highways england

A303 Stonehenge

Amesbury to Berwick Down
Scheme Assessment Report

Appendices F and G

Appraisal Summary Tables and Preferred Route

Volume 8

September 2017

Appendix F Appraisal Summary Tables

Appraisal Summary Table

Date produced:	28th	June	2017

Contact:	
Name	Stephen Bussell
Organisation	AAJV
Role	Economics and Business Case Workstream Lead

Name of scheme:	A303 Stonehenge: Amesbury to Berwick Down
Description of scheme:	Route Option 1Na is a variation on the published Route Option 1N in response to the consultation, with a local horizontal realignment to the west of the of WHS through Oatlands Hill and across the existing A303. The route consists of a 13.2km route running north of Winterbourne Stoke with an eastern tunnel portal located east of The Avenue and an increased approximate 3.25km long tunnel and canopy cover structure to the western portal which is moved further west from Normanton Gorse. The vertical alignment has also been reduced through the WHS to hide the new A303 traffic within the critical heritage landscape and through the section between the existing A303 and the River Till to minimise impacts on views from Winterbourne Stoke and further north.

Impacts		Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Removal of congestion resulting from lack of capacity at junctions and on existing single carriageway resulting in substantial improvements in journey times and therefore lower transport costs. In terms of DIs: Overall there are net benefits associated with all route options for residents in the core modelled area. User benefits have a particularly large impact on people with income deprivation due to increases in the cost of undertaking journeys. Around 2% of the impact area within the user benefit appraisal are within the most deprived income quintile nationally. These residents experience proportionate benefits for all route options.	**Value of journey time changes(£)**: 296,100,000 **Net journey time changes (£)**: 0 to 2min: 37,600,000; 2 to 5min: 78,100,000; > 5min: 180,400,000	N/A	295,300,000	Moderate Beneficial
	Reliability impact on business users	Increased capacity through the provision of a dual carriageway, together with junction improvements would lead to an improvement in day-to-day reliability whilst also reducing the frequency and impact of traffic incidents. Reliability is also improved by the attraction of traffic from local roads therefore reducing incidents.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N./A	14,600,000	
	Regeneration	The scheme is unlikely to have a significant impact on accessibility or economic activity in either of the identified regeneration areas in central Salisbury, or on areas of deprivation in Salisbury and Wilton. Therefore, a formal assessment has not been undertaken at this stage.	N/A	Neutral	N./A	
	Wider Impacts	Moderate agglomeration benefits are expected, driven particularly by reductions in journey costs between and within Salisbury and West Wiltshire but also due to improved links to the Andover/Test Valley area and beyond to Basingstoke and Newbury in the East and Bath in the West. Very slight benefits expected to result from an increase labour market participation resulting from reduced commuting costs. Slight benefits expected to result from increased output in imperfectly competitive markets. Assessment based on Wider Impacts guidance may understate total value of wider economic benefits.	Agglomeration £51.7m (PVB) Labour market impacts £1.6m (PVB) Output in imperfectly competitive markets £19.3m (PVB)	N/A	72,600,000	
Environmental	Noise	19 Households are likely to qualify for noise insulation due to road traffic noise. The 5 Schools and one library located within the noise impact study area would not be expected to experience a significant noise change. More households are predicted to experience a noise increase than a noise decrease, resulting in an overall monetised dis-benefit from the scheme. The monetised benefit of 1Na would offer least benefit due to the junction arrangement with the A360 and increased volumes of traffic travelling on local roads to access the new route alignment. No households are likely to experience more than 81dBA	545 Households are likely to experience an increase in daytime noise in the forecast year 2041 315 Households are likely to experience a decrease in daytime noise in the forecast year 2041 175 Households are likely to experience an increase in night time noise in the forecast year 2041 194 Households are likely to experience a decrease in night time noise in the forecast year 2041	N/A	-1,032,000	Moderate Adverse
	Air Quality	The nearest Air Quality Management Areas (AQMAs) are those in Salisbury approximately 11 km south of option 1Na. There would be no new exceedances as a result. Option 1Na would change air quality in year of opening 2026 at receptors for NO2/PM10 by: improving 2490/1410, worsening 1350/1348, no change at 1039/2121 receptors. Overall there would be a net improvement in local air quality with the scheme (for PM10 and NO2) as a result of the realignment of the A303 away from sensitive receptors. There would be a negative impact on regional emissions for NOx due to increases in AADT and HDV flows and the link distance travelled.	Local Air Quality Assessment Score in Year of Opening:2026: PM10: -48.3 NO2: -168 Regional Emissions (Over 60 year appraisal period) NOx: +1,578 tonnes	N/A	PM10 NPV: +196, 000 NOX NPV : -800, 000 Total value of change in air quality: -604, 000	Neutral
	Greenhouse gases	The change in non-traded carbon dioxide emissions in the opening year 2026 is 20,584 tCO2e. The route option would result in an increase in user carbon due to increases in vehicle flows attracted to the route, and the relatively longer distance travelled compared to the existing route.	Change in non-traded carbon over 60y (CO2e): 1,676, 541 Change in traded carbon over 60y (CO2e): 0	N/A	-75,515,000	
	Landscape	Overall this 13.2km route would have a Moderate Adverse impact on the Larkhill Chalk Downland, Till Narrow Chalk River Valley and Tilshead Chalk Downland LCAs. This is due to a decrease in tranquillity, reduced quality of visual amenity and adverse impact on the scale and pattern of the landscape. The latter as the result of the impact on topography and landscape character, particularly on Larkhill Downland LCA, where the substantial cutting through the high ground near to Oatlands Hill would be at considerable variance with the local landform and would be visually intrusive as well as the adverse effect on 'Diamond Wood' - a visually distinctive feature in the landscape. Conversely this route option would have beneficial effects on pattern, tranquillity and cultural aspects due to the tunnel section. This would allow reinstatement of landscape pattern and visual connectivity between cultural aspects within the WHS, as well as improving tranquillity and visual amenity. However, it is not considered that these beneficial effects would outweigh the adverse effects on the landscape.	N/A	Moderate Adverse	N/A	
	Townscape	It is anticipated that there would not be any notable impacts on townscape as a result of option 1Na.	N/A	Neutral	N/A	
	Historic Environment	1Na would remove the A303 from a key part of the WHS, significantly improving that part of the WHS and the setting of Stonehenge and c. 50 other related monuments within the WHS. It would also reconnect the Avenue and King Barrow Ridge. The option would benefit the WHS as a whole. These are very notable benefits associated with assets of predominately international and national value. The route would have adverse impacts on the setting of other scheduled monuments within and outside of the WHS and the fabric of one scheduled monument and numerous areas of non-designated archaeology of regional or local value. There would also be adverse and beneficial impacts on listed buildings, conservation areas and a registered park and garden. Overall, there would be a greater number of adverse effects than beneficial effects on designated and non-designated heritage assets, although a greater number of assets of high and very high importance would experience significant beneficial effects. For option 1Na of the 153 SMs, that contribute to the OUV of the WHS, 3 SMs of very high importance would experience significant beneficial effects*: moderate for The Cursus, large for The Avenue and very large for Stonehenge. For the remaining SMs of high importance, of the 58 SMs experiencing beneficial effects - this would be sub divided as follows: large 21, moderate 23 and slight 14, whereas for the 59 SMs experiencing adverse effects: very large 6, large 18, moderate 15, and slight 14. In terms of the overall score a balancing approach has been taken to reflect the complex mixture of adverse and beneficial impacts. This balance is reliant on professional judgements. NPSNN requires greater weight to be given to impacts on assets of the highest value e.g. the WHS, Stonehenge and the Avenue. Consequently, when balancing the overall impact on the historic environment a Slight Benefit has been recorded to reflect this weighting. * based on DMRB Scoring criteria	N/A	Slight Beneficial	N/A	
