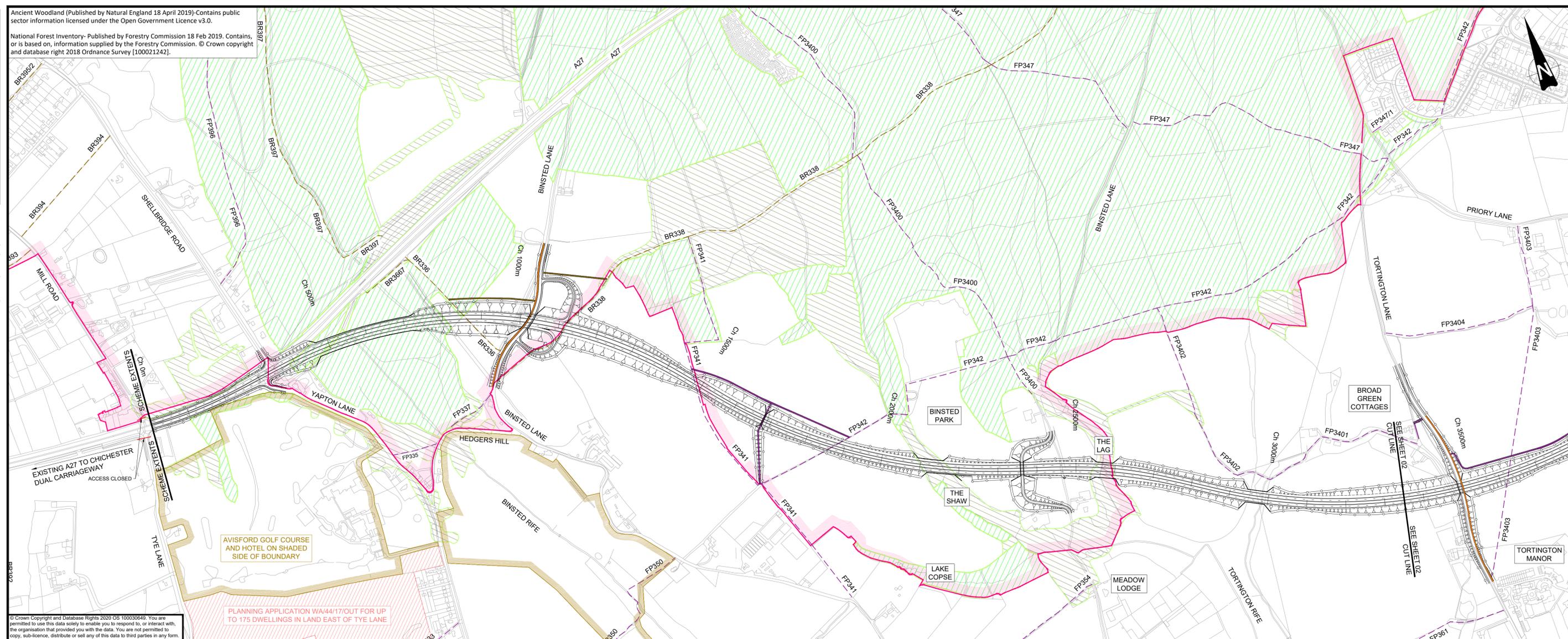
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Status	A2		
Project Title	A27 ARUNDEL BYPASS		
Drawing Title	ENGINEERING LAYOUT OPTION 4/5A V1 SHEET 1 OF 2		
Scale	1:5000	Drawn	D.Eddy
Original Size	A1	Date	12/07/19
Eng. Check	R.Tattersall	Disc. Check	S.Haagman
Authorised	M.Emery	Date	26/05/20
Drawing Number	HE551523	Originator	WSP
Volume	HGN	Design Stage	2
Location	C5A O3 VE	Type	A1 DR CH
Number	00001	Revision	C01

DO NOT SCALE

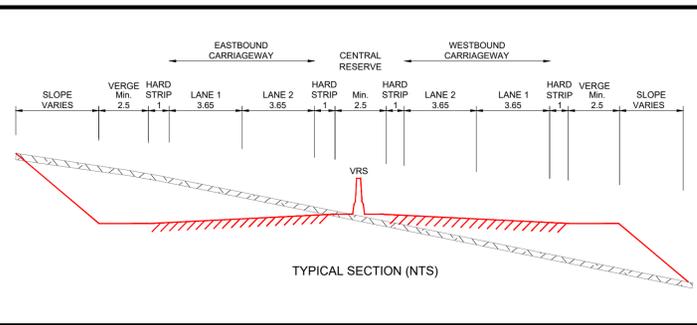


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- EXISTING BYWAY
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- PROPOSED FOOTPATH
- PROPOSED BRIDLEWAYS
- PROPOSED FOOTWAY
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	04/02/19	Updated for 2nd Rev of Benchmark Quants	SM	RT	SH	---
P02	26/02/19	Changes to PRowW and Floodplain Levels	SN	RT	SH	---
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	---
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

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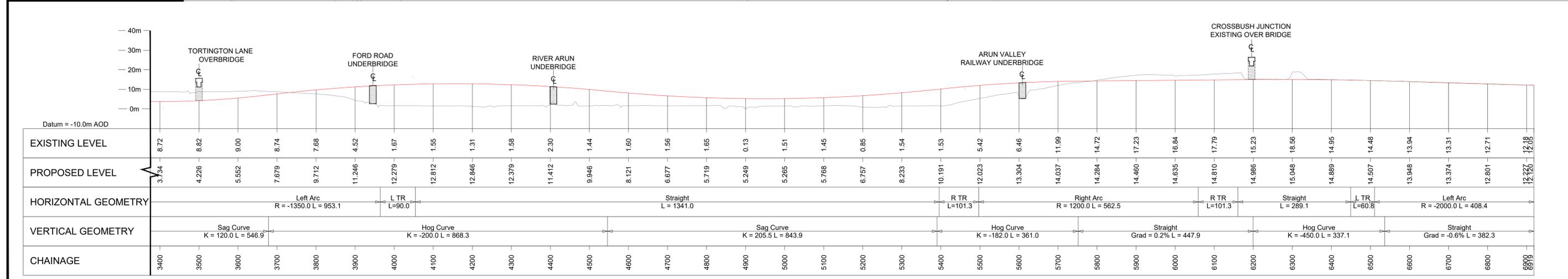
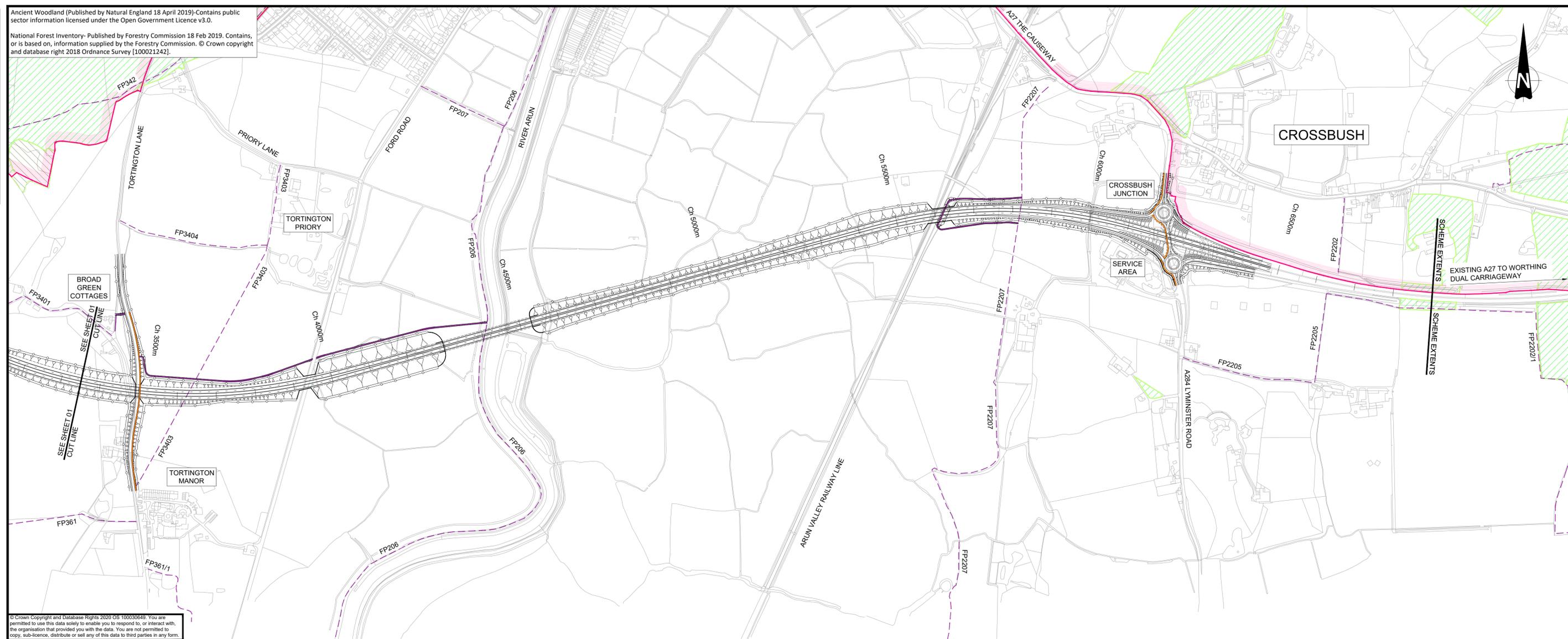
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Status	A2	Project Title	A27 ARUNDEL BYPASS						
Drawing Title	ENGINEERING LAYOUT OPTION 4/5A V2 SHEET 1 OF 2								
Scale	1:5000	Drawn	D.Eddy	Eng. Check	R.Tattersall	Disc. Check	S.Haagman	Authorised	M.Emery
Original Size	A1	Date	15/07/19	Date	15/07/19	Date	15/07/19	Date	26/05/20
Drawing Number	HE551523	Originator	WSP	Volume	HGN	Design Stage	2		
Location	C5A O4 VC	Type	A1 DR CH	Number	00001	Revision	C01		

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Millimetres
DO NOT SCALE

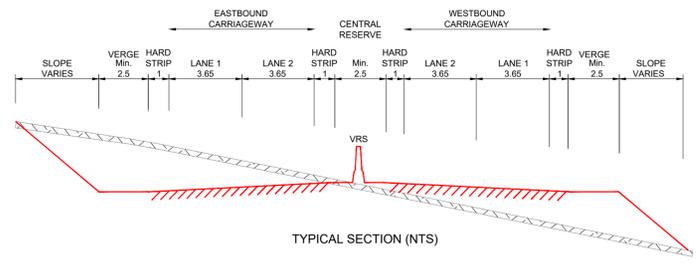


NOTES

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- ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
- NOT ALL ENVIRONMENTAL CONSTRAINTS ARE DISPLAYED ON THIS DRAWING. REFER TO ENVIRONMENTAL ASSESSMENT REPORT FOR DETAILS OF ALL ENVIRONMENTAL CONSTRAINTS.

KEY:

- PROPOSED STRUCTURE
- ANCIENT WOODLAND
- NATIONAL FORESTRY INVENTORY
- FP342 EXISTING FOOTPATH
- BR386 EXISTING BRIDLEWAY
- BW3061 EXISTING BYWAY
- SOUTH DOWNS NATIONAL PARK ON SHADED SIDE OF BOUNDARY
- PROPOSED FOOTPATH
- PROPOSED BRIDLEWAYS
- PROPOSED FOOTWAY
- INDICATIVE FENCLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION					
Refer to Residual Hazard Drawings and Designer Risk Management Schedule.					
P01	04/02/19	Updated for 2nd Rev of Benchmark Quants	SM	RT	SH
P02	26/02/19	Changes to FRow and Floodplain Levels	SN	RT	SH
P03	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH
C01	12/07/19	Amended for DF2a	DE	RT	SH
Rev.	Date	Description	Drawn	Eng Check	Disc Check

