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KEY:

| | | | |
|--|---|--|---|
| | OPTION 0A - JUNCTION IMPROVEMENTS ONLY | | LAMBETH GROUP |
| | OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS | | LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION AND PORTSDOWN CHALK FORMATION (UNDIFFERENTIATED) |
| | OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP-PB PROPOSAL) | | LONDON CLAY FORMATION |
| | OPTION 1 - ONLINE WIDENING + OFFLINE WSCC PROPOSAL | | NEW PIT CHALK FORMATION |
| | OPTION 3 - OFFLINE PINK ROUTE | | NEWHAVEN CHALK FORMATION |
| | OPTION 5 - OFFLINE GREEN ROUTE | | SEAFORD CHALK FORMATION |
| | OPTION 5A - OFFLINE GREEN/BLUE/PINK ROUTE | | SPETISBURY CHALK MEMBER |
| | OPTION 5B | | TARRANT CHALK MEMBER |
| | OPTION 2 - NOT CONSIDERED IN STAGE 1 | | |
| | OPTION 4 - NOT CONSIDERED IN STAGE 1 | | |

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| SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION |
| In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log). |
| Construction |
| Maintenance / Cleaning |
| Use |
| Decommissioning / Demolition |

| | |
|------------------|--|
| Project Title | REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL |
| Drawing Title | FIGURE 9.1 BEDROCK GEOLOGY |
| Scale | 1:20,000 |
| Drawn | CD |
| Checked | JL |
| Approved | RB |
| Authorised | RB |
| Original Size | A3 |
| Date | 15/03/17 |
| Project | HE551523 -WSP - GEN - A27AR- F1 - GIS - 0035 |
| Project Ref. No. | 3514447G |
| Revision | A |