	Biodiversity	A precautionary approach to assessment is taken of potential significant adverse impacts on designated international and national ecological sites. This is due to the construction of a tunnel, the uncertainty over construction methodology, and size / footprint of one new crossing over the River Till. Mitigation through design development should lead to a reduction of the scale of impact for the latter receptor. Adverse impacts would result from the construction of a new river crossing on the River Till SSSI, designation which overlaps with the River Avon SAC designation. Option 1Na passes very close to Salisbury Plain SAC/Parsonage Down SSSI & NNR, with likely associated indirect impacts from air quality, noise and visual disturbance. The route corridor would also result in direct impact to one CWS (Countess Cutting) and one woodland (The Diamond), assuming that the option will be contained to the existing highways land around Countess Roundabout and will not encroach into the Vespasian's Camp/Amesbury Abbey woodlands nor Countess Swamp CWS. Benefits brought by a tunnel option include landscape reconnection and habitat restoration leading to a reduction of road fatalities and increase in wildlife movement.	N/A	Large Adverse	N/A	
	Water Environment	A precautionary approach to assessment is taken of potential significant adverse impacts on local groundwater abstractions, flood risk and groundwater fed surface water features within the area of influence of option 1Na. This is because one of the construction methodologies may require dewatering of the Chalk aquifer. Overall, operational risks are considered to be significantly lower than those associated with construction. Monitoring will be required to fully evaluate the extent and magnitude of these effects, and this may influence the assessment score.	N/A	Large Adverse	N/A	
Social	Commuting and Other users	Removal of congestion resulting from lack of capacity at junctions and on existing single carriageway, producing significant improvements in journey times. In terms of DIs: Overall there are net user benefits for residents in the core modelled area in the region of £78 million. The most deprived income quintiles experience benefits that are in line with what would be expected from a fair distribution of benefits. Overall a moderate beneficial impact is considered for user benefits as a result of the option.	**Value of journey time changes(£)**: 306,100,000 **Net journey time changes (£)**: 0 to 2min: 3,100,000; 2 to 5min: 126,900,000; > 5min: 176,100,000	N/A	164,300,000	Moderate beneficial
	Reliability impact on Commuting and Other users	Delays due to incidents journey time variability is also perceived as an issue for commuters and other users. The scheme would improve reliability by providing additional capacity on the network, improved response times and greater resilience through provision of technology and improved access; and fewer accidents and incidents through the improvement to safety.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N/A	46,000,000	
	Physical activity	Overall 1Na would result in a beneficial effect on physical activity. 1Na would reduce severance at approx.18 Public Rights of Way (PRoW) and cause severance at 9 PRoW.	N/A	Beneficial	N/A	
	Journey quality	Loss of views of the WHS including Stonehenge is an adverse effect. However a dualled alignment would improve travellers ability to make good progress along the route and an improvement to the condition of the road network would reduce both traveller stress through less frustration and fear of potential accidents and give more route certainty.	N/A	Moderate Beneficial	N/A	
	Accidents	Replacement of existing single carriageway with grade-separated dual carriageway would save about six accidents per year. In terms of DIs: All affected links are expected to experience a decrease in accident levels as a result of the scheme. All vulnerable casualties are forecast to experience a slight benefit except cyclists and children (under 16) as there have not been any casualties of tis type on links forecast to experience a benefit in terms of accident levels. Overall, the 1Na option is likely to have a slight beneficial impact to accidents.	Monetised assessment of benefits of changes in accidents using COBALT software	N/A	14,400,000	Slight Beneficial
	Security	No significant impacts on personal security have been identified at this stage.	N/A	Neutral	N/A	Neutral
	Access to services	No impacts identified for public transport services and access to services.	N/A	Neutral	N/A	N/A
	Affordability	There is likely to be a slight reduction in vehicle operating costs due to reduced congestion, and a slight increase in vehicle operating costs due to travelling further, although the further distance will be minimal. Overall, the impact on affordability for users will be neutral. In terms of DIs: Overall there are net disbenefits for residents within the core modelled area in the region of £14 million. All quintiles experience disbenefits except for the most deprived income quintile (located around Salisbury) which experiences net benefits as a result of the option. This group only account for 2% of the population within the impact area, however experience a large beneficial impact. Due to the net disbenefits of the scheme, but beneficial impact on the most vulnerable residents within the impact area, the affordability appraisal is considered to be slight adverse.	N/A	Neutral	N/A	Slight adverse
	Severance	A number of rights of way would be severed by the new highway however this would affect a small number of residents and the impact could be mitigated to leave residual slight adverse effects. Through realignment of the highway and redistribution of traffic Option 1Na would reduce severance within and between several settlements in the vicinity, affecting more than 200 but less than 1000 travellers daily In terms of DIs: Overall, the route is likely to reduce severance for all groups, due to the option removing traffic from the existing A303 and displacing it to the bypass. Therefore, all groups are considered to have a slight beneficial severance impact associated with the scheme, however children are considered to have a moderate beneficial impact due to the location of three schools within close proximity to the existing route. Overall it is considered that there is a slight beneficial impact on severance.	N/A	Moderate Beneficial	N/A	Slight beneficial
	Option and non-use values	It is unlikely this scheme will have any impact on Option Values as there is no new provision of public transport services or removal of existing services.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	A privately-funded option using a DBFM structure with availability payments is the most likely commercial route to delivery of the scheme. Therefore, at this stage, it is assumed the entire cost of the scheme will initially be financed by the private sector and then paid by the Transport Budget after the opening date, over a period of around 25-35 years.	Indicative capital cost estimates provided by Highways England Commercial team. Allowance of tunnel and surface highway operating and maintenance costs included.	N/A	1,146,219,000	
	Indirect Tax Revenues	The increase in indirect taxation is marginal. There is a minor increase in indirect taxation due to vehicles travelling a slightly greater distance and therefore there is a minor net positive change in fuel duty revenue through increased vehicle operating costs.	Assessed based on traffic model outputs using TUBA software	N/A	-107,040,000	