Published - Option Selection

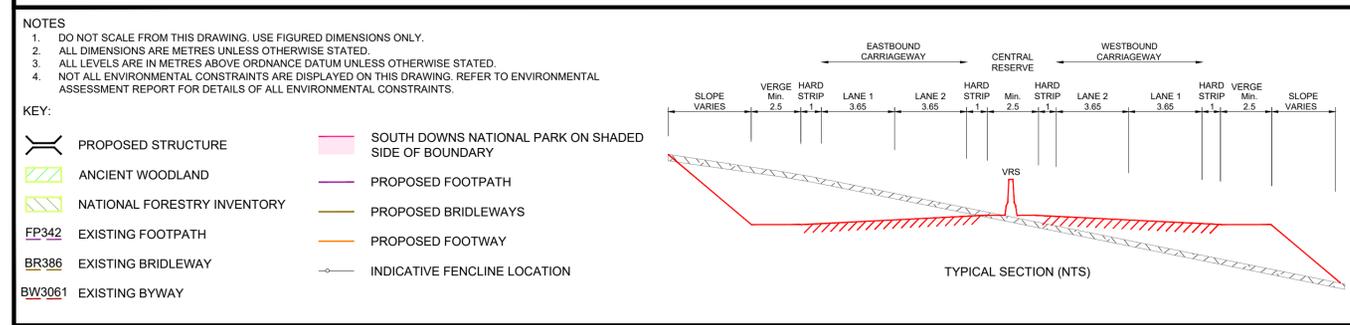
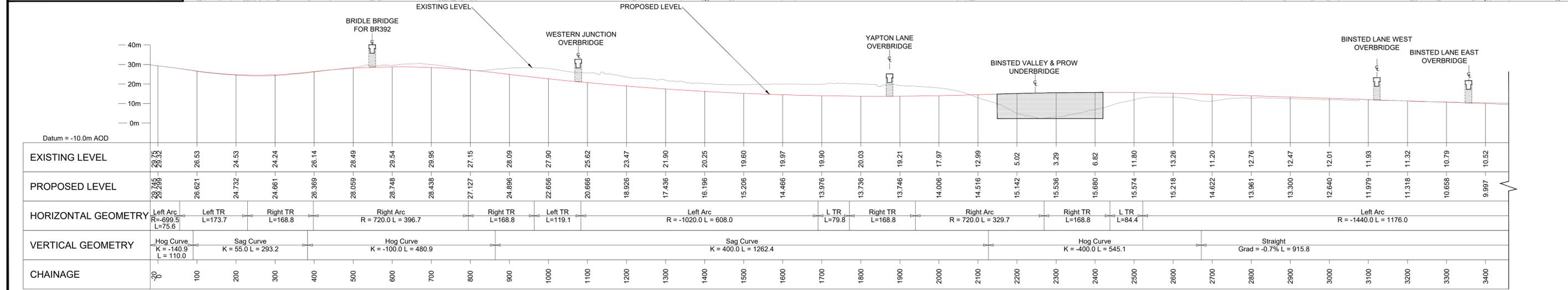
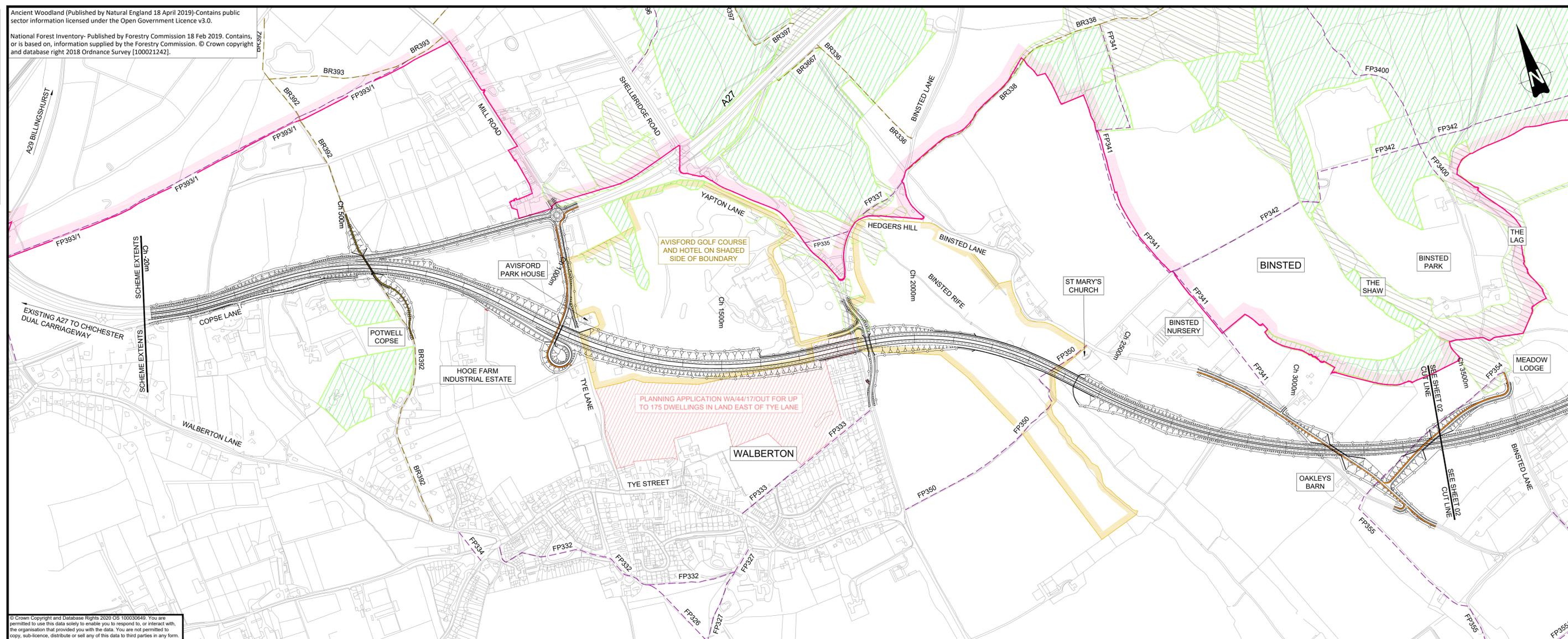
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Project Title				
A27 ARUNDEL BYPASS				
Drawing Title				
ENGINEERING LAYOUT OPTION 4/5A V2 SHEET 2 OF 2				
Scale	Drawn	Eng. Check	Disc. Check	Authorised
1:5000	D.Eddy	R.Tattersall	S.Haagman	M.Emery
Original Size	Date	Date	Date	Date
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Drawing Number	HE PIN	Originator	Volume	Design Stage
HE551523	HE551523	WSP	HGN	2
C5A	O4	VC	A1	DR
Location	Type	Role	Number	Revision
			00002	C01

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DO NOT SCALE



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	15/11/18	First Revision	DE	MH	SH	...
P02	04/02/19	Updated for 2nd Rev of Benchmark Quants	SM	RT	SH	...
P03	26/02/19	Changes to PRow and Floodplain Levels	SN	RT	SH	...
P04	24/05/19	Updates to PRow Junction for Design Fix 2a	DE	RT	SH	...
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

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Status: A3

Project Title: A27 ARUNDEL BYPASS

Drawing Title: ENGINEERING LAYOUT OPTION 5B V1 SHEET 1 OF 3

Scale	Drawn	Eng. Check	Disc. Check	Authorised
1:5000	D.Eddy	R.Tattersall	S.Haagman	M.Emery

Original Size	Date	Date	Date	Date
A1	12/07/19	15/07/19	15/07/19	26/05/20

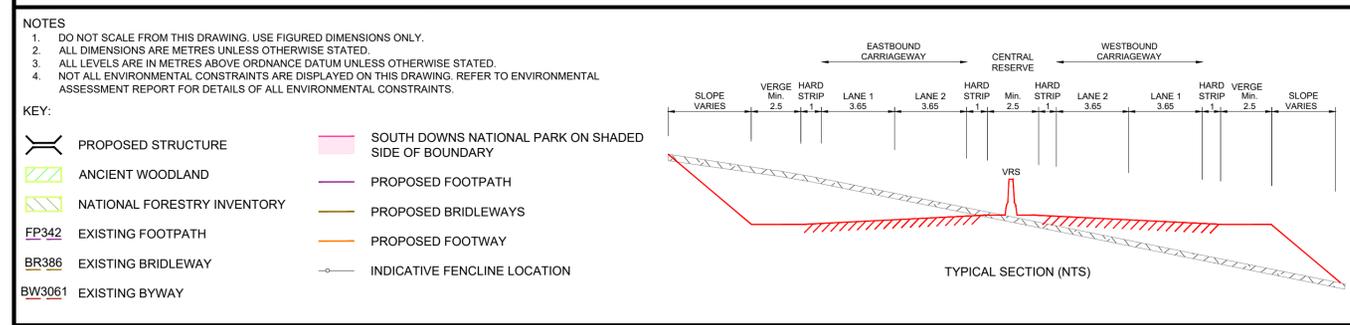
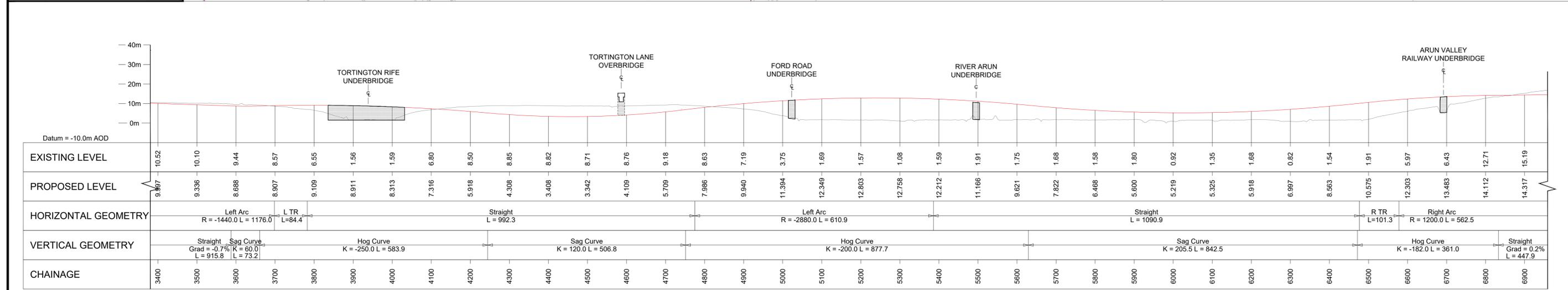
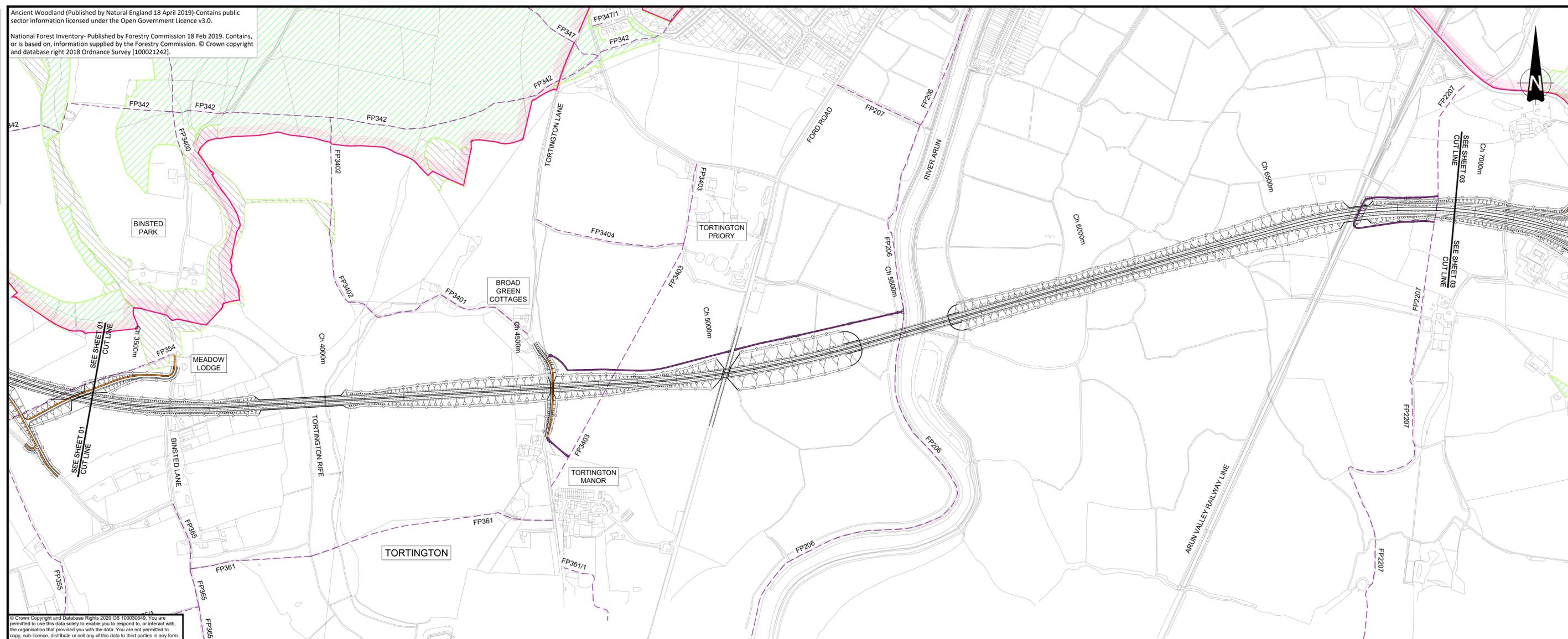
Drawing Number	HE PIN	Originator	Volume	Design Stage
HE551523		WSP	HGN	3

Location	Type	Number	Revision
C5B O2 VA	A2 DR CH	00001	C01

WSP Project Number: 70044640
WSP Drawing Number: HE551523-WSP-HGN-C5B_O2_VA_A2-DR-CH-00001

DO NOT SCALE

Millimetres
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SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	16/11/18	First Revision	DE	MH	SH	---
P02	04/02/19	Updated for 2nd Rev of Benchmark Quants	SM	RT	SH	---
P03	26/02/19	Changes to PRow and Floodplain Levels	SN	RT	SH	---
P04	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	---
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