Drawing Status: WORK IN PROGRESS

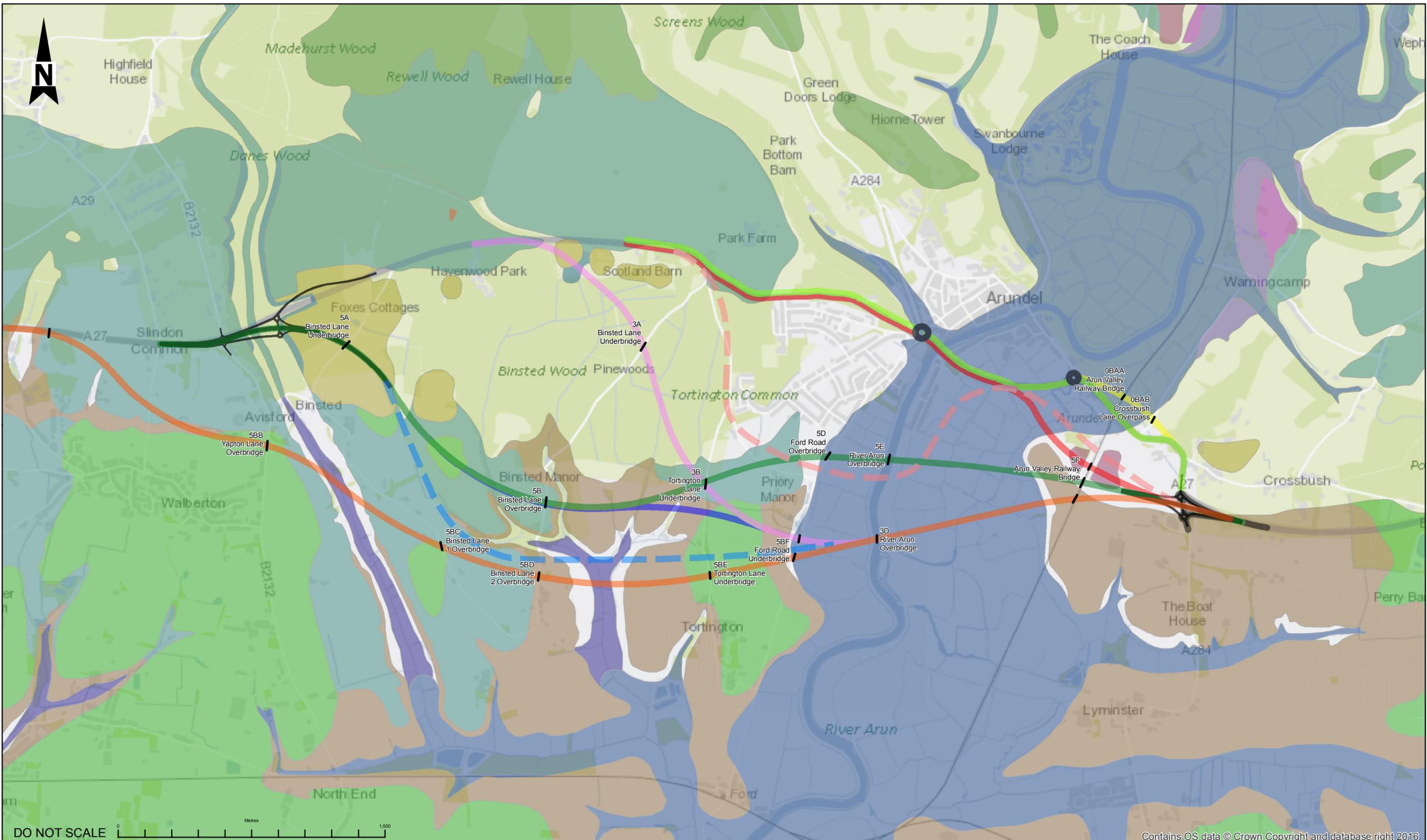
Suitability: S0

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Client: Working on behalf of **highways england**

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|-------|------|-------------|-----|------|-------|
| Rev. | Date | Description | By | Chkd | App'd |
| P01.1 | --- | First Issue | --- | --- | --- |



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| KEY | |
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| | OPTION 0A - JUNCTION IMPROVEMENTS ONLY |
| | OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS |
| | OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP-PB PROPOSAL) |
| | OPTION 1 - ONLINE WIDENING + OFFLINE WSCC PROPOSAL |
| | OPTION 3 - OFFLINE PINK ROUTE |
| | OPTION 5 - OFFLINE GREEN ROUTE |
| | OPTION 5A - OFFLINE GREEN/BLUE/PINK ROUTE |
| | OPTION 5B |
| | OPTION 2 - NOT CONSIDERED IN STAGE 1 |
| | OPTION 4 - NOT CONSIDERED IN STAGE 1 |
| | ALLUVIUM |
| | ARUN TERRACE DEPOSITS, 2 MEMBER |
| | ARUN TERRACE DEPOSITS, 3 MEMBER |
| | ARUN TERRACE DEPOSITS, 4 MEMBER |
| | CLAY-WITH-FLINTS FORMATION |
| | HEAD |
| | RAISED BEACH DEPOSITS, 1 |
| | RAISED BEACH DEPOSITS, 2 |
| | RAISED MARINE DEPOSITS |
| | RAISED STORM BEACH DEPOSITS, 1 |
| | RAISED STORM BEACH DEPOSITS, 2 |
| | RAISED STORM BEACH DEPOSITS, 1 |
| | RAISED STORM BEACH DEPOSITS, 2 |
| | RIVER TERRACE DEPOSITS (UNDIFFERENTIATED) |

| 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 to the design hazard log). | | | | |
| Construction | | | | |
| Maintenance / Cleaning | | | | |
| Use | | | | |
| Decommissioning / Demolition | | | | |
| Rev. | Date | Description | By | Chkd |
| P01.1 | --- | First Issue | --- | --- |