Appraisal Summary Table

Date produced:	28th	June	2017

Contact:	
Name	Stephen Bussell
Organisation	AAJV
Role	Economics and Business Case Workstream Lead

Name of scheme:	A303 Stonehenge; Amesbury to Berwick Down
Description of scheme:	Route Option 1Nd is a variation on the published Route Option 1N in response to the consultation, and consists of a 12.9km route running north of Winterbourne Stoke with an eastern tunnel portal located east of The Avenue and an increased approximate 3.2km long tunnel and canopy cover structure to the western portal which is moved north to a point just south of the existing A303. The vertical alignment has been reduced through the WHS to hide the new A303 traffic within the critical heritage landscape and through the section between the A360 and the River Till to minimise impacts on the key landscape views from Winterbourne Stoke and further north.

	Impacts	Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Removal of congestion resulting from lack of capacity at junctions and on existing single carriageway resulting in substantial improvements in journey times and therefore lower transport costs. In terms of DIs: Overall there are net benefits associated with all route options for residents in the core modelled area. User benefits have a particularly large impact on people with income deprivation due to increases in the cost of undertaking journeys. Around 2% of the impact area within the user benefit appraisal are within the most deprived income quintile nationally. These residents experience proportionate benefits for all route options.	Value of journey time changes(£): 305,500,000 Net journey time changes (£): 0 to 2min: 55,100,000; 2 to 5min: 80,900,000; > 5min: 169,500,000	N/A	309,300,000	Moderate Beneficial
	Reliability impact on business users	Increased capacity through the provision of a dual carriageway, together with junction improvements would lead to an improvement in day-to-day reliability whilst also reducing the frequency and impact of traffic incidents. Reliability is also improved by the attraction of traffic from local roads therefore reducing incidents.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N./A	14,600,000	
	Regeneration	The scheme is unlikely to have a significant impact on accessibility or economic activity in either of the identified regeneration areas in central Salisbury, or on areas of deprivation in Salisbury and Wilton. Therefore, a formal assessment has not been undertaken at this stage.	N/A	Neutral	N./A	
	Wider Impacts	Moderate agglomeration benefits are expected, driven particularly by reductions in journey costs between and within Salisbury and West Wiltshire but also due to improved links to the Andover/Test Valley area and beyond to Basingstoke and Newbury in the East and Bath in the West. Very slight benefits expected to result form an increase labour market participation resulting from reduced commuting costs. Slight benefits expected to result from increased output in imperfectly competitive markets. Assessment based on Wider Impacts guidance may understate total value of wider economic benefits.	Agglomeration £45.0m (PVB) Labour market impacts £1.6m (PVB) Output in imperfectly competitive markets £19.6m (PVB)	N/A	66,100,000	
Environmental	Noise	12 Households are likely to qualify for noise insulation due to road traffic noise. The 5 Schools and one library located within the noise impact study area would not be expected to experience a significant noise change. More households are predicted to experience a noise increase than a noise decrease, resulting in a overall monetised dis-benefit from the scheme. The monetised benefit of 1Nd would offer more benefit than 1Na due to the lower noise impact from the A360 junction location, but would not reduce the noise impact of increased volumes of traffic travelling on local roads around Amesbury. No households are likely to experience more than 81dBA	763 Households are likely to experience an increase in daytime noise in the forecast year 2041 269 Households are likely to experience a decrease in daytime noise in the forecast year 2041 196 Households are likely to experience an increase in night time noise in the forecast year 2041 167 Households are likely to experience a decrease in night time noise in the forecast year 2041	N/A	-358,000	Moderate Adverse
	Air Quality	The nearest AQMAs to the Scheme are those in Salisbury, approximately 11 km south of option 1Nd. There would be no new exceedances as a result. Option 1Nd would change air quality in year of opening 2026 at receptors for NO2/PM10 by: improving 2804/1367, worsening 1397/1076, no change at 679/2437 receptors. Overall there is a net improvement in local air quality with the scheme (for PM10 and NO2) as a result of the realignment of the A303 away from sensitive receptors. There is a negative impact on regional emissions for NOx due to increases in AADT and HDV flows and link distance travelled.	Local Air Quality Assessment Score in Year of Opening:2026: PM10: -63.70 NO2: -185.70 Regional Emissions (Over 60 year appraisal period) NOx: +1,606 tonnes	N/A	PM10 NPV: +271,000 NOX NPV : -813,000 Total value of change in air quality: - 543,000	Neutral
	Greenhouse gases	The change in non-traded carbon dioxide emissions in the opening year 2026 is 20,993 tCO2e. The route option would result in an increase in user carbon due to increases in vehicle flows attracted to the route, and the relatively longer distance travelled compared to the existing route.	Change in non-traded carbon over 60y (CO2e): 1,667,427 Change in traded carbon over 60y (CO2e): 0	N/A	-75,116,000	
	Landscape	Overall this 12.9km route would have a Moderate Adverse impact on the Larkhill Chalk Downland, Till Narrow Chalk River Valley and Tilshead Chalk Downland LCAs. This includes a decrease in tranquillity, reduced quality of visual amenity and adverse impact on the scale and landscape pattern, an important feature that shapes this landscape of expansive open rolling downland and small scale sinuous river valleys. This would be due to the adverse effects of the cuttings and (to a lesser extent due to their infrequency) the embankments on the topography and character of the landscape. Conversely this route option would have beneficial effects on pattern, tranquillity and cultural aspects due to the tunnel section. This would allow the reinstatement of landscape pattern and visual connectivity between cultural aspects within the WHS, as well as improving tranquillity and visual amenity. However, it is not considered that these beneficial effects would outweigh the adverse effects on the landscape.	N/A	Moderate Adverse	N/A	
	Townscape	It is anticipated that there would not be any notable impacts on townscape as a result of Option 1Nd.	N/A	Neutral	N/A	
	Historic Environment	1Nd would remove the A303 from a key part of the WHS, significantly improving that part of the WHS and the setting of Stonehenge and c. 50 other related monuments within the WHS. It would also reconnect the Avenue and King Barrow Ridge. The option would benefit the WHS as a whole, and the route also exits the WHS to the west with the least impact of all options and the greatest scope for design mitigation. These are very notable benefits associated with assets of predominately international and national value. The route would have adverse impacts on the setting of other scheduled monuments within and outside of the WHS and the fabric of one scheduled monument and numerous areas of non-designated archaeology of regional or local value. There would also be adverse and beneficial impacts on listed buildings, conservation areas and a registered park and garden. Overall, there would be a greater number of adverse effects than beneficial effects on designated and non-designated heritage assets, although a greater number of assets of high and very high importance would experience significant beneficial effects. Within the study area for option 1Nd, of the 167 SMs, that contribute to the OUV of the WHS, 3 SMs of very high importance would experience significant beneficial effects*: moderate for The Cursus, large for The Avenue and very large for Stonehenge. For the remaining SMs of high importance, of the 49 SMs experiencing beneficial effects - this would be sub divided as follows: large 13, moderate 22 and slight 14, whereas the 68 SMs experiencing adverse effects: very large 7, large 20, moderate 27, and slight 14. In terms of the overall score a balancing approach has been taken to reflect the complex mixture of adverse and beneficial impacts. This balance is reliant on professional judgements. NPSNN requires greater weight to be given to impacts on assets of the highest value e.g. the WHS, Stonehenge and the Avenue. Consequently, when balancing the overall impact on the historic environment a Slight Benefit has been recorded to reflect this weighting. * based on DMRB Scoring criteria	N/A	Slight Beneficial	N/A	