Published - Option Selection

wsp

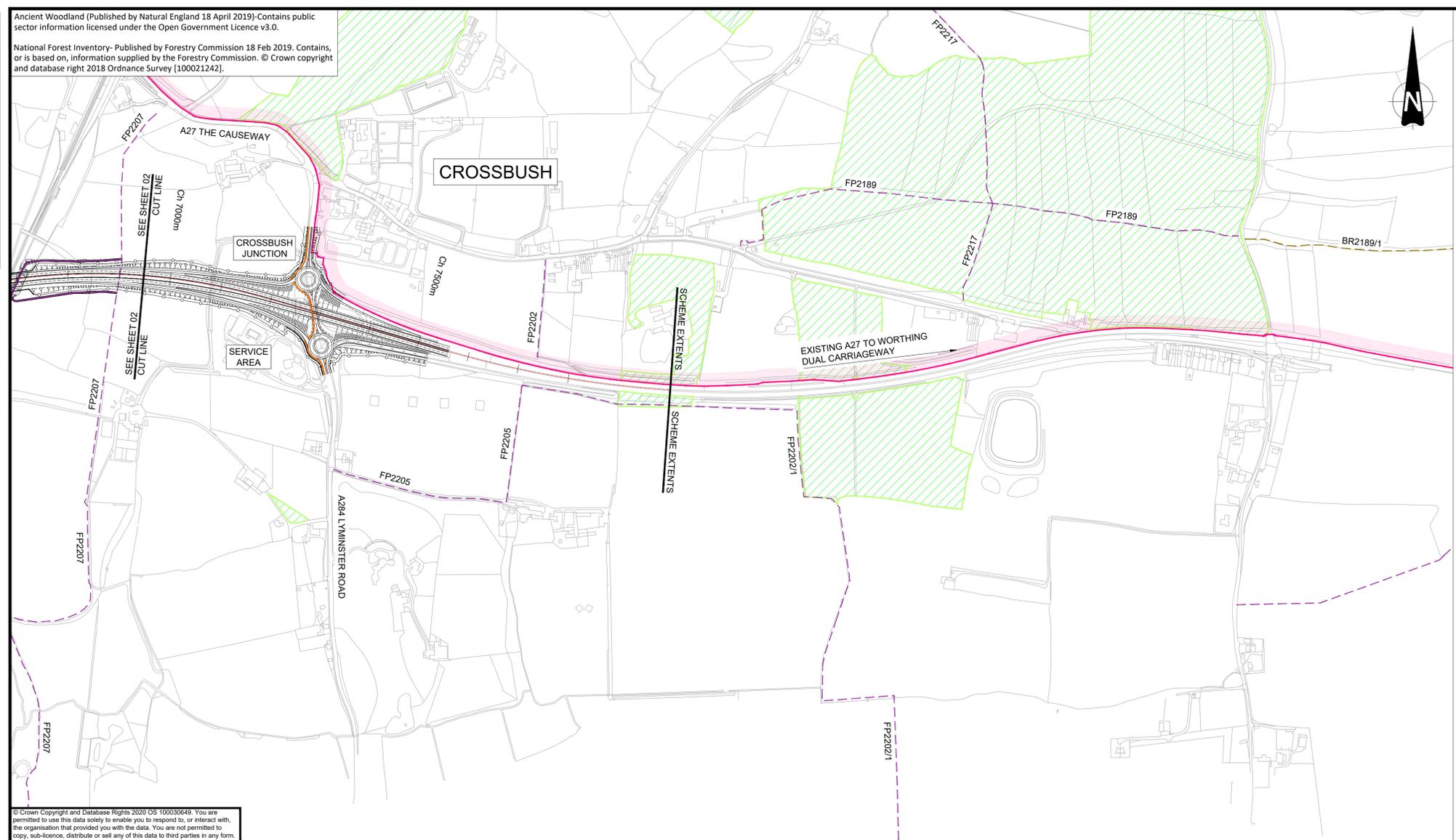
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Status	A2	Project Title	A27 ARUNDEL BYPASS			
Drawing Title	ENGINEERING LAYOUT OPTION 5B V1 SHEET 2 OF 3					
Scale	1:5000	Drawn	D.Eddy	Eng. Check	R.Tattersall	
Original Size	A1	Date	12/07/19	Date	15/07/19	
Drawing Number	HE PIN	Disc Check	S.Haagman	Authorised	M.Emery	
HE PIN	HE551523	Date	15/07/19	Date	26/05/20	
Location	C5B O2 VA	Volume	WSP	Revision	2	
Type	A2 DR CH	Number	HGN	Revision	C01	
Number	00002	Number	00002	Revision	C01	

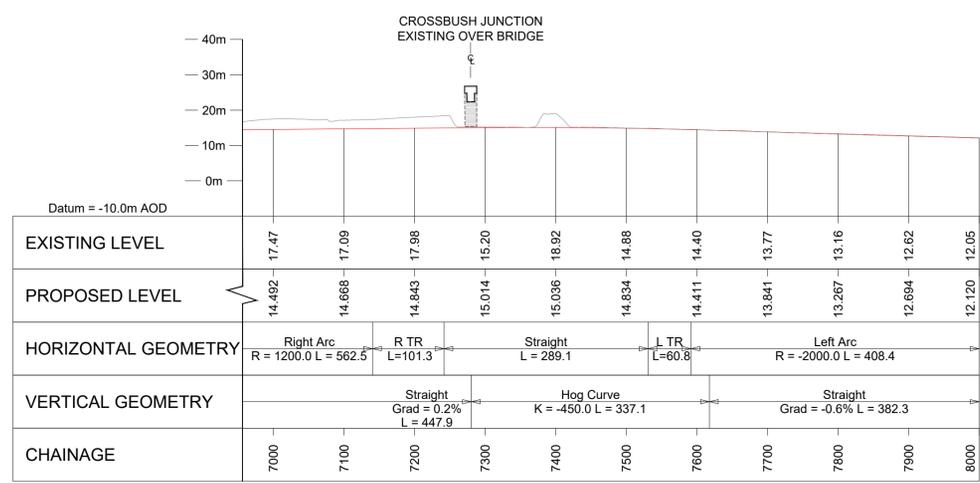
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Millimetres



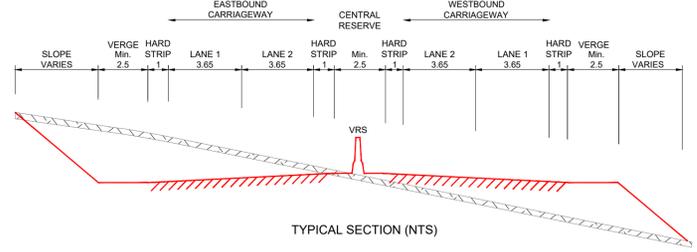
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National Forest Inventory- Published by Forestry Commission 18 Feb 2019. Contains, or is based on, information supplied by the Forestry Commission. © Crown copyright and database right 2018 Ordnance Survey [100021242].

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- NOTES**
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- KEY:**
- PROPOSED STRUCTURE
 - ANCIENT WOODLAND
 - NATIONAL FORESTRY INVENTORY
 - EXISTING FOOTPATH
 - EXISTING BRIDLEWAY
 - EXISTING BYWAY
 - SOUTH DOWNS NATIONAL PARK ON SHADED SIDE OF BOUNDARY
 - PROPOSED FOOTPATH
 - PROPOSED BRIDLEWAYS
 - PROPOSED FOOTWAY
 - INDICATIVE FENCLINE LOCATION



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Refer to Residual Hazard Drawings and Designer Risk Management Schedule.

Rev.	Date	Description	Drawn	Eng Check	Disc Check	Authorised
P01	16/11/18	First Revision	DE	MH	SH	...
P02	04/02/19	Updated for 2nd Rev of Benchmark Quants	SM	RT	SH	...
P03	26/02/19	Changes to PRoW and Floodplain Levels	SN	RT	SH	...
P04	24/05/19	Updates to Crossbush Junction for Design Fix 2a	DE	RT	SH	...
C01	12/07/19	Amended for DF2a	DE	RT	SH	ME

Published - Option Selection

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Status	A2	Project Title	A27 ARUNDEL BYPASS						
Drawing Title	ENGINEERING LAYOUT OPTION 5B V1 SHEET 3 OF 3								
Scale	1:5000	Drawn	D.Eddy	Eng. Check	R.Tattersall	Disc. Check	S.Haagman	Authorised	M.Emery
Original Size	A1	Date	12/07/19	Date	15/07/19	Date	15/07/19	Date	26/05/20
Drawing Number	HE551523	Originator	WSP	Volume	HGN	Design Stage	2		
Location	C5B O2 VA	Type	A2 DR CH	Number	00003	Revision	C01		

A27 Arundel Bypass Scheme Assessment Report

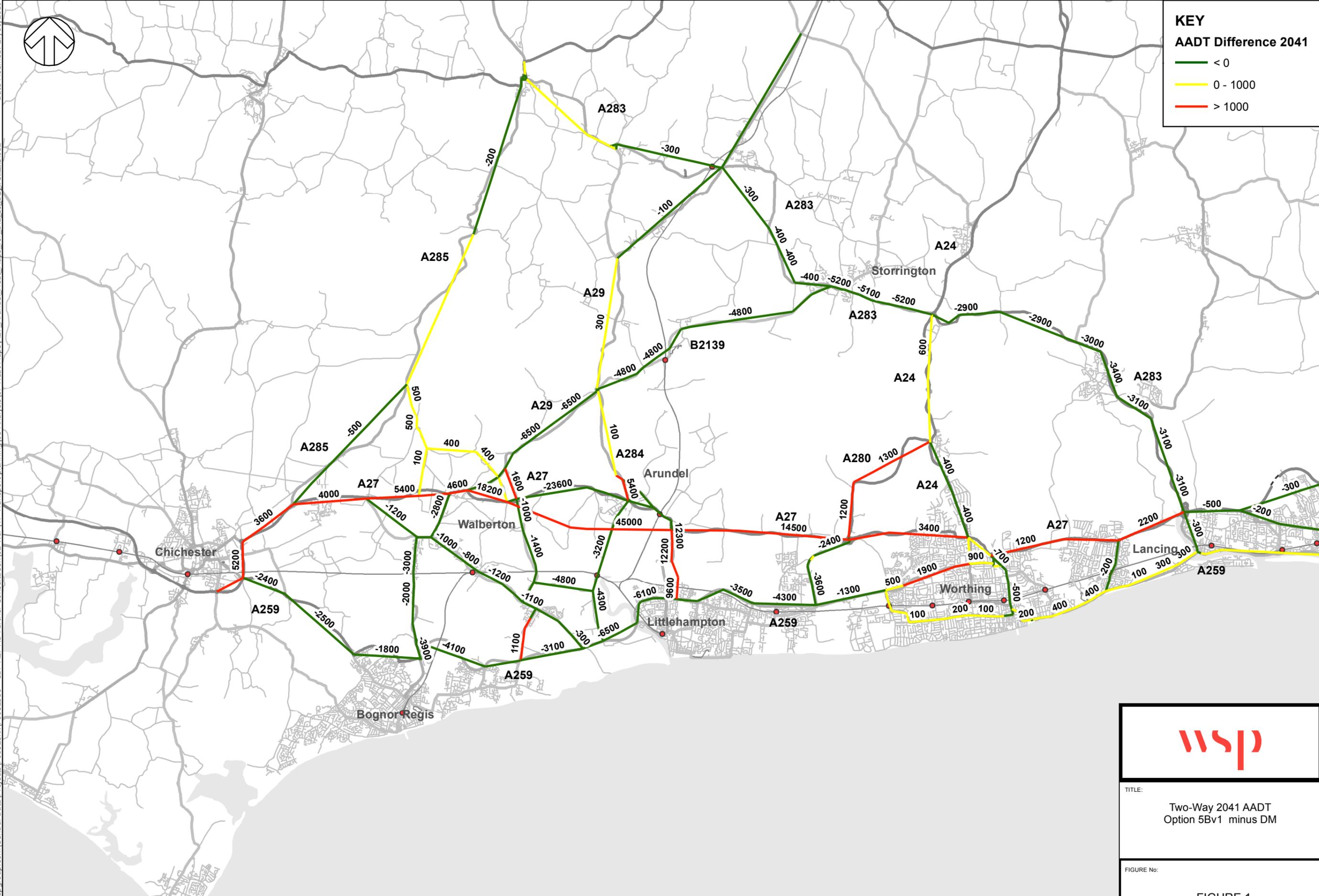
Appendix E - Heat Maps



KEY

AADT Difference 2041

- < 0
- 0 - 1000
- > 1000



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0 0.75 1.5 3 4.5 6 Kilometres

wsp

TITLE:
Two-Way 2041 AADT
Option 5Bv1 minus DM

FIGURE No:
FIGURE 1

A27 Arundel Bypass Scheme Assessment Report

Appendix F - Appraisal Summary Tables

October 2020

Appraisal Summary Table

Date produced: 28/04/2020

Contact: Drew Woodbridge
Highways England
Project Manager

Name of scheme:	A27 Arundel Bypass Option 1V5
Description of scheme:	The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Name:	Drew Woodbridge
Organisation:	Highways England
Role:	Project Manager