Drawing Status: **WORK IN PROGRESS**

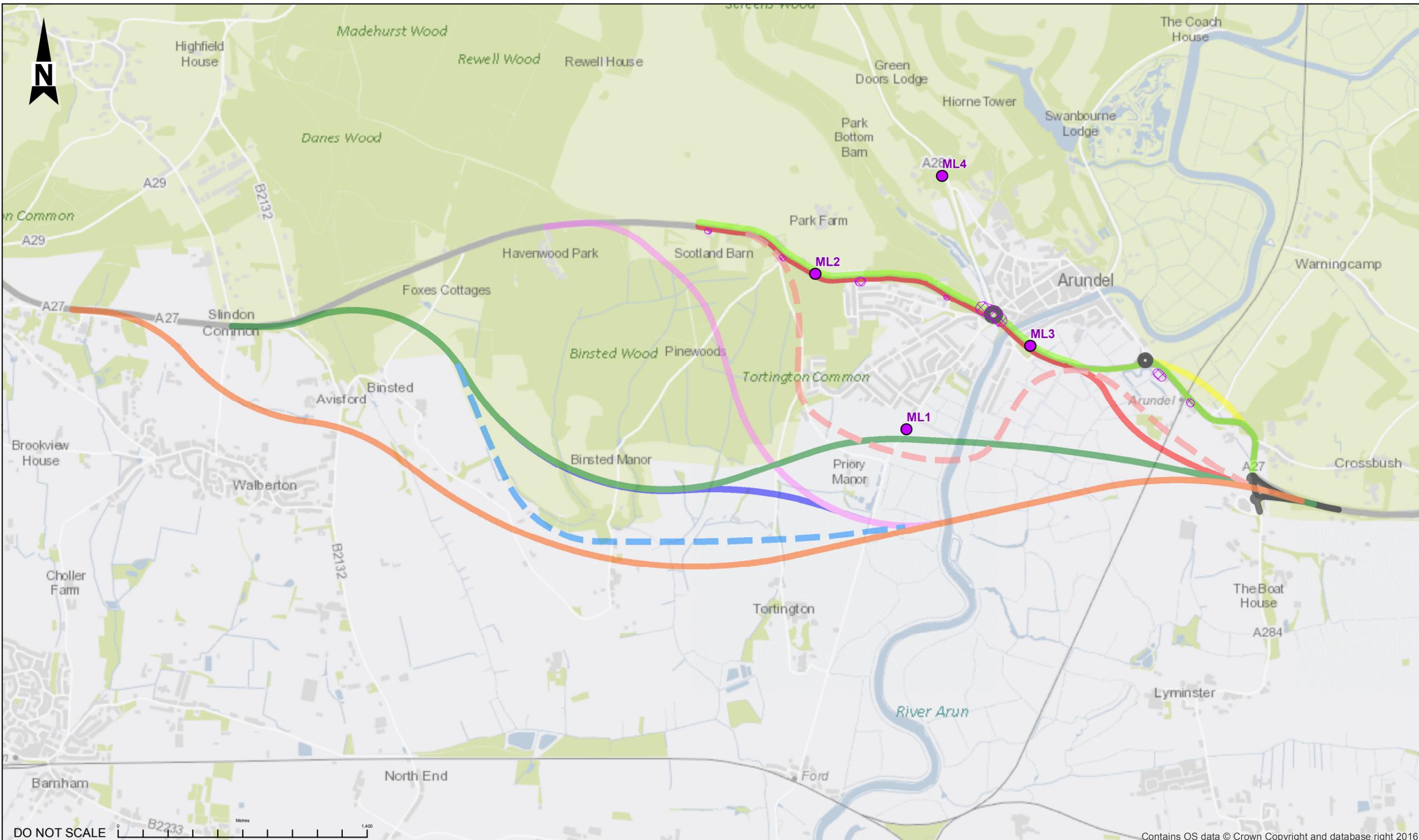
Suitability: **S0**

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| REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL | | | | |
|--|-----------------|-------------|---------------------------|----------------|
| Drawing Title: FIGURE 9.2 SUPERFICIAL GEOLOGY | | | | |
| Scale: 1:20,000 | Drawn: CD | Checked: JL | Approved: RB | Authorised: RB |
| Original Size: A3 | Date: 15/03/17 | Date: --- | Date: --- | Date: --- |
| Drawing Number: HE551523 -WSP - GEN - A27AR- F1 - GIS - 0036 | Originator: --- | Volume: --- | Project Ref. No. 3514447G | |
| Location: --- | Type: --- | Role: --- | Revision: A | |