	Biodiversity	A precautionary approach to assessment is taken of potential significant adverse impacts on designated international and national ecological sites. This is due to the construction of a tunnel, the uncertainty over construction methodology, and size / footprint of one new crossing over the River Till. Mitigation through design should lead to a reduction of the scale of impact for the latter receptor. Adverse impacts would result from the construction of a new river crossing on the River Till SSSI, designation which overlaps with the River Avon SAC designation. Option 1Nd passes very close to Salisbury Plain SAC/Parsonage Down SSSI & NNR, with likely associated indirect impacts from air quality, noise and visual disturbance. The route corridor would also result in direct impact to one CWS inc (Countess Cutting), two woodlands and hedgerows, assuming that the option will be contained to the existing highways land around Countess Roundabout and will not encroach into the Vespasian's Camp/Amesbury Abbey woodlands nor Countess Swamp CWS. Benefits brought by a tunnel option include landscape reconnection and habitat restoration leading to a reduction of road fatalities and increase in wildlife movement. This option is also the furthest away from the Normanton Down RSPB reserve which supports breeding stone curlew that are part of the metapopulation of the Salisbury Plain SPA.	N/A	Large Adverse	N/A	
	Water Environment	A precautionary approach to assessment is taken of potential significant adverse impacts on local groundwater abstractions, flood risk and groundwater fed surface water features within the area of influence of option 1Nd. This is because one of the construction methodologies may require dewatering of the Chalk aquifer. Overall, operational risks are considered to be significantly lower than those associated with construction. Monitoring will be required to fully evaluate the extent and magnitude of these effects, and this may influence the assessment score.	N/A	Large Adverse	N/A	
Social	Commuting and Other users	Removal of congestion resulting from lack of capacity at junctions and on existing single carriageway, producing significant improvements in journey times. In terms of DIs: Overall there are net user benefits for residents in the core modelled area. The most deprived income quintiles experience benefits that are in line with what would be expected from a fair distribution of benefits. Overall a moderate beneficial impact is considered for user benefits as a result of the option.	Value of journey time changes(£): 329,300,000 Net journey time changes (£): 0 to 2min: 85,500,000; 2 to 5min: 103,000,000; > 5min: 141,300,000	N/A	184,100,000	Moderate beneficial
	Reliability impact on Commuting and Other users	Increased capacity through the provision of a dual carriageway, together with junction improvements would lead to an improvement in day-to-day reliability whilst also reducing the frequency and impact of traffic incidents. Reliability is also improved by the attraction of traffic from local roads therefore reducing incidents.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N/A	46,000,000	
	Physical activity	Overall 1Nd would result in a beneficial effect on physical activity. 1Nd would reduce severance at approx.18 Public Rights of Way (PRoW) and cause severance at 9 PRoW.	N/A	Beneficial	N/A	
	Journey quality	Loss of views of the WHS including Stonehenge is an adverse effect. However a dualled alignment would improve travellers ability to make good progress along the route and an improvement to the condition of the road network would reduce both traveller stress through less frustration and fear of potential accidents and give more route certainty.	N/A	Moderate Beneficial	N/A	
	Accidents	Replacement of existing single carriageway with grade-separated dual carriageway would save about six accidents per year. No significant impacts on personal security have been identified at this stage. In terms of DIs: All affected links are expected to experience a decrease in accident levels as a result of the scheme. All vulnerable casualties are forecast to experience a slight benefit except cyclists and children (under 16) as there have not been any casualties of tis type on links forecast to experience a benefit in terms of accident levels. Overall, the 1Nd option is likely to have a slight beneficial impact to accidents.	Monetised assessment of benefits of changes in accidents using COBALT software	N/A	14,200,000	Slight Beneficial
	Security	No significant impacts on personal security have been identified at this stage.	N/A	Neutral	N/A	Neutral
	Access to services	No impacts identified for public transport services and access to services.	N/A	Neutral	N/A	N/A
	Affordability	There is likely to be a slight reduction in vehicle operating costs due to reduced congestion, and a slight increase in vehicle operating costs due to travelling further, although the further distance will be minimal. Overall, the impact on affordability for users will be neutral. In terms of DIs: Overall there are net disbenefits for residents within the core modelled area. All quintiles experience disbenefits except for the most deprived income quintile (located around Salisbury) which experiences net benefits as a result of the option. This group only account for 2% of the population within the impact area, however experience a large beneficial impact. Due to the net disbenefits of the scheme, but beneficial impact on the most vulnerable residents within the impact area, the affordability appraisal is considered to be slight adverse.	N/A	Neutral	N/A	Slight adverse
	Severance	A number of rights of way would be severed by the new highway however this would affect a small number of residents and the impact could be mitigated to leave residual slight adverse effects. Through realignment of the highway and redistribution of traffic Option 1Nd would reduce severance within and between several settlements in the vicinity, affecting more than 200 but less than 1000 travellers daily. In terms of DIs: Overall, the route is likely to reduce severance for all groups, due to the option removing traffic from the existing A303 and displacing it to the bypass. Therefore, all groups are considered to have a slight beneficial severance impact associated with the scheme, however children are considered to have a moderate beneficial impact due to the location of three schools within close proximity to the existing route. Overall it is considered that there is a slight beneficial impact on severance.	N/A	Moderate Beneficial	N/A	Slight beneficial
	Option and non-use values	It is unlikely this scheme will have any impact on Option Values as there is no new provision of public transport services or removal of existing services.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	A privately-funded option using a DBFM structure with availability payments is the most likely commercial route to delivery of the scheme. Therefore, at this stage, it is assumed the entire cost of the scheme will initially be financed by the private sector and then paid by the Transport Budget after the opening date, over a period of around 25-35 years.	Indicative capital cost estimates provided by Highways England Commercial team. Allowance of tunnel and surface highway operating and maintenance costs included.	N/A	1,146,219,000	
	Indirect Tax Revenues	The increase in indirect taxation is marginal. There is a minor increase in indirect taxation due to vehicles travelling a slightly greater distance and therefore there is a minor net positive change in fuel duty revenue through increased vehicle operating costs.	Assessed based on traffic model outputs using TUBA software	N/A	-110,339,000	