Impacts	Summary of key impacts	Assessment							
		Quantitative			Qualitative	Monetary	Distributional		
		Value of journey time changes (€m)				€m (NPV)	7-pt scale/ vulnerable grp		
Economy	Business users & transport providers	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for business users.			€71.341			Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial	
		Net journey time changes (€m)							
		0 to 2min	2 to 5min	> 5min		N/A	€68.6		
	Reliability impact on Business users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability/variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.			not quantified		N/A		
	Regeneration	Not applicable					N/A		
Wider Impacts	The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.			Agglomeration impacts €54.159m Output change in imperfectly competitive market €4.771m Tax revenue due to labour market impacts €1.430m		N/A	€80.4		
Environmental	Noise	Adverse impacts within Arundel town are generally moderate to major in the short term and minor to moderate in the long term. 1,065 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 841 properties; major adverse: 224 properties). 86 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 77 properties; major beneficial: 9 properties). 419 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 1V5, this number would reduce to 255 once the option is in operation in the design year. There will, therefore, be 164 fewer properties with noise levels above SOAEL with Option 1V5 in operation compared to do-minimum in the design year. 380 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 360; major adverse: 20). 7 properties would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 6; major beneficial: 1). 54 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended. NIAs to the west of Option 1V5, along the A27, at Ford Road roundabout, and to the east and south of Crossbush (B158, S490, 12480, 5488, 12488, 5485, 5486, 5484, 6157, 93485, 5482 and 12488) generally experience a minor to moderate adverse impact in the short-term, and negligible impact in the long-term. A night-time noise model has not been undertaken at this stage. Instead, night time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EAR, in accordance with DMRB HD213/11 rev1.			Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1861 Estimated number of households experiencing reduced daytime noise levels in the forecast year 2041: 129		N/A	-€5.1	Income Quintile 1 - Neutral; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Slight Adverse; Income Quintile 5 - Large Adverse
		Overall for Option 1V5 there is a net improvement in local air quality. There are no worsenings or creations of any exceedance of air quality objectives or limit values with Option 1V5. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 1V5. There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Horsham AQMA No 1 (Storrington) where the option results in air quality improvements. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085. There is no account of CO2 emissions from power generating sources for electric vehicle.			Net Total Assessment 2026 PM2.5: -172.31 NO2: -699.07 Net Total Assessment 2041 PM2.5: -252.15 NO2: -591.08 Net total route assessment (opening year) for PM2.5: -172.31 Change in NOx emissions over 60 years: 304 tonnes Properties (PM2.5 in the opening year 2026) Improved: 13913 Neutral: 558 Worsening: 9,173 Properties (NO2 in the opening year 2026) Improved: 13801 Neutral: 509 Worsening: 9,234		N/A	-€6.9	Income Quintile 1 - Large Beneficial; Income Quintile 2 - Slight Adverse; Income Quintile 3 - Large Beneficial; Income Quintile 4 - Large Adverse; Income Quintile 5 - Moderate Adverse
		The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085. There is no account of CO2 emissions from power generating sources for electric vehicle.			Change in non-traded carbon over 60y (CO2e)	247,028	N/A	-€10.7	
		The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085. There is no account of CO2 emissions from power generating sources for electric vehicle.			Change in traded carbon over 60y (CO2e)	NA			
Landscape	The Option follows the existing A27 alignment for much of its length and is therefore unlikely to significantly degrade the existing levels of tranquillity surrounding the A27. Off-line sections across the floodplain would introduce a new section of highway within the open and exposed landscape, slightly affecting existing levels of tranquillity, modifying the nature of the undeveloped landscape and the network of drainage ditches and degrade the inter-relationship and cultural associations between the floodplain, the historic town of Arundel and the SDNP. The Option would result in the loss of some ancient woodland and trees and the loss of openness within the floodplain. The overall character of the landscape and those experiencing it along the route would be significantly degraded.			NA		Moderate adverse	N/A		
Townscape	Option 1V5 would result in minor loss of existing townscape features where it follows the existing alignment and would slightly alter the prevailing character in these areas. It would introduce an unsympathetic, dominating structure into the town, with visual impacts on the historic townscape. The proposed mitigation strategy would seek to replace roadside and boundary vegetation, with the aim of reducing potentially significant effects. With this option, the design of a high quality bridge over the river would be especially important in making the proposal more visually acceptable, though this would not alter the impact of increased urbanisation. Substantial change is therefore anticipated to arise within the townscape associated with Arundel, due to changes in the scale and form that the A27 is anticipated to take. Localised impacts will occur to the southern residential area of the town associated with the Ford Road roundabout, River Arun crossing and the existing A27.			NA		Moderate adverse	N/A		
Historic Environment	Option 1V5 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise five Scheduled Monuments, four Grade I Listed Buildings, six Grade II* Listed Buildings, 206 Grade II Listed Buildings, one Grade II* Registered Park & Garden and two Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting so that the relationship is no longer readily appreciable; the interpretability of the significance of the asset is significantly reduced; a loss or reduction of rural tranquillity and/or where traffic noise, light and movement are likely to increase.			NA		Slight adverse	N/A		
Biodiversity	Overall Option 1V5 is regarded as having a Large Adverse impact. Large Adverse impacts are predicted for five features: Binsted Wood Complex LWS, Rewell Wood Complex LWS, Ancient Woodland, Deciduous Woodland HPI and Bats. Moderate Adverse impacts are predicted for six features: Ancient and Veteran Trees; Coastal and Floodplain Grazing Marsh HPI; Protected and notable plants; Hazel dormouse; Invertebrates (terrestrial); and Water vole. All other impacts would be Slight Adverse or Neutral.			NA		Large adverse	N/A		
Water Environment	The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including (but not limited to) soil stripping, cutting, reducing aquifer overburden and intensive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be Negligible, and the overall impact will be Insignificant. This option will not include cuttings within the Chalk aquifer. However, given the sensitivity of groundwater resources to the north of Option 1V5 (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with W6TAG assessment guidance, the magnitude will be Negligible, and the overall impact will be Insignificant. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for new sections of road and may offer an opportunity for settlement for existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual Developed by CIRIA (C753). Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in infiltration may arise due to the introduction of impermeable areas. This may reduce recharge to local groundwater bodies, however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.			NA		Neutral	N/A		

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)			N/A	£143.6	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial	
			Net journey time changes (£m)						
			0 to 2min	2 to 5min	> 5min				
			£13.8	£71.8	£84.2				
Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.		not quantified			Moderate beneficial	N/A		
Physical activity	Not assessed		N/A			N/A	N/A		
Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. The bypass sections separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the part-online improvement options are deemed to have a neutral impact as a result of minimal change to the wider views of the surrounding area.		N/A			Slight beneficial	N/A		
Accidents	COBALT assessment has shown that Option 1+5 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing traffic from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.		Total number of accidents saved 411, and 589 casualties saved of which 4 fatal, 85 serious, 500 slight.			N/A	£23.2	N/A	
Security	Not applicable		N/A			N/A	N/A	N/A	
Access to services	Not applicable		N/A			N/A	N/A	N/A	
Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme, this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.		N/A			Moderate adverse	N/A	Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse	
Severance	Proposed dual carriageway following the existing alignment to the west of Arundel and through Ford Road roundabout. Increased traffic volumes on the A27 through Arundel contributes to an increased severance effect. A grade-separated elevated structure will allow through-traffic to bypass the Ford Road roundabout, reducing conflicting traffic movements at this location. However, this structure can be considered a significant physical barrier for non-motorised users (NMI). Limited crossing options and a lack of formalised crossing facilities is a constraint for more vulnerable pedestrians.		not quantified			Slight adverse	N/A	N/A	
Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.		Not applicable			N/A	N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.		Scheme cost (PVC)			N/A	£133.0	
	Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.		indirect tax revenues			N/A	£13.7	

Appraisal Summary Table

Date produced: 28/04/2020

Contact: Drew Woodbridge
Highways England
Project Manager

Name of scheme: A27 Arundel Bypass Option 1V9
Description of scheme: The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Impacts	Summary of key impacts	Assessment										
		Quantitative		Qualitative	Distributional							
		Value of journey time changes (£m)	£70.020	Monetary (£m (NPV))	7-pt scale/ vulnerable grp							
Economy	Business users & transport providers	<p>The offline new dual carriageway would increase capacity and reduce delays and yield time savings for business users.</p> <p>Net journey time changes (£m)</p> <table border="1"> <tr> <td>0 to 2min</td> <td>2 to 5min</td> <td>> 5min</td> </tr> <tr> <td>-£2.8</td> <td>£39.6</td> <td>£33.2</td> </tr> </table>		0 to 2min	2 to 5min	> 5min	-£2.8	£39.6	£33.2	N/A	£67.3	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial
	0 to 2min	2 to 5min	> 5min									
	-£2.8	£39.6	£33.2									
	Reliability impact on Business users	<p>The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.</p>		Large beneficial	N/A							
Regeneration	<p>Not applicable</p>		N/A	N/A								
	Wider Impacts	<p>The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.</p> <p>Agglomeration impacts £40.238m Output change in imperfectly competitive market £4.536m Tax revenue due to labour market impacts £1.117m</p>		N/A	£45.9							
Environmental	Noise	<p>Adverse impacts within Arundel town are generally moderate to major in the short term and generally minor in the long term.</p> <p>987 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 913 properties; major adverse: 74 properties).</p> <p>80 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 77 properties; major beneficial: 3 properties).</p> <p>407 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 1V9, this number would reduce to 281 once the option is in operation in the design year. There will, therefore, be 126 fewer properties with noise levels above SOAEL with Option 1V9 in operation compared to do-minimum in the design year.</p> <p>174 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 174 properties; major adverse: 0 properties).</p> <p>1 property would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 1 property; major beneficial: 0 properties).</p> <p>64 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended.</p> <p>A summary of key noise impacts is presented below; the PCF Stage 2 EAR Chapter 11 provides a full description. NIAs to the west of Option 1V9, along the existing A27, and to the east and south of Chisoboth (12491, 14991, 12490, 8188, 5490, 12489, 5487, 5488, 12488, 5485, 5486, 5484, 6167, 12485, 12486, 12487 and 5482) generally experience a negligible to minor adverse impact in the short-term, and negligible impact in the long-term; although two areas continue to experience a minor adverse impact in the long-term (6157 and 5488). Conversely, one property within NIA 5487 will experience a minor beneficial impact in the short-term and negligible in the long-term.</p> <p>A night-time noise model has not been undertaken at this stage. Instead, night time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EAR, in accordance with DMRB HD213/11 rev1.</p>		Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1816	Estimated number of households experiencing reduced daytime noise levels in the forecast year 2041: 135	N/A	Income Quintile 1 - Neutral; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Slight Adverse; Income Quintile 5 - Large Adverse					
	Air Quality	<p>Overall for Option 1V9 there is a net improvement in local air quality. There are no worsenings or cretions of air quality exceedances of air quality objective limit values with Option 1V9. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 1V9.</p> <p>There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Horsham AQMA No 1 (Storrington) where the option results in air quality improvements.</p> <p>Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2086. There is no account of CO2 emissions from power generating sources for electric vehicles.</p>		Net Total Assessment 2026 PM2.5: -160.33 NO2: -897.88	Net Total Assessment 2041 PM2.5: -216.42 NO2: -505.62	Net total route assessment (opening year) for PM2.5 -160.33 Change in NOx emissions over 60 years: 259 tonnes	N/A	Income Quintile 1 - Large Beneficial; Income Quintile 2 - Slight Adverse; Income Quintile 3 - Large Beneficial; Income Quintile 4 - Large Adverse; Income Quintile 5 - Moderate Adverse				
	Greenhouse gases	<p>Change in non-traded carbon over 60y (CO2e)</p>		177,353	N/A	-£7.7						
	Landscape	<p>The Option follows the existing A27 alignment for much of its length and is therefore unlikely to significantly degrade the existing levels of tranquillity surrounding the A27. Off-line sections across the floodplain would introduce a new section of highway within the open and exposed landscape, slightly affecting existing levels of tranquillity, modifying the nature of the undeveloped landscape and the network of drainage ditches and degrade the inter-relationship and cultural associations between the floodplain, the historic town of Arundel and the SDNP. The Option would result in the loss of some ancient woodland and trees and the loss of openness within the floodplain. The overall character of the landscape and those experiencing it along the route would be significantly degraded.</p>		N/A	Moderate adverse	N/A						
Townscape	<p>Option 1V9 would result in minor loss of existing townscape features where it follows the existing alignment and would slightly alter the prevailing character in these areas. It would introduce an additional unsympathetic bridge structure across the River Arun and create visual impacts on the historic townscape. The proposed mitigation strategy would seek to replace roadside and boundary vegetation, with the aim of reducing potentially significant effects. With this option, the design of a high quality bridge over this would not alter the impact of increased urbanisation. Despite these measures, substantial change is anticipated to arise within the townscape associated with Arundel, due to changes in the scale and form that the A27 is anticipated to take. Localised impacts would occur to the southern residential area of the town associated with the Ford Road roundabout and River Arun crossing and the existing A27.</p>		N/A	Moderate adverse	N/A							
Historic Environment	<p>Option 1V9 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise five Scheduled Monuments, four Grade I Listed Buildings, six Grade II* Listed Buildings, 205 Grade II Listed Buildings, one Grade II* Registered Park and Garden and two Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting so that the relationship is no longer readily appreciable; the interpretability of the significance of the asset is significantly reduced; a loss or reduction of rural tranquillity and / or where traffic noise, light and movement are likely to increase.</p>		N/A	Slight Adverse	N/A							
Biodiversity	<p>Overall Option 1V9 is regarded as having a Large Adverse impact.</p> <p>Large Adverse impacts are predicted for five features: Binsted Wood Complex LWS; Rewell Wood Complex LWS; Ancient Woodland; Deciduous Woodland HPI; and Bats.</p> <p>Moderate Adverse impacts are predicted for six features: Ancient and Veteran Trees; Coastal and Floodplain Grazing Marsh HPI; Protected and notable plants; Hazel dormouse; Invertebrates (terrestrial); and Water vole</p> <p>All other impacts would be Slight Adverse or Neutral.</p>		N/A	Large adverse	N/A							
Water Environment	<p>The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including, (but not limited to) soil stripping, cutting, reducing aquifer overburden and intrusive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be Negligible, and the overall impact will be Insignificant. This option will not include cuttings within the chalk aquifer. However, given the sensitivity of groundwater resources to the north of Option 1V9 (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with WebTAG assessment guidance, the magnitude will be Negligible, and the overall impact will be Insignificant. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for new sections of road and may offer an opportunity for betterment or existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual Developed by CIRIA (C753).</p> <p>Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in infiltration may arise due to the introduction of impermeable areas. This may reduce recharge to local groundwater bodies; however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.</p>		N/A	Neutral	N/A							