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| KEY: | | SITE SURVEY LOCATION | |
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| | OPTION 0A - JUNCTION IMPROVEMENTS ONLY | | SITE SURVEY LOCATION |
| | OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS | | NOISE IMPORTANT AREA |
| | OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP-PB PROPOSAL) | | |
| | OPTION 1 - ONLINE WIDENING + OFFLINE WSSC PROPOSAL | | |
| | OPTION 3 - OFFLINE PINK ROUTE | | |
| | OPTION 5 - OFFLINE GREEN ROUTE | | |
| | OPTION 5A - OFFLINE GREEN/BLUE/PINK ROUTE | | |
| | OPTION 5B | | |
| | OPTION 2 - NOT CONSIDERED IN STAGE 1 | | |
| | OPTION 4 - NOT CONSIDERED IN STAGE 1 | | |

| 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 to the design hazard log). | | | |
| Construction | | | |
| Maintenance / Cleaning | | | |
| Use | | | |
| Decommissioning / Demolition | | | |
| Rev. | Date | Description | By Chkd App'd |
| P01.1 | | First Issue | |

Drawing Status: **WORK IN PROGRESS**

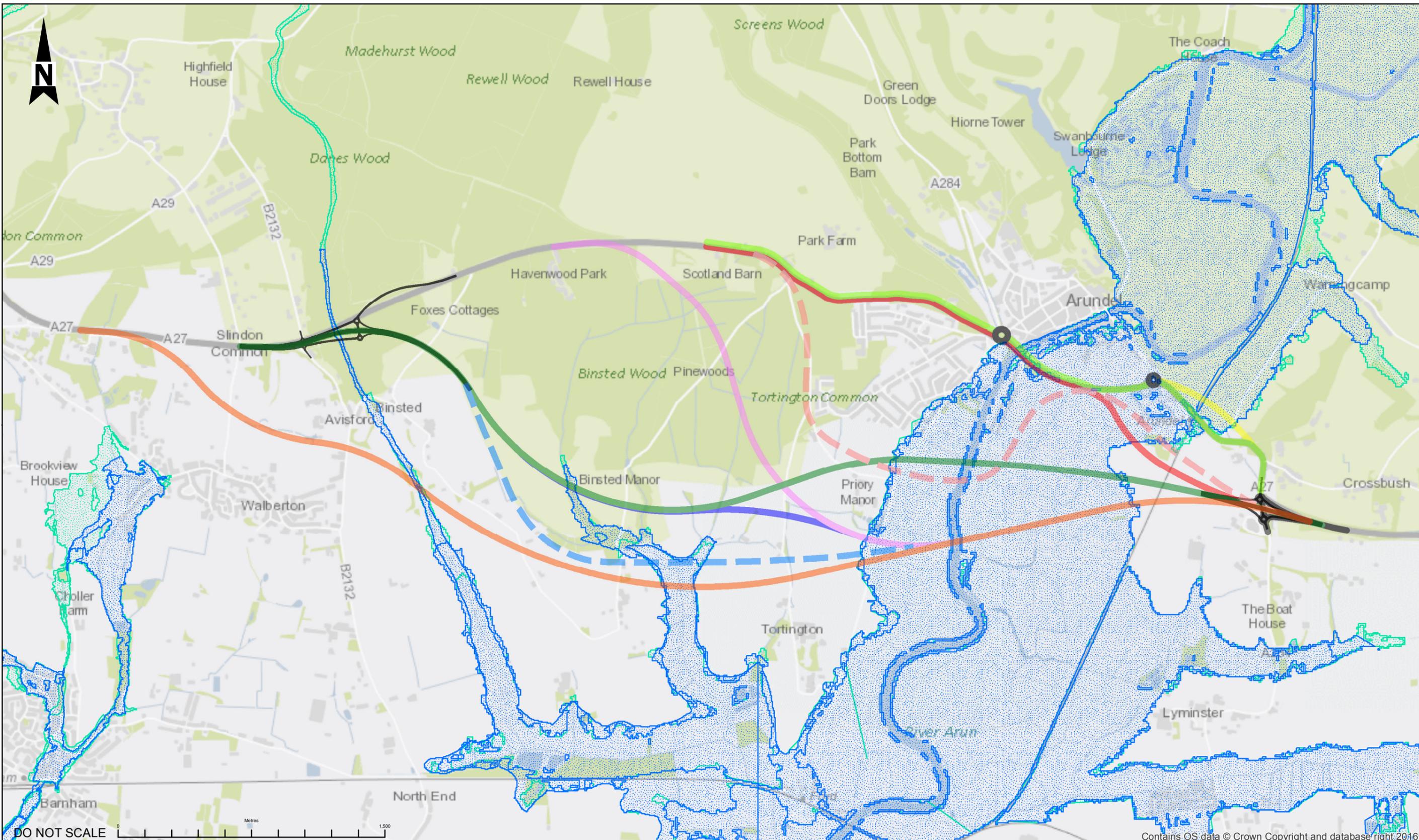
Suitability: **S0**

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|---|-----------------|-------------|---------------------------|----------------|
| Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL | | | | |
| Drawing Title: FIGURE 11.1 NOISE IMPORTANT AREAS AND SITE SURVEY LOCATIONS | | | | |
| Scale: 1:20,000 | Drawn: CD | Checked: AL | Approved: JL | Authorised: RB |
| Original Size: A3 | Date: 14/09/16 | Date: --- | Date: --- | Date: --- |
| Drawing Number: HE551523 -WSP - GEN - A27AR- F1 - GIS - 0030 | Originator: --- | Volume: --- | Project Ref. No: 3514447G | |
| Location: --- | Type: --- | Role: --- | Revision: A | |



KEY:

| | | | |
|--|---|--|-----------------------------------|
| | OPTION 0A - JUNCTION IMPROVEMENTS ONLY | | ENVIRONMENT AGENCY - FLOOD ZONE 3 |
| | OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS | | ENVIRONMENT AGENCY - FLOOD ZONE 2 |
| | OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP-PB PROPOSAL) | | |
| | OPTION 1 - ONLINE WIDENING + OFFLINE WSSC PROPOSAL | | |
| | OPTION 3 - OFFLINE PINK ROUTE | | |
| | OPTION 5 - OFFLINE GREEN ROUTE | | |
| | OPTION 5A - OFFLINE GREEN/BLUE/PINK ROUTE | | |
| | OPTION 5B | | |
| | OPTION 2 - NOT CONSIDERED IN STAGE 1 | | |
| | OPTION 4 - NOT CONSIDERED IN STAGE 1 | | |

| 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 to the design hazard log). | | | |
| Construction | | | |
| Maintenance / Cleaning | | | |
| Use | | | |
| Decommissioning / Demolition | | | |
| Rev. | Date | Description | By Chkd App'd |
| P01.1 | --- | First Issue | --- |