Appraisal Summary Table

Date produced:	28th	June	2017

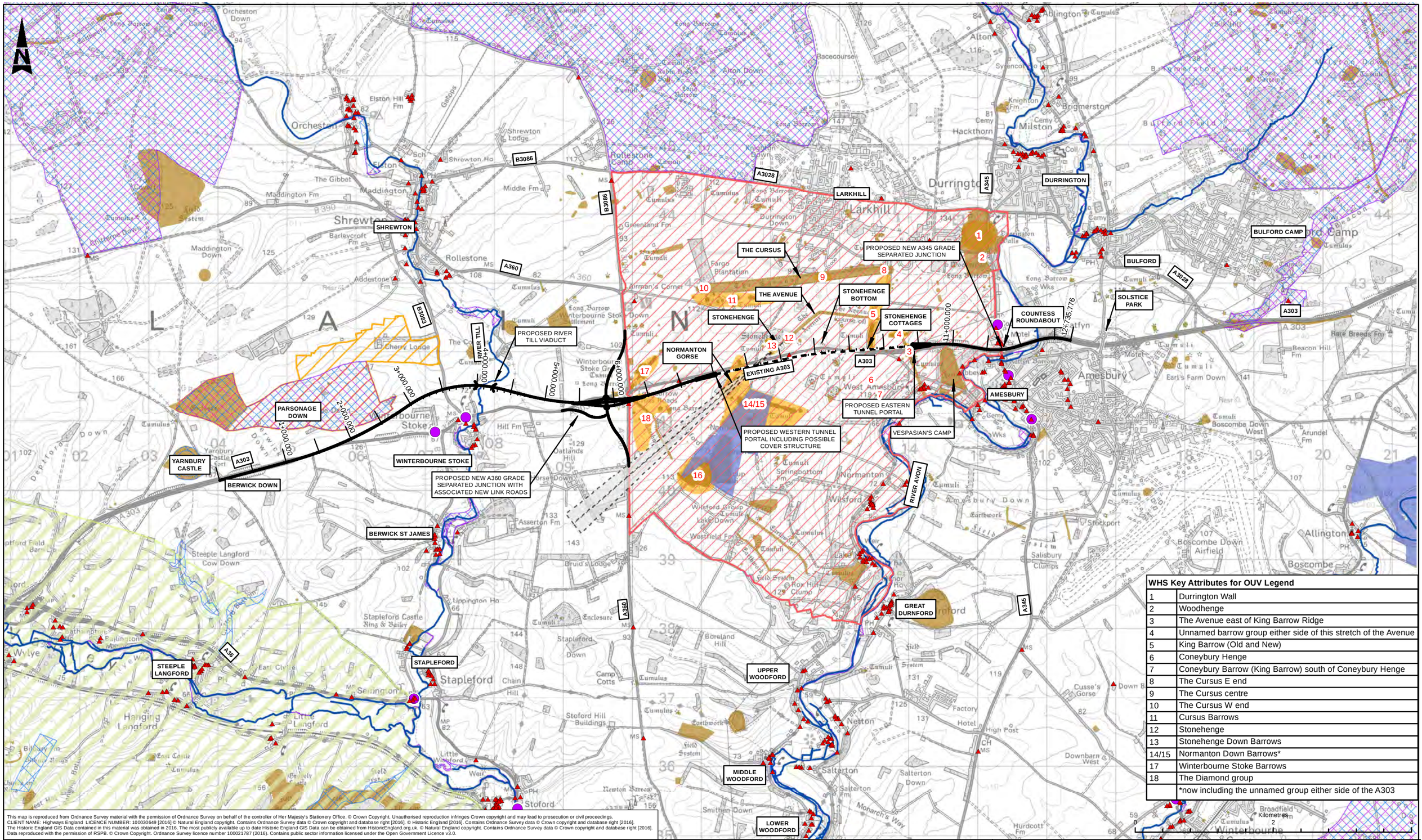
Contact:	
Name	Stephen Bussell
Organisation	AAJV
Role	Economics and Business Case Workstream Lead