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)			N/A	£145.611	N/A	£139.4	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial
			Net journey time changes (£m)							
			0 to 2min	2 to 5min	> 5min					
			£8.5	£82.8	£54.3					
	Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified			Moderate beneficial	N/A			
	Physical activity	Not assessed	N/A			N/A	N/A			
	Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. The bypass sections separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the part-online improvement options are deemed to have a neutral impact as a result of minimal change to the wider views of the surrounding area.	N/A			Slight beneficial	N/A			
	Accidents	COBALT assessment has shown that Option 1v9 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing trips from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.	Total number of accidents saved 397, and 555 casualties saved of which 4 fatal, 78 serious, 473 slight			N/A	£21.8		N/A	
	Security	Not applicable	N/A			N/A	N/A		N/A	
	Access to services	Not applicable	N/A			N/A	N/A		N/A	
	Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme, this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.	N/A			Moderate adverse	N/A		Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse	
	Severance	Proposed dual carriageway following the existing alignment to the west of Arundel and through Ford Road roundabout. Increased traffic volumes on the A27 through Arundel contributes to an increased severance effect for NMUs. The A27 at Ford Road roundabout flares to multi-lane approach, at-grade throughabout junction. Signification formalises crossing facilities but these are multi-stage and within a traffic dominated environment.	N/A			Slight adverse	N/A		N/A	
	Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.	N/A			Not applicable	N/A			
	Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.			Scheme cost (PVC)	N/A	£129.7		
		Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.			indirect tax revenues	N/A	£8.0		

Appraisal Summary Table

Date produced: 28/04/2020

Contact: Drew Woodbridge
Highways England
Project Manager

Name of scheme: A27 Arundel Bypass Option 3V1
Description of scheme: The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Impacts	Summary of key impacts	Assessment					
		Quantitative	Qualitative	Monetary	Distributional		
		Value of journey time changes (€m)		€m (NPV)	7-pt scale/ vulnerable grp		
Economy	Business users & transport providers	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for business users.	€82.837	N/A	€80.9	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial	
		Net journey time changes (€m)					
		0 to 2min	2 to 5min				> 5min
		-€0.7	€40.4				€43.1
Reliability impact on Business users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified	Large beneficial	N/A			
Regeneration	Not applicable						
Wider impacts	The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.	Agglomeration impacts €78.109m Output change in imperfectly competitive market €6.029m Tax revenue due to labour market impacts €1.789m	N/A	€85.9			
Environmental	Noise	Adverse impacts to the east of Crossbush, Fizzalan Road, south-west of Ford Road roundabout and Tortington are generally moderate to major in the short term, and moderate in the long term. Some beneficial impacts, including some that are moderate and major in the short-term, are seen in Arundel town and along the existing A27.					
		554 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 339 properties; major adverse: 215 properties). 199 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 148 properties; major beneficial: 51 properties). 428 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 3V1, this number would reduce to 249 once the option is in operation in the design year. There will, therefore, be 179 fewer properties with noise levels above SOAEL with Option 3V1 in operation compared to do-minimum in the design year. 328 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 317 properties; major adverse: 9 properties). 45 properties would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 44 properties; major beneficial: 1 property). 3 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended.					
		NIAs to the west of Option 3V1 (6158 and 5490) generally experience a minor adverse impact in the short-term, and negligible impact in the long-term. NIAs to the east and south of Crossbush (12486, 12485 and 5482) generally experience a minor to moderate adverse impact in the short-term and a negligible to moderate adverse impact in the long-term. NIAs along the existing A27 through Arundel (12489, 5487, 5488, 12488, 5485 and 5486) generally experience a minor to moderate beneficial impact in the short-term and negligible to minor beneficial impact in the long-term. A night-time noise model has not been undertaken at this stage. Instead, night time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EA6, in accordance with DMRB HD2/13/11 rev1.	Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1103 Estimated number of households experiencing reduced daytime noise levels in the forecast year 2041: 405	N/A	-€2.0	Income Quintile 1 - Neutral; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Slight Adverse; Income Quintile 4 - Large Adverse; Income Quintile 5 - Moderate Adverse	
		Overall for Option 3V1 there is a net improvement in local air quality. There are no worsenings or creations of any exceedance of air quality objectives or limit values with Option 3V1. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 3V1. There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Horsham AQMA No 1 (Storrington) where the option results in an air quality improvement. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085.	Net Total Assessment 2026 PM2.5: -327.25 NO2: -1546.68 Net Total Assessment 2041 PM2.5: -403.43 NO2: -1133.97	Net total route assessment (opening year) for PM2.5 -327.25 Change in NOx emissions over 60 years: 385 tonnes	N/A	-€7.7	Income Quintile 1 - Large Beneficial; Income Quintile 2 - Slight Adverse; Income Quintile 3 - Large Beneficial; Income Quintile 4 - Large Adverse; Income Quintile 5 - Large Beneficial
Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085. There is no account of CO2 emissions from power generating sources for electric vehicles.	Change in non-traded carbon over 60y (CO2e)	309,819	N/A	€13.5		
		Change in traded carbon over 60y (CO2e)	N/A				
Landscape	There would be irreplaceable loss and fragmentation of connected ancient woodlands within the SDNP and beyond, through substantial modifications to landform, field patterns and field boundary vegetation such as hedgerows and trees. It would substantially degrade the experiential qualities of valued landscapes and rural countryside, including tranquility along the route. It would disrupt the historic associations of woodlands and the floodplain with surrounding settlements and cultural features. It would cross the open floodplain on embankment in a prominent and isolated location, and within the flat, largely static, landform, further increasing its prominence. This option substantially fragments significant areas within the high quality landscape of the SDNP and its setting. It would permanently fragment the dispersed rural village character of Binsted and areas of irreplaceable ancient woodland and former parkland on the edge of the SDNP.	N/A	Large adverse	N/A			
Townscape	This option does not go through areas of townscape, therefore not applicable.						
Historic Environment	Option 3V1 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise: four Scheduled Monuments, two Grade II* Listed Buildings, 27 Grade II Listed Buildings and two Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting on the relationship is no longer readily appreciable; the interpretability of the significance of the asset is significantly reduced; a loss or reduction of rural tranquility and / or where traffic noise, light and movement are likely to increase. Note that the impact on numerous designated heritage assets within the historic town of Arundel, which lies just outside the 1km study area has been assessed in EAR Chapter 6 - Cultural Heritage, but the asset numbers are not included in the asset count for the study area above.	N/A	Not applicable	N/A			
Biodiversity	Overall Option 3V1 is regarded as having a Very Large Adverse impact. A Very Large Adverse impact is predicted on five features: Binsted Wood Complex LWS; Ancient Woodland; Deciduous Woodland HPI; Bats; and invertebrates (terrestrial). A Large Adverse impact is predicted for one feature: Rewell Wood Complex LWS. Moderate Adverse impacts are predicted for eight features: A27 Axford 'site A' 'site B' and site C' suitable road verge; Coastal and Floodplain Grazing Marsh HPI; Protected and notable plants; Birds; Hazel dormouse; Reptiles; Water vole; and Other notable mammal species All other impacts would be Slight Adverse or Neutral.	N/A	Very large adverse	N/A			
Water Environment	The route requires the construction of new carriageway within undeveloped land to the west and east of Arundel, crossing several ordinary watercourses and land drains. The option also crosses the River Arun and the Binsted and Tortington Rife. The option will also cross a EA designated main river Tortington and Binsted Rife and its minor tributaries, which are Lead Local Flood Authority designated ordinary watercourses. These watercourses convey flow to the River Arun. Mitigation is to include a clear spanning structures with piers not within flood zones and therefore not expected to cause an increase in flood risk. The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including, (but not limited to) soil stripping, cutting, reducing aquifer overburden and intrusive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be negligible, and the overall impact will be insignificant. This option will not include cuttings within the Chalk aquifer. However, given the sensitivity of groundwater resources to the north of the option (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with W46TAG assessment guidance, the magnitude will be negligible, and the overall impact will be insignificant. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for ree sections of road and may offer an opportunity for betterment for existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual developed by CRU (CT53). Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in infiltration may arise due to the introduction of impermeable areas. This may reduce recharge to local groundwater bodies; however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.	N/A	Neutral	N/A			

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)		N/A	£173.636	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial	
			Net journey time changes (£m)					
			0 to 2min	2 to 5min				> 5min
			£18.6	£80.2	£74.8	N/A	£168.9	
	Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified			Moderate beneficial	N/A	
	Physical activity	Not assessed	N/A			N/A	N/A	
	Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. More extensive bypass sections are provided with the fully offline routes which separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the fully offline improvement options are deemed to have a positive impact as a result of improved views of the surrounding area.	N/A			Slight beneficial	N/A	
	Accidents	COBALT assessment has shown that Option 3v1 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing trips from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.	Total number of accidents saved 379, and 545 casualties saved of which 4 fatal, 85 serious, 457 slight			N/A	£22.0	N/A
	Security	Not applicable	N/A			N/A	N/A	N/A
	Access to services	Not applicable	N/A			N/A	N/A	N/A
	Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme, this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.	N/A			Moderate adverse	N/A	Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse
	Severance	Proposed new bypass (to the south of the existing alignment) significantly reduces the volume of traffic and therefore the level of severance in Arundel, in particular between the residential area to the south of Arundel and the town centre. Grade separation and diversions introduced as part of the new A27 Arundel Bypass to maintain PROW on the new alignment, Volume of NMU movements crossing the new bypass alignment likely to be relatively low.	N/A			Slight beneficial	N/A	N/A
	Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.	N/A			Not applicable	N/A	
	Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.			Scheme cost (PVC)	N/A	£161.6
		Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.			indirect tax revenues	N/A	£15.7

Appraisal Summary Table

Date produced: 28/04/2020

Contact: Drew Woodbridge
Highways England
Project Manager

Name of scheme:	A27 Arundel Bypass Option 4/5A/V1
Description of scheme:	The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Name:	Drew Woodbridge
Organisation:	Highways England
Role:	Project Manager