Drawing Status: **WORK IN PROGRESS**

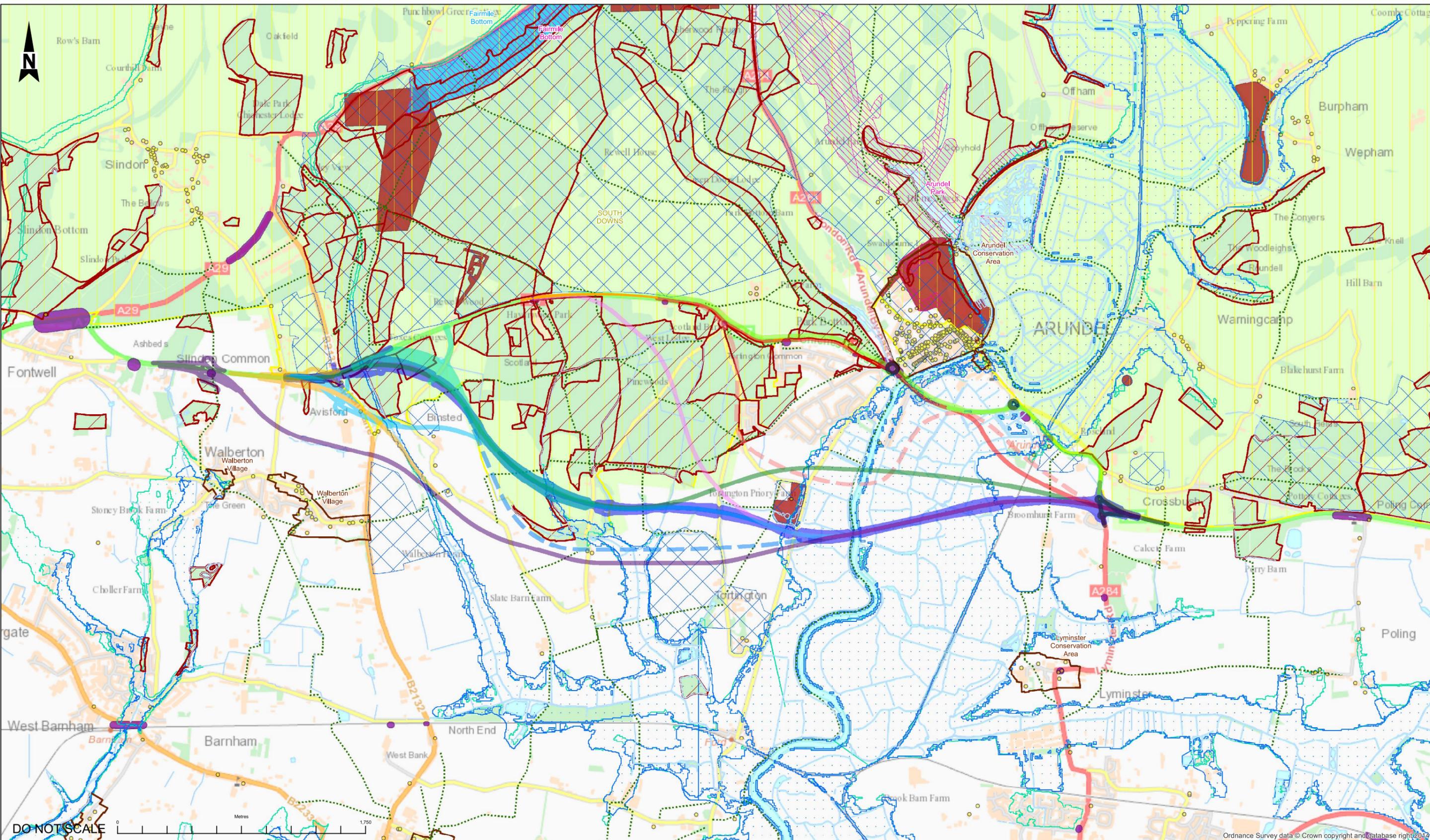
Subsidiary: **S0**

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| | | | | |
|---|------------------------|--------------------|----------------------------------|-----------------------|
| Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL | | | | |
| Drawing Title: FIGURE 13.1 FLOOD ZONES | | | | |
| Scale: 1:20,000 | Drawn: CD | Checked: JL | Approved: RB | Authorised: RB |
| Original Size: A3 | Date: 15/03/17 | Date: --- | Date: --- | Date: --- |
| Drawing Number: HE551523 -WSP - GEN - A27AR- F1 - GIS - 0033 | Originator: --- | Volume: --- | Project Ref. No: 3514447G | |
| Location: --- | Type: --- | Role: --- | Revision: A | |



| KEY: | |
|---|--|
| OPTION 0A - JUNCTION IMPROVEMENTS ONLY | CONSERVATION AREA |
| OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS | ENVIRONMENT AGENCY - FLOOD ZONE 3 |
| OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP/PB PROPOSAL) | ENVIRONMENT AGENCY - FLOOD ZONE 2 |
| OPTION 1 - ONLINE WIDENING + OFFLINE WSCC PRO PO SAL | NATURAL ENGLAND - ANCIENT WOODLAND |
| OPTION 3 - OFFLINE PINK ROUTE | NATURAL ENGLAND - SPECIAL AREA OF CONSERVATION |
| OPTION 5 - OFFLINE GREEN ROUTE | NATURAL ENGLAND - SITE OF SPECIAL SCIENTIFIC INTEREST |
| OPTION 5A - OFFLINE GREEN/BLEU/PINK ROUTE | NATURAL ENGLAND - NATURE IMPROVEMENT AREA |
| OPTION 5A1 | NOISE IMPORTANT AREA |
| OPTION 5B1 | ARCHAEOLOGICAL NOTIFICATION AREA |
| OPTION 5B | SO SOUTH DOWNS NATIONAL PARK |
| OPTION 5C | NATURAL ENGLAND/WORTHING LANDRA - LOCAL NATURE RESERVE |
| OPTION 2 - NOT CONSIDERED IN STAGE 1 | HISTORIC ENGLAND - SCHEDULED MONUMENT |
| OPTION 4 - NOT CONSIDERED IN STAGE 1 | |
| PAVEMENT ALIGNMENT | |
| HISTORIC ENGLAND - LISTED BUILDING | |
| PUBLIC RIGHT OF WAY | |
| WATERBODY | |

| 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 to the design hazard log). | |
| Construction | |
| Maintenance / Cleaning | |
| Use | |
| Decommissioning / Demolition | |

| Rev. | Date | Description | By | CHK'd | App'd |
|-------|------|-------------|----|-------|-------|
| P01,1 | | First Issue | | | |