Name of scheme:	A303 Stonehenge: Amesbury to Berwick Down
Description of scheme:	Route Option 1Sa is a variation on the published Route Option 1S in response to the consultation, with a reduced vertical alignment through the WHS to hide the new A303 traffic within the critical heritage landscape. The route consists of a 13.3km route running south of Winterbourne Stoke with an eastern tunnel portal located east of The Avenue and an increased approximate 3.225km long tunnel and canopy cover structure to the western portal which is moved further west from Normanton Gorse.

Impacts		Summary of key impacts	Assessment: Quantitative	Assessment: Qualitative	Assessment: Monetary £(NPV)	Assessment: Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	Removal of congestion resulting from lack of capacity at junctions and on existing single carriageway resulting in substantial improvements in journey times and therefore lower transport costs. In terms of DIs: Overall there are net benefits associated with all route options for residents in the core modelled area. User benefits have a particularly large impact on people with income deprivation due to increases in the cost of undertaking journeys. Around 2% of the impact area within the user benefit appraisal are within the most deprived income quintile nationally. These residents experience proportionate benefits for all route options.	Value of journey time changes(£): 281,100,000 Net journey time changes (£): 0 to 2min: 57,900,000; 2 to 5min: 77,900,000; > 5min: 145,300,000	N/A	277,400,000	Moderate Beneficial
	Reliability impact on Business users	Increased capacity through the provision of a dual carriageway, together with junction improvements would lead to an improvement in day-to-day reliability whilst also reducing the frequency and impact of traffic incidents. Reliability is also improved by the attraction of traffic from local roads therefore reducing incidents.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N/A	14,600,000	
	Regeneration	The scheme is unlikely to have a significant impact on accessibility or economic activity in either of the identified regeneration areas in central Salisbury, or on areas of deprivation in Salisbury and Wilton. Therefore, a formal assessment has not been undertaken at this stage.	N/A	Neutral	N/A	
	Wider Impacts	Moderate agglomeration benefits are expected, driven particularly by reductions in journey costs between and within Salisbury and West Wiltshire but also due to improved links to the Andover/Test Valley area and beyond to Basingstoke and Newbury in the East and Bath in the West. Very slight benefits expected to result from an increased labour market participation resulting from reduced commuting costs. Slight benefits expected to result from increased output in imperfectly competitive markets. Assessment based on Wider Impacts guidance may understate total value of wider economic benefits.	Agglomeration £54.4m (PVB) Labour market impacts £1.6m (PVB) Output in imperfectly competitive markets £17.8m (PVB)	N/A	73,800,000	
Environmental	Noise	8 Households are likely to qualify for noise insulation due to road traffic noise. The 5 Schools and one library located within the noise impact study area would not be expected to experience a significant noise change. Although slightly more households are predicted to experience a noise increase than a noise decrease, the size of the benefit to those properties experiencing a decrease results in a overall monetised benefit from the scheme. The monetised benefit of 1Sa would offer an overall benefit due to the junction arrangement with the A360 and lower volumes of traffic travelling on local roads around Amesbury to access the new route alignment. No households are likely to experience more than 81dBA	597 Households are likely to experience an increase in daytime noise in the forecast year 2041 401 Households are likely to experience a decrease in daytime noise in the forecast year 2041 145 Households are likely to experience an increase in night time noise in the forecast year 2041 194 Households are likely to experience a decrease in night time noise in the forecast year 2041	N/A	762000*	Moderate Adverse*
	Air Quality	The nearest air Quality Management Areas (AQMAs) to the Scheme are those in Salisbury, approximately 11 km south of option1Sa. There would be no new exceedances as a result. option 1Sa would change air quality in year of opening 2026 at receptors for NO2/PM10 by: improving 3339/2332, worsening 1525/1038, no change at 15/1509 receptors. Overall there would be a net improvement in local air quality with the scheme (for PM10 and NO2) as a result of the realignment of the A303 away from sensitive receptors. There would be a negative impact on regional emissions for NOx due to increases in AADT and HDV flows and link distance travelled.	Local Air Quality Assessment Score in Year of Opening 2026: PM10: -91.40 NO2: -269.20 Regional Emissions (Over 60 year appraisal period) NOx: +1,669 tonnes	N/A	PM10 NPV: +322,000 NOX NPV : -847,000 Total value of change in air quality: - 525,000	Neutral
	Greenhouse gases	The change in non-traded carbon dioxide emissions in the opening year 2026 is 22,603 tCO2e. The route option would result in an increase in user carbon due to increases in vehicle flows attracted to the route, and the relatively longer distance travelled compared to the existing route.	Change in non-traded carbon over 60y (CO2e): 1,732,585 Change in traded carbon over 60y (CO2e): 0	N/A	-78,006,000	
	Landscape	Overall this 13.3km route would affect the landscape as a result of Moderate Adverse impacts identified for the Larkhill Chalk Downland, Till Narrow Chalk River Valley and Tilshead Chalk Downland Landscape Character Areas. This includes a decrease in tranquillity, reduced quality of visual amenity and adverse impact on the scale and pattern of the landscape. The adverse effects of option 1Sa as it crosses the Till Valley to the south east of Winterbourne Stoke would result from the impact on landscape features and the route cutting into a side spur of the valley side.	N/A	Moderate Adverse	N/A	
	Townscape	It is anticipated that there would not be any notable impacts on townscape as a result of option 1Sa.	N/A	Neutral	N/A	
	Historic Environment	1Sa would remove the A303 from a key part of the WHS, significantly improving that part of the WHS and the setting of Stonehenge and c. 50 other related monuments within the WHS. It would also reconnect the Avenue and King Barrow Ridge. The option would benefit the WHS as a whole, although there is a risk of interference with the Winter Solstice Sunset alignment. These are very notable benefits associated with assets of predominately international and national value. The route would have adverse impacts on the setting of other scheduled monuments within and outside of the WHS and the fabric of one scheduled monument and numerous areas of non-designated archaeology of regional or local value. There would also be adverse and beneficial impacts on listed buildings, conservation areas and a registered park and garden. Overall, there would be a greater number of adverse effects than beneficial effects on designated and non-designated heritage assets, although a greater number of assets of high and very high importance would experience significant beneficial effects. Within the study area for option 1SA, of the 150 SMs, that contribute to the OUV of the WHS, 3 SMs of very high importance would experience significant beneficial effects*: moderate for The Cursus, large for The Avenue and very large for Stonehenge. For the remaining SMs of high importance, of the 62 SMs experiencing beneficial effects - this would be sub divided as follows: large 22, moderate 22 and slight 18, whereas the 59 SMs experiencing adverse effects: very large 2, large 20, moderate 15, and slight 13. In terms of the overall score a balancing approach has been taken to reflect the complex mixture of adverse and beneficial impacts. This balance is reliant on professional judgements. NPSNN requires greater weight to be given to impacts on assets of the highest value e.g. the WHS, Stonehenge and the Avenue. Consequently, when balancing the overall impact on the historic environment a Slight Benefit has been recorded to reflect this weighting. * based on DMRB Scoring criteria	N/A	Slight Beneficial	N/A	