Impacts	Summary of key impacts	Assessment							
		Quantitative		Qualitative	Distributional				
		Value of journey time changes (€m)	€86.297	Monetary €m (NPV)	7-pt scale/ vulnerable grp				
Economy	Business users & transport providers	Value of journey time changes (€m)		N/A	€84.1	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial			
		Net journey time changes (€m)							
		0 to 2min	2 to 5min				> 5min		
	Reliability impact on Business users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified		Large beneficial	N/A			
Regeneration	Not applicable	N/A		N/A	N/A				
Wider impacts	The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.	Agglomeration impacts €64.259m Output change in imperfectly competitive market €5.888m Tax revenue due to labour market impacts €1.673m		N/A	€71.8				
Environmental	Noise	Adverse impacts on properties at Fitzalan Road (south) and south-west of Ford Road roundabout are generally moderate to major in the short-term and minor to moderate in the long-term. Properties located at Tortington and Binsted are generally subject to major adverse impact in the short term, and moderate to major in the long term. Some beneficial impacts, including some that are moderate and major in the short-term, are seen in Arundel town and along the existing A27. 402 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 209 properties; major adverse: 193 properties). 277 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 167 properties; major beneficial: 120 properties). 428 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 4/5A/V1, this number would reduce to 231 once the option is in operation in the design year. There will, therefore, be 197 fewer properties with noise levels above SOAEL with Option 4/5A/V1 in operation compared to do-minimum in the design year. 232 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 141 properties; major adverse: 91 properties). 98 properties would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 37 properties; major beneficial: 3 property). 4 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended. N/A to the west of Option 4/5A/V1 (6158 and 5400) and to the east and south of Crasbush (12486, 12485 and 5482) generally experience a minor adverse impact in the short-term, and negligible impact in the long-term. N/A's along the existing A27 through Arundel (12488, 5487, 5488, 12488, 5485 and 5480) generally experience a moderate to major beneficial impact in the short-term and minor to moderate beneficial impact in the long-term. A night-time noise model has not been undertaken at this stage. Instead, night time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EIA, in accordance with DMRE HD3/19/1 rev1.		Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1064	Estimated number of households experiencing reduced daytime noise levels in the forecast year 2041: 466	N/A	€0.9	Income Quintile 1 - Neutral; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Slight Adverse; Income Quintile 4 - Large Adverse; Income Quintile 5 - Moderate Adverse	
		Air Quality	Overall for Option 4/5A/V1 there is a net improvement in local air quality. There are no waterings or crossings of any exceedance of air quality objectives or limit values with Option 4/5A/V1. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 4/5A/V1. There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Horsham AQMA No 1 (Storrington) where the option results in air quality improvements. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2086. There is no account of CO2 emissions from power generating sources for electric vehicles.	Net Total Assessment 2026 PM2.5: -375.04 NO2: -1793.69	Net Total Assessment 2041 PM2.5: -433.02 NO2: -1263.83	Net total route assessment (opening year) for PM2.5: -375.04 Change in NOx emissions over 60 years: 273 tonnes	N/A	-€7.5	Income Quintile 1 - Large Beneficial; Income Quintile 2 - Slight Adverse; Income Quintile 3 - Large Beneficial; Income Quintile 4 - Large Adverse; Income Quintile 5 - Slight Beneficial
		Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2086. There is no account of CO2 emissions from power generating sources for electric vehicles.	Change in non-traded carbon over 60y (CO2e)		222,105	N/A	-€9.6	
Landscape	The option would create a manmade feature substantially out of scale and discordant within the surrounding landscape pattern. It would result in the permanent loss and fragmentation of intimate, tranquil, dark rural landscapes, including loss of ancient woodland, hedgerows and trees. It would disrupt the historic associations of woodlands and the floodplain with surrounding settlements and cultural features. It would cross the open floodplain on embankment in a prominent and isolated location, and within the flat, largely static, landscape, further increasing its prominence. This option substantially fragments significant areas within the high quality landscape of the SDNP and its setting. It would permanently fragment the dispersed rural village character of Binsted and areas of irreplaceable ancient woodland and former parkland on the edge of the SDNP.	Change in traded carbon over 60y (CO2e)		N/A	N/A	-€9.6			
Townscape	This option does not go through areas of townscape, therefore not applicable.	N/A		N/A	N/A				
Historic Environment	Option 4/5A/V1 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise four Scheduled Monuments, one Grade I Listed Building, three Grade II* Listed Buildings, 55 Grade II Listed Buildings and four Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting so that the relationship is no longer readily appreciable; the interpretability of the significance of the asset is significantly reduced; a loss or reduction of rural tranquility and / or where traffic noise, light and movement are likely to increase. Note that the impact on numerous designated heritage assets within the historic town of Arundel, which lies just outside the 1km study area has been assessed in EAR Chapter 6 - Cultural Heritage, but the asset numbers are not included in the asset count for the study area above.	N/A		N/A	Moderate adverse	N/A			
Biodiversity	Overall Option 4/5A/V1 would have a Large Adverse impact on three features: Binsted Wood Complex LWS; Ancient Woodland; and Bats. Moderate Adverse impacts are predicted for 14 features: A27 Aisford 'site A' 'site B' and site C' notable road verge; Ancient and Veteran Trees; Traditional Orchard HPI; Deciduous Woodland HPI; Hedgeway HPI; Coastal and Floodplain Grazing Marsh HPI; River HPI; Protected and notable plants; Birds; Hazel dormouse; Invertebrates (terrestrial); Reptiles; Water vole; and Other notable mammal species. All other impacts would be Slight Adverse or Neutral.	N/A		N/A	Large adverse	N/A			
Water Environment	The route requires the construction of new cartilageway within undeveloped land to the west and east of Arundel, crossing several ordinary watercourses and land drains. The option also crosses the River Arun and the Binsted and Tortington Rife. The option will also cross a EA designated main river Tortington and Binsted Rife and its minor tributaries, which are Lead Local Flood Authority designated ordinary watercourses. These watercourses convey flow to the River Arun. Mitigation is to include a clear spanning structures with piers not within flood zones and therefore not expected to cause an increase in flood risk. The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including, but not limited to soil stripping, cutting, reducing aquifer overburden and intrusive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be Negligible, and the overall impact will be insignificant. This option will not include cuttings within the Chalk aquifer. However, given the sensitivity of groundwater resources to the north of the option (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with W45TAG assessment guidance, the magnitude will be Negligible, and the overall impact will be Negligible. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for new sections of road and may offer an opportunity for betterment for existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual developed by CRU (17/53). Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in infiltration may arise due to the introduction of impermeable areas. This may reduce recharge to local groundwater bodies; however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.	N/A		N/A	Neutral	N/A			

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)			N/A	£174.0	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial
			Net journey time changes (£m)					
			0 to 2min	2 to 5min	> 5min			
			£19.2	£79.0	£81.1			
	Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified			Moderate beneficial	N/A	
	Physical activity	Not assessed	N/A			N/A	N/A	
	Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. More extensive bypass sections are provided with the fully offline routes which separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the fully-offline improvement options are deemed to have a positive impact as a result of improved views of the surrounding area.	N/A			Slight beneficial	N/A	
	Accidents	COBALT assessment has shown that Option 4/5A1 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing trips from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.	Total number of accidents saved 527 and 751 casualties saved of which 8 fatal, 105 serious and 639 slight			N/A	£29.0	N/A
	Security	Not applicable	N/A			N/A	N/A	N/A
	Access to services	Not applicable	N/A			N/A	N/A	N/A
	Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme, this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.	N/A			Moderate adverse	N/A	Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse
	Severance	Proposed new bypass (to the south of the existing alignment) significantly reduces the volume of traffic and therefore the level of severance in Arundel, in particular between the residential area to the south of Arundel and the town centre. Grade separation and diversions introduced as part of the new A27 Arundel Bypass to maintain PROW on the new alignment. Volume of NHJ movements crossing the new bypass alignment likely to be relatively low.	N/A			Slight beneficial	N/A	N/A
	Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.	N/A			Not applicable	N/A	
	Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.					
		Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.			Scheme cost (PVC)	N/A	£174.8
			indirect tax revenues				N/A	£11.7

Appraisal Summary Table

Date produced: 28/04/2020

Contact:
Name: Drew Woodbridge
Organisation: Highways England
Role: Project Manager

Name of scheme:	A27 Arundel Bypass Option 4/5A/2
Description of scheme:	The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Impacts	Summary of key impacts	Assessment						
		Quantitative			Qualitative	Monetary	Distributional	
		Value of journey time changes (£m)				£m (NPV)	7-pt scale/ vulnerable grp	
Economy	Business users & transport providers	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for business users.						
		Value of journey time changes (£m)			£91.894			
		Net journey time changes (£m)						
	Reliability impact on Business users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.						
	Regeneration	Not applicable						
	Wider Impacts	The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.						
Environmental	Noise	Adverse impacts on properties at Fitzalan Road (south) and south-west of Ford Road roundabout are generally moderate to major in the short-term and minor to moderate in the long-term. Properties located at Tortington and Binsted are generally subject to major adverse impacts in the short-term, and moderate to major in the long-term. Some beneficial impacts, including some that are moderate and major in the short-term, are seen in Arundel town and along the existing A27.						
		375 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 169 properties; major adverse: 206 properties). 305 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 201 properties; major beneficial: 104 properties). 407 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 4/5A/2, this number would reduce to 228 once the option is in operation in the design year. There will, therefore, be 179 fewer properties with noise levels above SOAEL with Option 4/5A/2 in operation compared to do-minimum in the design year.						
		224 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 160 properties; major adverse: 64 properties). 97 properties would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 88 properties; major beneficial: 9 properties). 8 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended.						
		NIAs to the west of Option 4/5A/2 (6158 and 6490) and to the east and south of Crossbush (12486, 12485 and 5482) generally experience a minor adverse impact in the short-term, and negligible impact in the long-term. NIAs along the existing A27 through Arundel (12488, 5487, 5488, 12488, 5485 and 5488) generally experience a moderate to major beneficial impact in the short-term and minor to moderate beneficial impact in the long-term. A night-time noise model has not been undertaken at this stage. Instead, night-time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EAR, in accordance with DMRB HD213/11 rev1.			Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1008			
	Air Quality	Overall for Option 4/5A/2 there is a net improvement in local air quality. There are no worsenings or creations of air quality objectives or limit values with Option 4/5A/2. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 4/5A/2.						
		There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Hosham AQMA No 1 (Storrington) where the option results in air quality improvements.						
		Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2086.			Net total route assessment (opening year) for PM2.5 - 358.08 Change in NOx emissions over 60 years: 233 tonnes			
	Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2086. There is no account of CO2 emissions from power generating sources for electric vehicles.			Net Total Assessment 2026 PM2.5- 358.08 NO2- 1729.29			
					Net Total Assessment 2041 PM2.5- 438.77 NO2- 1229.66			
	Landscape	This option would result in substantial loss and fragmentation of a varied section of rural landscape, including the irreplaceable lots of ancient woodland and historic parkland. It would result in a substantial loss of tranquillity, vegetation (including hedgerows and trees) and impact on local cultural associations. It would cross the open floodplain on embankment in a prominent and isolated location, and within the flat, largely static, landscape, further increasing its prominence. This option substantially fragments significant areas within the high quality landscape of the SDNP and its setting. It would permanently fragment the dispersed rural village character of Binsted and areas of irreplaceable ancient woodland and former parkland on the edge of the SDNP.			Properties (PM2.5 in the opening year 2026) Improved: 14960 Neutral: 640 Worsening: 7944			
	Historic Environment	Option 4/5A/2 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise four Scheduled Monuments, two Grade II Listed Buildings and Grade II Listed Buildings and four Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting so that the relationship is no longer readily appreciable, the interpretability of the significance of the asset is significantly reduced, a loss or reduction of rural tranquillity and/or where traffic noise, light and movement are likely to increase. Note that the impact on numerous designated heritage assets within the historic town of Arundel, which lies just outside the 1km study area has been assessed in EAR Chapter 6 - Cultural Heritage, but the asset numbers are not included in the asset count for the study area above.			Properties (NO2 in the opening year 2026) Improved: 14149 Neutral: 1376 Worsening: 8,019			
	Biodiversity	Overall Option 4/5A/2 is regarded as having a Very Large Adverse Impact on six features: Binsted Wood Complex LWS, Ancient Woodland, Wood Pasture and Parkland HPI, Deciduous Woodland HPI, Bats, Invertebrates (terrestrial)						
		Moderate Adverse impacts are predicted for 11 features: A27 Aislford 'site A' 'site B' and site C notable road verge, Ancient and Veteran Trees, Hedgerow HPI, Coastal and Floodplain Grazing Marsh HPI, River HPI, Protected and notable plants, Birds, Hoatzin dormouse, Reptiles, Water vole; and Other notable mammal species						
	Water Environment	All other impacts would be Slight Adverse or Neutral.						
		The route requires the construction of new carriageway within undeveloped land to the west and east of Arundel, crossing several ordinary watercourses and land drains. The option also crosses the River Arun and the Binsted and Tortington Rife. The option will also cross a EA designated main river Tortington and Binsted Rife and its minor tributaries, which are Lead Local Flood Authority designated ordinary watercourses. These watercourses convey flow to the River Arun. Mitigation is to include a clear spanning structures with piers not within flood zones and therefore not expected to create an increase in flood risk. The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including, (but not limited to) soil stripping, cutting, reducing aquifer overburden and intrusive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be Negligible, and the overall impact will be insignificant. This option will not include cuttings within the Chalk aquifer. However, given the sensitivity of groundwater resources to the north of the option (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with W487AG assessment guidance, the magnitude will be Negligible, and the overall impact will be Insignificant. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for new sections of road and may offer an opportunity for treatment for existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual Developed by CIRIA (C753). Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in infiltration may arise due to the introduction of impermeable areas. This may reduce recharge to local groundwater bodies; however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.						

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)		£192,807	N/A	£187.4	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial	
			Net journey time changes (£m)						
			0 to 2min	2 to 5min					> 5min
			£23.3	£79.3	£90.3				
Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.		not quantified			Moderate beneficial	N/A		
Physical activity	Not assessed		N/A			N/A	N/A		
Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. More extensive bypass sections are provided with the fully offline routes which separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the fully-offline improvement options are deemed to have a positive impact as a result of improved views of the surrounding area.		N/A			Slight beneficial	N/A		
Accidents	COBALT assessment has shown that Option 4.5A2 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing trips from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.		Total number of accidents saved 727 and 1,019 casualties saved of which 9 fatal, 133 serious and 878 slight.			N/A	£36.9	N/A	
Security	Not applicable		N/A			N/A	N/A	N/A	
Access to services	Not applicable		N/A			N/A	N/A	N/A	
Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme; this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.		N/A			Moderate adverse	N/A	Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse	
Severance	Proposed new bypass (to the south of the existing alignment) significantly reduces the volume of traffic and therefore the level of severance in Arundel, in particular between the residential area to the south of Arundel and the town centre. Grade separation and diversions introduced as part of the new A27 Arundel Bypass to maintain PROW on the new alignment. Volume of NMU movements crossing the new bypass alignment likely to be relatively low.		N/A			Slight beneficial	N/A	N/A	
Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.		N/A			Not applicable	N/A		
Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.		Scheme cost (PVC)			N/A	£183.1	
	Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.		indirect tax revenues			N/A	£5.9	

Appraisal Summary Table

Date produced: 28/04/2020

Contact:
Name: Drew Woodbridge
Organisation: Highways England
Role: Project Manager

Name of scheme: A27 Arundel Bypass Option 5B/V1
Description of scheme: The replacement of the existing single carriageway road with a dual carriageway Bypass, linking together the two existing dual carriageway sections of the road.