Drawing Status: **WORK IN PROGRESS**

Suitability: **S0**

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|--|--|--|----------|--|------|--|--|------------------|--|------------|--|
| REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL | | 1:20,000 | CB | CD | JL | JL | | | | | |
| Drawing Title | | Original Size | Date | Date | Date | Date | | | | | |
| FIGURE 16.1 ENVIRONMENTAL CONSTRAINTS PLAN | | A2 | 28/04/16 | — | — | — | | | | | |
| Drawing Number | | Project | | Originator | | Volume | | Project Ref. No. | | | |
| HE551523 -WSP - GEN - A27AR - FI - GIS - 0000 | | HE551523 -WSP - GEN - A27AR - FI - GIS - 0000 | | HE551523 -WSP - GEN - A27AR - FI - GIS - 0000 | | HE551523 -WSP - GEN - A27AR - FI - GIS - 0000 | | 3514447G | | | |
| Location | | Type | Rate | Number | | Revision | | | | | |

Appendix B

**CULTURAL HERITAGE DETAILED BASELINE AND ASSESSMENT
TABLES**

Table B.1: Designated Assets within the 1km Study Area - Option 0A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|---------------------------|---|--------------------|-------------|-------------------|
| 1012177 | Ringwork 400m NNW of Batworthpark House | Scheduled Monument | National | Late Medieval |
| 1034405 | The Priory Farm House | Grade II* Listed | National | Late Medieval |
| Grade II Listed Buildings | There are 10 Grade II Listed Buildings within the 1km Study Area, | Grade II Listed | National | Multi period |

Table B.2: Non-Designated Heritage Assets within the 200m Study Area - Option 0A

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------------|-----------------------------------|
| MWS5715 | Roman Site - Crossbush | Regional | Romano-British | Outside |
| MWS7536 | Site of Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |

Table B.3: Archaeological Notification Areas within the 200m Study Area - Option 0A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|---|
| DWS8148 | Napoleonic barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Outside but has potential to extend in to the Scheme Area |

Table B.4: Designated Assets within the 1km Study Area - Option 0B, 0AB and 1

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|--|--------------------|-------------|-------------------------|
| 1005865 | Maison Dieu | Scheduled Monument | National | Late Medieval |
| 1005895 | Goblestubbs Copse Earthworks within ANA DWgS8132 | Scheduled Monument | National | Potentially prehistoric |
| 1012177 | Ringwork 400m NNW of Batworthpark House | Scheduled Monument | National | Late Medieval |
| 1012500 | Arundel Castle | Scheduled Monument | National | Multi Period |
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1027914 | Church of St Nicholas | Grade I Listed | National | Late Medieval |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|---------------------------|---|------------------|-------------|-------------------|
| 1248090 | Roman Catholic Cathedral of St Philip Neri and piers surrounding churchyard | Grade I Listed | National | Industrial |
| 1263812 | Fitzalan chapel | Grade I Listed | National | Late Medieval |
| 1027926 | Arundel Castle | Grade I Listed | National | Multi Period |
| 1278040 | Stables at No 26 and the Vicarage | Grade II* Listed | National | Industrial |
| 1263836 | No. 51 High Street | Grade II* Listed | National | Post -medieval |
| 1027913 | The Priory (St Wilfreds) | Grade II* Listed | National | Late Medieval |
| 1027908 | The Norfolk Hotel | Grade II* Listed | National | Industrial |
| 1034405 | The Priory Farm House | Grade II* Listed | National | Late Medieval |
| 1027947 | Railings to No 61 | Grade II* Listed | National | Industrial |
| DWS373 | Arundel Castle Park and Garden | Grade II* | National | Industrial |
| Grade II Listed Buildings | There are 197 Grade II Listed Buildings within the 1km Study Area, the majority of which are located within the Historic Town of Arundel Conservation Area | Grade II Listed | National | Multi period |