	Biodiversity	A precautionary approach to assessment is taken of potential significant adverse impacts on designated international and national ecological sites. This is due to the construction of a tunnel, the uncertainty over construction methodology, and size / footprint of one new crossing over the River Till. Mitigation through design should lead to a reduction of the scale of impact for the latter receptor. Adverse impacts would result from the construction of a new river crossing on the River Till SSSI, designation which overlaps with the River Avon SAC designation. Option 1Sa would also result in direct impact to six woodlands and one CWS (Countess Cutting), assuming that the option will be contained to the existing highways land around Countess Roundabout and will not encroach into the Vespasian's Camp/Amesbury Abbey woodlands nor Countess Swamp CWS. Benefits brought by a tunnel option include landscape reconnection and habitat restoration leading to a reduction of road fatalities and increase in wildlife movement.	N/A	Large Adverse	N/A	
	Water Environment	A precautionary approach to assessment is taken of potential significant adverse impacts on local groundwater abstractions, flood risk and groundwater fed surface water features within the area of influence of option 1Sa. This is because one of the construction methodologies may require dewatering of the Chalk aquifer. Overall, operational risks are considered to be significantly lower than those associated with construction. Monitoring will be required to fully evaluate the extent and magnitude of these effects, and this may influence the assessment score.	N/A	Large Adverse	N/A	
Social	Commuting and Other users	Increased capacity through the provision of a dual carriageway, together with junction improvements would lead to an improvement in day-to-day reliability whilst also reducing the frequency and impact of traffic incidents. Reliability is also improved by the attraction of traffic from local roads therefore reducing incidents. In terms of DIs: Overall there are net user benefits for residents in the core modelled area in the region of £96 million. The most deprived income quintiles experience benefits that are in line with what would be expected from a fair distribution of benefits. Overall a moderate beneficial impact is considered for user benefits as a result of the option.	Value of journey time changes(£): 295,700,000 Net journey time changes (£): 0 to 2min: 83,500,000; 2 to 5min: 15,300,000; > 5min: 196,900,000	N/A	146,900,000	Moderate beneficial
	Reliability impact on Commuting and Other users	Delays due to incidents and journey time variability is perceived as an issue for commuters and other users. The scheme would improve reliability by providing additional capacity on the network, improved response times and greater resilience through provision of technology and improved access; and fewer accidents and incidents through the improvement to safety.	Assessment based on comparison of reliability performance of single and dual carriageway sections of the A303	N/A	46,000,000	
	Physical activity	Overall 1Sa would result in a beneficial effect on physical activity.1Sa would reduce severance at approx. 18 Public Rights of Way (PRoW) and cause severance at 10 PRoW.	N/A	Beneficial	N/A	
	Journey quality	Loss of views of the WHS including Stonehenge is an adverse effect. However a dualled alignment would improve travellers ability to make good progress along the route and an improvement to the condition of the road network would reduce both traveller stress through less frustration and fear of potential accidents,and give more route certainty.	N/A	Moderate Beneficial	N/A	
	Accidents	Replacement of existing single carriageway with grade-separated dual carriageway would save about six accidents per year. In terms of DIs: All affected links are expected to experience a decrease in accident levels as a result of the scheme. Vulnerable casualties are forecast to experience a slight benefit, other than older people, who will have a moderate benefit as previously a higher than average proportion of older casualties were occurring on links forecast to experience a reduction in accident levels. Therefore, 1Sa is likely to have a sight beneficial impact to accidents.	Monetised assessment of benefits of changes in accidents using COBALT software	N/A	15,100,000	Slight Beneficial
	Security	No significant impacts on personal security have been identified at this stage	N/A	Neutral	N/A	Neutral
	Access to services	No impacts identified for public transport services and access to services.	N/A	Neutral	N/A	N/A
	Affordability	There is likely to be a slight reduction in vehicle operating costs due to reduced congestion, and a slight increase in vehicle operating costs due to travelling further, although the further distance will be minimal. Overall, the impact on affordability for users will be neutral. In terms of DIs: Overall there are net disbenefits for residents within the core modelled area in the region of £13 million. All quintiles experience disbenefits except for the most deprived income quintile (located around Salisbury) that actually experience net benefits as a result of the option. This group only account for 2% of the population within the impact area, however experience a moderate beneficial impact. Due to the net disbenefits of the scheme, but beneficial impact on the most vulnerable residents within the impact area, the affordability appraisal is considered to be slight adverse.	N/A	Neutral	N/A	Slight adverse
	Severance	A number of rights of way would be severed by the new highway however this would affect a small number of residents and the impact could be mitigated to leave residual slight adverse effects. Generally, through realignment of the highway and redistribution of traffic, Option 1Sa would reduce severance within and between several settlements in the vicinity. This would affect between 200 and 1000 travellers daily. In terms of DIs: Overall, the route is likely to reduce severance for all groups, due to the option removing traffic from the existing A303 and displacing it to the bypass. Therefore, all groups are considered to have a slight beneficial severance impact associated with the scheme, however children are considered to have a moderate beneficial impact due to the location of three schools within close proximity to the existing route. Overall it is considered that there is a slight beneficial impact on severance.	N/A	Moderate Beneficial	N/A	Slight beneficial
	Option and non-use values	It is unlikely this scheme will have any impact on Option Values as there is no new provision of public transport services or removal of existing services.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	A privately-funded option using a DBFM structure with availability payments is the most likely commercial route to delivery of the scheme. Therefore, at this stage, it is assumed the entire cost of the scheme will initially be financed by the private sector and then paid by the Transport Budget after the opening date, over a period of around 25-35 years.	Indicative capital cost estimates provided by Highways England Commercial team. Allowance of tunnel and surface highway operating and maintenance costs included.	N/A	1,148,337,000	
	Indirect Tax Revenues	The increase in indirect taxation is marginal. There is a minor increase in indirect taxation due to vehicles travelling a slightly greater distance and therefore there is a minor net positive change in fuel duty revenue through increased vehicle operating costs.	Assessed based on traffic model outputs using TUBA software	N/A	-112,384,000	