Impacts	Summary of key impacts	Assessment					
		Quantitative		Qualitative	Distributional		
Economy	Business users & transport providers	Value of journey time changes (£m)		£85.570	N/A	£83.5	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial
		0 to 2min	2 to 5min				
		-£0.2	£35.6	£50.2			
	Reliability impact on Business users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / variability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.		not quantified	Large beneficial	N/A	
	Regeneration	Not applicable		N/A	N/A	N/A	
	Wider Impacts	The wider economic impacts of the scheme have been assessed using a WITA emulator tool. The scheme would deliver positive economic impacts associated with agglomeration (of manufacturing, construction, consumer services and producer services), labour market impacts and output change in imperfectly competitive markets.		Agglomeration impacts £76,000m Output change in imperfectly competitive market £6,458m Tax revenue due to labour market impacts £1,858m	N/A	£84.4	
Environmental	Noise	Adverse impacts on properties at Fitzalan Road (south), south of A27 and west of Ford Road roundabout and a limited number of properties at Walberton are generally moderate to major in the short-term, and minor to moderate in the long-term. Properties located at Tortington and Binsted are generally subject to major adverse impact in the short-term, and moderate to major in the long-term. Some beneficial impacts, including some that are moderate and major in the short-term, are seen in Arundel town and along the existing A27. 531 properties would experience a moderate and major adverse impact in the short-term (moderate adverse: 322 properties; major adverse: 209 properties). 312 properties would experience a moderate and major beneficial impact in the short-term (moderate beneficial: 175 properties; major beneficial: 137 properties). 462 properties within the study area would be subject to noise levels exceeding the significant observed adverse effect level (SOAEL) in the design (forecast) year without Option 5B/V1; this number would reduce to 263 once the option is in operation in the design year. There will, therefore, be 199 fewer properties with noise levels above SOAEL with Option 5B/V1 in operation compared to de-minimum in the design year. 265 properties would experience a moderate and major adverse impact in the long-term (moderate adverse: 176 properties; major adverse: 89 properties). 107 properties would experience a moderate and major beneficial impact in the long-term (moderate beneficial: 105 properties; major beneficial: 2 properties). 2 properties have the potential to qualify under the Noise Insulation Regulations 1975, as amended. The NIA to the west of Option 5B/V1 (6158) and NIAs to the east and south of Crossbush (12486, 12487, 12488 and 5482) generally experience a minor adverse impact in the short-term, and negligible impact in the long-term. NIAs along the existing A27 through Arundel (12489, 5487, 5488, 12488, 5485 and 5486) generally experience a moderate to major beneficial impact in the short-term and minor to moderate beneficial impact in the long-term. A night-time noise model has not been undertaken at this stage. Instead, night-time impacts have been translated from daytime noise metrics. Using this method, the noise assessment workbook does not provide quantitative results for the households experiencing increased and reduced night-time noise in the forecast year. However, the potential for night-time noise impacts during the long-term have been reported in the PCF Stage 2 EAR, in accordance with DMRB HD21/3/11 rev1.		Estimated number of households experiencing increased daytime noise levels in the forecast year 2041: 1249 Estimated number of households experiencing reduced daytime noise levels in the forecast year 2041: 527	N/A	-£1.7	Income Quintile 1 - Neutral; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Slight Adverse; Income Quintile 4 - Large Adverse; Income Quintile 5 - Moderate Adverse
	Air Quality	Overall for Option 5B/V1 there is a net improvement in local air quality. There are no worsenings or creations of air quality objectives or limit values with Option 5B/V1. However, in a regional context, total mass emissions of NOx and PM2.5 are predicted to increase as a result of Option 5B/V1. There are a number of receptors contained within designated AQMAs within 200m of the local air quality affected road network, primarily within Hosham AQMA No 1 (Storrington) where the option results in air quality improvements. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085.		Net Total Assessment 2026 PM2.5: -327.39 NO2: -1476.68 Net Total Assessment 2041 PM2.5: -396.82 NO2: -961.22 Net total route assessment (opening year) for PM2.5 - 327.39 Change in NOx emissions over 60 years: 209 tonnes Properties (PM2.5 in the opening year 2026) Improved: 14970 Neutral: 576 Worsening: 7998 Properties (NO2 in the opening year 2026) Improved: 14653 Neutral: 576 Worsening: 8,115	N/A	-£7.1	Income Quintile 1 - Large Beneficial; Income Quintile 2 - Slight Adverse; Income Quintile 3 - Large Beneficial; Income Quintile 4 - Large Adverse; Income Quintile 5 - Slight Beneficial
	Greenhouse gases	The appraisal reflects a net increase in vehicle kilometres travelled over a large network extent. Uncertainties comprise: no forecast of traffic growth beyond 2041, beyond this no change has been assumed; no forecast emission factors after 2030. From 2030 it has been assumed that 2030 emission factors apply up to 2085. There is no account of CO2 emissions from power generating sources for electric vehicles.		Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	151,808 N/A	N/A -£6.5	
	Landscape	This option would result in significant adverse impacts on the setting of the SCONP and would permanently change the diverse, high quality landscape from Binsted to Crossbush. It would result in loss of vegetation, including woodland and hedgerow, and significant fragmentation of the existing local landscape pattern. It would result in a considerable loss of tranquillity, especially within the quiet, rural communities of Binsted and Tortington. Cultural associations with these communities would also be damaged, through severance of physical linkages and through disturbance of cultural activities. It would cross the open floodplain on embankment in a prominent and isolated location, and within the flat, largely static, landform, further increasing its prominence.		N/A	Large adverse	N/A	
	Townscape	This option does not go through areas of townscape, therefore not applicable.		N/A	Not applicable	N/A	
	Historic Environment	Option 5B/V1 study area contains a considerable number of designated assets not all of which will be affected by the proposed scheme (See EAR Chapter 6 - Cultural Heritage). Designated assets within the study area comprise: one Grade I Listed Monument, one Grade I Listed Building, three Grade II* Listed Buildings, 63 Grade II Listed Buildings and five Conservation Areas. The impacts are likely to include harm to the relationship between the asset and its setting so that the relationship is no longer easily appreciable; the interpretability of the significance of the asset is significantly reduced; a loss or reduction of rural tranquillity and / or where traffic noise, light and movement are likely to increase. Note that the impact on numerous designated heritage assets within the historic town of Arundel, which lies just outside the 1km study area has been assessed in EAR Chapter 6 - Cultural Heritage, but the asset numbers are not included in the asset count for the study area above.		N/A	Moderate adverse	N/A	
	Biodiversity	Overall Option 5B/V1 is regarded as having a Large Adverse impact on one feature: Bats. Moderate Adverse impacts are predicted for 12 features: Ancient and Veteran Trees; Deciduous Woodland HPI; Hedgerow HPI; Coastal and Floodplain Grazing Marsh HPI; River HPI Protected and notable plants; Birds; Hazel dormouse Invertebrates (terrestrial); Reptiles; Water vole; and Other notable mammal species. All other impacts would be Slight Adverse or Neutral.		N/A	Large adverse	N/A	
	Water Environment	The route requires the construction of new carriageway within undeveloped land to the west and east of Arundel, crossing several ordinary watercourses and land drains. The option also crosses the River Arun and the Binsted and Tortington Rife. The option will also cross an EA designated main river Tortington and Binsted Rife and its minor tributaries, which are Lead Local Flood Authority designated ordinary watercourses. These watercourses convey flow to the River Arun. The Scheme option also crosses ordinary watercourses associated with the tributaries of the Lidsey Rife. Mitigation is to include a clear spanning structures with piers not within flood zones and therefore not expected to cause an increase in flood risk. The structure crossing the River Arun assumed to be on an embankment will introduce a physical barrier to the movement of surface water, groundwater and displace floodplain storage. Groundwater quality and groundwater flow pathway issues may arise from construction phase activities including, but not limited to) soil stripping, cutting, reducing aquifer overburden and intrusive piled structures. This may consequently create a shorter flow pathway to the groundwater body and increase groundwater vulnerability. With appropriate mitigation measures, the magnitude will be Negligible, and the overall impact will be Insignificant. This option will not include cuttings within the Chalk aquifer. However, given the sensitivity of groundwater resources to the north of the option (comprising Principal Aquifer and a groundwater Source Protection Zone) groundwater is likely contributing to the baseflow of the local surface water features. If groundwater dewatering is required, indirect effects may impact upon these resources. In accordance with W&TAG assessment guidance, the magnitude will be Negligible, and the overall impact will be Insignificant. Risks to water quality in the River Arun, other watercourses and groundwater bodies that may receive the discharge of runoff from the option during operation will be mitigated by the proposed surface water drainage system. This will include appropriate pollution control measures for new sections of road and may offer an opportunity for betterment for existing sections of road if the existing drainage systems are upgraded in line with the SuDS Manual (Developed by CIRIA (07/3). Detailed mitigation will be developed during detailed design including an appropriate drainage system to provide treatment of runoff prior to discharge therefore a Neutral impact is predicted to the quality of surface water and groundwater bodies during operation. A decrease in the amount of infiltration may arise because of the introduction of impermeable areas. This could impact upon the local groundwater flow regime; however, this impact is considered to be Negligible. It is assumed that there are no groundwater dependent ecosystems.		N/A	Neutral	N/A	

Social	Commuting and Other users	The offline new dual carriageway would increase capacity and reduce delays and yield time savings for commuters and others.	Value of journey time changes (£m)			N/A	£179.8	Income Quintile 1 - Moderate Beneficial; Income Quintile 2 - Moderate Beneficial; Income Quintile 3 - Moderate Beneficial; Income Quintile 4 - Moderate Beneficial; Income Quintile 5 - Moderate Beneficial
			Net journey time changes (£m)					
			0 to 2min	2 to 5min	> 5min			
			£19.7	£74.8	£90.2			
	Reliability impact on Commuting and Other users	The scheme would provide an overall reduction in congestion and journey times, with consequential improvements in journey time reliability / stability. The new bypass would provide reliability benefits including in the event of accidents. Reliability savings have not been quantified.	not quantified			Moderate beneficial	N/A	
	Physical activity	Not assessed	N/A			N/A	N/A	
	Journey quality	This option would offer a higher standard of route and would provide reduced levels of congestion and improved journey times, and therefore improved journey quality as a result of reduced driver stress. More extensive bypass sections are provided with the fully offline routes which separate local and strategic traffic, with traffic benefiting from improved carriageway standards which are associated with lower accident rates. This would contribute to a reduction in the fear of potential accidents associated with pedestrians stepping out into the road. In terms of travellers views, the fully-offline improvement options are deemed to have a positive impact as a result of improved views of the surrounding area.	N/A			Slight beneficial	N/A	
	Accidents	COBALT assessment has shown that Option 5bV1 would bring about significant accident benefits. This follows a forecast decrease in the number of accidents as the proposed bypass diverts existing trips from the local lower standard and currently congested routes, onto higher standard roads with typically lower accident rates, resulting in an increased overall level of safety on the highway network.	Total number of accidents saved 678 and 952 casualties saved of which 9 fatal, 126 serious and 817 slight			N/A	£35.0	N/A
	Security	Not applicable				N/A	N/A	N/A
	Access to services	Not applicable				N/A	N/A	N/A
	Affordability	The Arundel improvement scheme comprises the provision of new and improved roads, therefore any changes in affordability are associated with car fuel and non-fuel operating costs. As the intervention is expected to reduce congestion, and the amount of time spent queuing, time savings are expected. However, forecasting indicates an increase in distance travelled on average as a result of re-routing toward the scheme; this would increase vehicle operating costs for some travellers. Examples of these costs include fuel, tyres and the depreciation costs associated with maintenance. A moderate adverse impact is expected across all economic groups as the proposed option results in an increase in distance travelled, resulting in increased vehicle operating costs.	N/A			Moderate adverse	N/A	Income Quintile 1 - Moderate Adverse; Income Quintile 2 - Moderate Adverse; Income Quintile 3 - Moderate Adverse; Income Quintile 4 - Moderate Adverse; Income Quintile 5 - Moderate Adverse
	Severance	Proposed new bypass (to the south of the existing alignment) significantly reduces the volume of traffic and therefore the level of severance in Arundel, in particular between the residential area to the south of Arundel and the town centre. Grade separation and diversions introduced as part of the new A27 Arundel Bypass to maintain PROW on the new alignment. Volume of HGV movements crossing the new bypass alignment likely to be relatively low.	N/A			Slight beneficial	N/A	N/A
	Option and non-use values	Since the scheme will not change the availability of transport services within the study area, option values and non-use values are not applicable for this assessment and have therefore not been assessed.	Not assessed			N/A	Not applicable	
Public Accounts	Cost to Broad Transport Budget	All costs are funded by central government.	Scheme cost (PVC)			N/A	£194.0	
	Indirect Tax Revenues	An increase in indirect tax revenues is predicted as a result of the scheme.	indirect tax revenues			N/A	£11.1	