*The NPV presents a value for the option as a whole, which is positive. However, the Distributional Impacts (DI) assessment takes into account the distribution of both the beneficial and/or adverse impacts are located, and how the impacts are distributed across the population. For example, for option 1Sa, in terms of the DI the population in quintile 2 and 4 receive a much larger proportion of dis-benefits, whereas those in quintile 5 receive a much larger proportion of the benefits. Detail is provided in the Distributional Impact Technical Note.

Appendix G Recommended Preferred Route



WHS Key Attributes for OUV Legend	
1	Durrington Wall
2	Woodhenge
3	The Avenue east of King Barrow Ridge
4	Unnamed barrow group either side of this stretch of the Avenue
5	King Barrow (Old and New)
6	Coneybury Henge
7	Coneybury Barrow (King Barrow) south of Coneybury Henge
8	The Cursus E end
9	The Cursus centre
10	The Cursus W end
11	Cursus Barrows
12	Stonehenge
13	Stonehenge Down Barrows
14/15	Normanton Down Barrows*
17	Winterbourne Stoke Barrows
18	The Diamond group
	*now including the unnamed group either side of the A303

LEGEND

- ROUTE OPTION
- TUNNEL SECTION - 3.2KM TUNNEL LENGTH
- RIVER CROSSING STRUCTURE
- INDICATIVE TUNNEL PORTAL (WESTERN PORTAL WITH CUT AND COVER CANOPY)
- CHAINAGE
- WINTER SOLSTICE LINE
- WORLD HERITAGE SITE
- RIVER NETWORK
- SPECIAL AREAS OF CONSERVATION (SAC)
- SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI)
- ANCIENT WOODLANDS
- NATIONAL NATURE RESERVES (NNR)
- AREAS OF OUTSTANDING NATURAL BEAUTY (AONB)
- RSPB RESERVES
- SCHEDULED MONUMENTS
- BARROW GROUPS
- LISTED BUILDINGS
- NOISE IMPORTANT AREAS (NIA)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made in the design hazard log)

Construction
None

Maintenance / Cleaning
None

Use
None

Decommission / Demolition
None

Rev	Date	Description	By	Chk'd	App'd
P04	31/08/17	ISSUED FOR REVIEW	FG	RC	SL

Drawing Status: FIT FOR INTERNAL REVIEW AND COMMENT
Suitability: S3

Client: highways england

Designers: ARUP ATKINS

Project Title: A303 AMESBURY TO BERWICK DOWN

Drawing Title: PREFERRED ROUTE

Scale	Designed / Drawn	Checked	Approved	Authorised
1:50,000	FG	RC	SL	SH
Original Size: A3	Date: 31/08/17	Date: 31/08/17	Date: 31/08/17	Date: 31/08/17

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