A27 Arundel Bypass Scheme Assessment Report

Appendix G - Option Assessment Framework

October 2020

Assessment Framework

Scheme Objective	Detailed Objective	NNNPS Policy	Legislation	Criteria	Sub Criteria
Improve capacity of the A27 whilst supporting local planning authorities to manage the impact of planned economic growth	a) Improving regional connectivity, taking into account all modes of transport, and the resilience provided by the A27 route within the West Sussex coastal region in order to contribute positively to the economy of the Arun area b) Facilitating the delivery of housing allocations within the Local Plans	NNNPS Para 2, 2.2, 2.6, 2.9, 2.10, 2.22, 2.23 5.151, 5.152		Increases link capacity and traffic volumes on the A27	
				A27 operating within link volume / capacity levels	
				Extent to which scheme removes traffic from existing route between Ford Road Roundabout and Crossbush Junction	
				Generates wider economic benefits as a result of reduced generalised travel costs	
Reduce congestion, reduce travel time and improve journey time reliability along the A27		NNNPS Para 2, 2.2, 2.22, 2.27	-	A27 journey time improved relative to existing and Do Minimum conditions	
			-	Overall reduction in journey time and delay across the road network	
				Reduce volume of traffic on local roads	
				Improve journey time reliability	
				A27 junctions function within operational capacity under peak traffic conditions	
Improve the safety of travellers along the A27 and consequently	a) Along the Arundel section of the A27 route. The A27 through Arundel has a higher than average accident rate due to its single carriageway	NNNPS Para 2, 2.9, 2.13, 2.24, 4.66		Reduce no. of collisions on A27	
				Reduce total number of collisions	

the wider local road network	component and multiple junctions. b) On the wider local road network caused by longer distance traffic avoiding congestion on the A27				
Improve accessibility for all users to local services and facilities	To reduce the community severance caused by the A27 through Arundel by improving the links between local communities, to provide better access to local services and facilities, particularly for tourism and access to railway stations and bus services	NNNPS Para 2, 2.2, 2.6, 2.9		Reduce highway severance effect for walking, cycling and horse riding Improve multi-modal journey times to key services and facilities	
Respect the South Downs National Park and its special qualities in our decision making	Recognising that any improvement would have a significant impact on the SDNP, have regard to the National Park purposes and the special qualities the SDNP authority is seeking to preserve in designing and evaluating improvement options	NNNPS Para 5.150 - 5.158 - Nationally designated areas: National Parks, the Broads & Areas of Outstanding Natural Beauty		Avoid development within the South Downs National Park except in exceptional circumstances where it can be demonstrated that it is in the public interest following assessment.	<p>1. Diverse, inspirational landscapes and breath-taking views</p> <p>a) Inspirational Landscapes</p> <p>b) Breath-taking views (long distance and panoramic views within SDNP)</p> <p>2. A rich variety of wildlife and habitats including rare and internationally important species.</p> <p>Effects on internationally designated sites - Singleton and Cocking Tunnels SAC f- Arun Valley SAC, SPA and Ramsar site. - The Mens SAC - Ebernoe Common SAC</p> <p>Effects on designated sites (Binsted Wood Complex LWS - a site of national importance)</p> <p>Effects on designated sites (Rewell Wood Complex LWS - a site of national importance)</p> <p>Effects on environmentally designated sites (Avisford Sites A, B and C Notable Road Verges)</p> <p>b) Effects on protected habitats and species, fragmentation and connectivity issues</p> <p>Ancient woodland</p> <p>Wood pasture and parkland HPI</p> <p>Ancient or veteran trees</p>

					Deciduous woodland HPI
					Coastal floodplain grazing marsh HPI and other wetland HPIs
					Aquatic ecology
					Bats
					Birds (woodland)
					Barn owl
					Hazel dormouse
					Terrestrial invertebrates
					Water vole
					Protected/notable plants
					3. Tranquil and unspoilt places
					a) Impact on the landscape quality and tranquillity levels
					4. An environment shaped by centuries of farming and embracing new enterprise
					a) Permanent effect on farming economy
					b) Permanent effect on diversified farm businesses
					c) Temporary effect on new enterprises
					5 Great opportunities for recreational activities and learning experiences
					a) Effects on public rights of way and other access route
					b) Effects on sustainable transport schemes
					c) Severance of the National Park from coastal communities
					di) Effects on recreational and educational facilities (Construction)
					dii) Effects on recreational and educational facilities (Operation)
					6 Well-conserved historical features and a rich cultural heritage
					1. Impacts on settings of designated heritage assets during construction of the Scheme (following The Ancient Monuments Act and 1990 Planning Act – from EAR)
					2. Impacts on settings of designated heritage assets during operation of the Scheme (following The Ancient Monuments Act and 1990 Planning Act – from EAR)
					3. Impacts on non-designated buried heritage assets and historic landscape areas during construction (from EAR)
				4. Impacts on non-designated buried heritage assets and historic landscape areas during operation (from EAR)	

					7. Distinctive towns and villages and communities with real pride in their area
					Reduce traffic volumes on the A29 and A283 route through the SDNP
					a) Positive and negative effects on any direct or indirect changes in traffic volumes and speeds (Construction) (Air Quality)
					a,i) Negative effects on any direct or indirect changes in traffic volumes and speeds (Construction) (Noise and Vibration)
					a,ii) Positive and negative effects on any direct or indirect changes in traffic volumes and speeds (Construction) (Driver Stress)
					b, i) Positive and negative effects on any direct or indirect changes in traffic volumes and speeds - (Operation) (Air Quality)
					b, ii) Negative effects on any direct or indirect changes in traffic volumes and speeds - (Operation) (Noise and Vibration)
					b, iii) Positive and negative effects on any direct or indirect changes in traffic volumes and speeds - (Operation) (Driver Stress)
					b, iv) Positive and negative effects on any direct or indirect changes in traffic volumes and speeds - (Operation) (Traffic accident numbers)
					c, i) Positive and negative effects on access to local services (construction)
					c, ii) Positive and negative effects on access to local services (operation)
					d, i) Pride in the area (construction)
					d, ii) Pride in the area (operation)
Deliver a scheme that minimises environmental impact and seeks to protect and enhance the quality of the surrounding environment through its high-quality	reduce air and noise pollution	NNNPS Para 5.194 and 5.195		Avoid significant adverse impacts on health and quality of life resulting from noise, mitigate and minimise adverse impacts resulting from noise, and contribute improvements where possible.	3. Number of properties within 100m from the alignment of the option
					4. Number of properties with an adverse noise impact in the short-term of moderate or major magnitude (DMRB HD 213/11)
					5. Number of properties above the SOAEL (Noise Policy Statement for England) in the future year with the option
					6. Number of properties with a magnitude of noise impact in the long-term of moderate or major (DMRB HD 213/11)
					7. Potential for qualification under the Noise Insulation Regulations 1975, as amended 1988
					1. Potential impacts on ambient NO2 concentrations at human receptors during operational phase (from EAR)
	NNNPS Para 3.8, 5.9 -5.13	Meeting the air quality policies	Mitigate the air quality impact of the scheme,		

<p>design.</p> <p>To deliver a design that reflects the quality of the landscape and setting of Arundel that takes advantage of opportunities to minimise the adverse environmental impact of new construction, including habitat loss and takes into account the following objectives</p>			to comply with the Government's carbon budgets and the European Union's air quality limit values, including the Air Quality Directive.	and address areas of poor air quality having undertaken assessment.	2. Potential impacts on ambient NOx concentrations and nitrogen deposition levels at ecological receptors during the operational phase (from EAR)
	Protect and enhance the countryside and historic and archaeological environments	NNNPS Para -5.149 -5.157 Nationally designated areas: National Parks, the Broads & Areas of Outstanding Natural Beauty	Meeting landscape and townscape related policy objectives and legislative requirements, including the; National Parks and Access to the Countryside Act 1949; Environment Act 1995; Countryside and Rights of Way Act 2000; and Natural Environment and Rural Communities Act 2006	Avoid or minimise harm to the landscape. Avoid development within nationally designated areas except in exceptional circumstances where it can be demonstrated that it is in the public interest following assessment.	1. Impacts on landscape character (from EAR) 2. Impacts on visual amenity (from EAR)
	work in harmony with the environment to conserve natural resources and encourage bio-diversity	NNNPS Para 5.29 - Sites of Special Scientific Interest (includes National Nature Reserves) NNNPS Para 5.32 -	Meeting policy objectives and legislative requirements for ecology, including the; Wild Birds Directive 2009/147/EC; Habitats Directive	Avoid adverse effects on SSSIs, ancient woodland, veteran trees, and mitigate any adverse aspects of the development. Take opportunities to conserve and enhance biodiversity or geological	1. Impacts on statutory and non-statutory designated sites during construction and operation of the Scheme 2. Impacts on Ancient Woodland (comprising Semi-Natural Ancient Woodland and Plantation on an Ancient Woodland Site) during construction (shown in hectares) 3. Impacts on Ancient and Veteran trees during construction

		Irreplaceable habitats including Ancient Woodland and veteran trees NNNPS Para. 4.22– 4.25 and 5.23-5.26 Protection of other habitats and species, biodiversity and ecological conservation.	92/43/EEC; Water Framework Directive 2000/60/EC; Environmental Impact Assessment Directive 2011/92/EU; Conservation of Habitats and Species Regulations 2017; Wildlife and Countryside Act 1981; Countryside and Rights of Way Act 2000; Natural Environment and Rural Communities Act 2006; National Parks and Access to the Countryside Act 1949; Protection of Badgers Act 1992; and Hedgerow Regulations 1997	conservation interests.	<p>4. Impacts on Habitats of Principal Importance (HPI) during construction (shown in hectares)</p> <p><i>Arable Field Margin HPI</i> <i>Coastal and Floodplain Grazing Marsh HPI</i> <i>Deciduous Woodland HPI</i> <i>Coastal saltmarsh HPI</i> <i>Lowland meadow HPI</i> <i>Hedgerow HPI</i> <i>Mudflat HPI</i> <i>River HPI</i> <i>Traditional Orchard HPI</i> <i>Wood Pasture and Parkland HPI</i></p> <p>5. Residual impacts on protected species during construction and operation of the Scheme.</p>
	Protect and enhance the countryside and historic and archaeological environments	NNNPS Para 5.128-5.138 - The historic environment (designated heritage assets)	Meeting policy objectives and legislative requirements for preserving cultural heritage, including the	Avoid substantial harm to or total loss of significance of designated heritage assets unless it can be demonstrated that the substantial harm or loss of significance	<p>1. Impacts on settings of designated heritage assets during construction of the Scheme (following The Ancient Monuments Act and 1990 Planning Act – from EAR)</p> <p>2. Impacts on settings of designated heritage assets during operation of the Scheme (following The Ancient Monuments Act and 1990 Planning Act – from EAR)</p> <p>3. Impacts on non-designated buried heritage assets and historic landscape areas during construction (from EAR)</p>

			Ancient Monuments and Archaeological Areas Act 1979; the Planning (Listed Buildings and Conservation Areas) Act 1990.	is necessary in order to deliver substantial public benefits that outweigh that loss or harm or that the criteria in paragraph 5.133 of the NNNPS apply.	4. Impacts on non-designated buried heritage assets and historic landscape areas during operation (from EAR)
	Plan for climate change	NNNPS Para 4.36 - 4.47 - Climate Change Adaptation	Meet policies on GHG emission reduction.		3. The change in CO2 due to construction 4. Total change in emissions between do minimum (without scheme) and the do something (with scheme option) over the 60 year lifespan of the Scheme for the Traffic Reliability Area.
		NNNPS Para 5.92-5.97, 5.99 - 5.109- Flood risk NNNPS Para 5.224 - 5.227 - Water quality and resources	Meeting water environment policy objectives and legislative requirements, including the; Water Framework Directive 2000/60/EC; Groundwater Directive (2006/118/EC); Floods and Water Management Act 2010; Environment Agency Groundwater Protection Guides (2017); Environmental Permitting (England and Wales) Regulations 2010; and	Not to increase flood risk and seek to limit and reduce flood risk to the infrastructure. Taking into account project climate change allowances. Mitigate adverse effects on the water environment.	1. Potential for impacts on water quality - Comparison will be made based on the sensitivity of watercourses and number of crossings (based on current design freeze) 2. Potential impacts related to flood risk associated with watercourse crossings and route alignment in flood zones (based on current design freeze). 3.. Potential impact related to flood risk associated with increased surface water discharge- comparison will be made based on the amount of new impermeable surface area introduced (based on current design freeze)

Throughout the design and delivery stages, the scheme should ensure that customers and communities are fully considered	<p>a) Understanding the needs and views of all segments of customers (including vulnerable users), stakeholders and partners</p> <p>b) Responding to those needs and views such that the end product delivers an improved customer experience</p> <p>c) Assessing the impact of works on road users and communities, minimizing disruption and delivering appropriate mitigation measures. The assessment should look at issues through customers eyes</p>		Land Drainage Act 1991.		
			Meeting policy objectives and legislative requirements, including the; National Parks and Access to the Countryside Act 1949; Environment Act 1995; Countryside and Rights of Way Act 2000; Natural Environment and Rural Communities Act 2006	Delays to journeys during scheme construction are minimised	
				Impacts on communities during construction are minimised: Indicator 1: Community feedback on traffic management arrangements during construction	
				Impacts on communities during construction are minimised: Indicator 2: Local business feedback on traffic management arrangements during construction	
				Impacts on journey quality for motorised and non-motorised road uses (from EAR) 1. Journey amenity	
				Impacts on community cohesion 1. People's way of life and Community	Community severance Visual amenity Townscape Cultural heritage
				Impacts on community cohesion 2. Health and wellbeing	Accidents Noise
				Impacts on community cohesion 3. Personal and property rights	

				Impacts on community cohesion 4. Fears and aspirations	Stakeholder fears and aspirations (Consultation Questionnaire Question B.7)
					Consultation Questionnaire Question B.9: Taking into consideration what you know about the proposed options, please select your least preferred option if all options were brought into an affordable range.
				Impacts on community cohesion 5. Vulnerable users using assets within the community (pulled from EqIA)	