Table B.5: Conservation Areas within the 1km Study Area - Option 0B, 0BA and 1

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel Conservation Area | None | Regional | Multi-period | Inside |

Table B.6: Non-Designated Heritage Assets within the 200m Study Area - Option 0B, 0BA and 1

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------------|-----------------------------------|
| MWS4696 | Brickyard on North side of Chichester Road | Local | Industrial | Outside |
| MWS2984 | Warehouses and Granaries | Local | Industrial | Outside |
| MWS2695 | Site of Augustinian Priory and Hospital | Local | Late Medieval | Outside |
| MWS4223 | Lynchets, Broomhurst Farm | Local | Post Medieval | Outside |
| MWS4224 | Lynchets and Path, Upper Broomhurst Farm | Local | Late Medieval | Outside |
| MWS4437 | Wall footing, Tarrant Street | Local | Romano-British | Outside |
| MWS5681 | Site of Brickyard on South side of Arundel Road | Local | Post-Medieval | Potentially extends inside |

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------------|-----------------------------------|
| MWS5715 | Roman Site - Crossbush | Regional | Romano-British | Outside |
| MWS6506 | Site of Brickyard near the Gas Works on Ford Road. Likely to be destroyed by existing A27 | Local | Industrial | Outside |
| MWS7536 | Site of Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |
| MWS7583 | Loopholed Wall WWII | Regional | Modern | Inside |

Table B.7: Significant Historic Landscapes within the 200m Study Area - Option 0B, 0BA and 1

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |

Table B.8: Archaeological Notification Areas within the 200m Study Area - Option 0B, 0BA and 1

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------|-------------------|--|
| DWS8132 | Multi-period earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke' | None | Regional | Multi-period | Inside |
| DWS8148 | Napoleonic barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Outside Option 0AB and 1 but has potential to extend in to the Scheme Area of 1. Inside for Option 0A. |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------|-------------------|-----------------------------------|
| DWS8141 | Multi-Period Archaeological Features within Arundel Park, including the Historic Core of Arundel, Arundel Castle, the Church of St. Nicholas and the Roman Catholic Cathedral | None | Regional | Industrial | Inside |

Table B.9: Designated Assets within the 1km Study Area - Option 2

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|---|--------------------|-------------|-------------------------|
| 1005865 | Maison Dieu | Scheduled Monument | National | Post-Medieval |
| 1012177 | Ringwork 400m NNW of Batworthpark House | Scheduled Monument | National | Late Medieval |
| 1012500 | Arundel Castle | Scheduled Monument | National | Multi Period |
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1005895 | Goblestubbs Copse Earthworks within ANA DWS8132 | Scheduled Monument | National | Potentially Prehistoric |
| 1263812 | Fitzalan Chapel | Grade I Listed | National | Late Medieval |
| 1248090 | Roman Catholic Cathedral of St Philip Neri and piers surrounding churchyard | Grade I Listed | National | Industrial |
| 1027914 | Church of St Nicholas | Grade I Listed | National | Late Medieval |
| 1027926 | Arundel Castle | Grade I Listed | National | Multi period |
| 1221996 | Tortington Priory Barn to the north of Priory Farm | Grade II* Listed | National | Late Medieval |
| 1278040 | Stables at No 26 and The Vicarage | Grade II* Listed | National | Post- medieval |
| 1263836 | No. 51 High Street, Arundel | Grade II* Listed | National | Post- medieval |
| 1034405 | Priory Farmhouse | Grade II* Listed | National | Late Medieval |
| 1027908 | The Norfolk Hotel | Grade II* Listed | National | Industrial |
| 1027913 | The Priory (St Wilfreds) | Grade II* Listed | National | Late Medieval |
| 1027947 | Railings to No 61 | Grade II* Listed | National | Industrial |
| DWS373 | Arundel Castle Park and Garden | Grade II* | National | Industrial; |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|---------------------------|--|-----------------|-------------|-------------------|
| Grade II Listed Buildings | There are 199 Grade II Listed Buildings within the 1km Study Area, the majority of which are located within the Historic Town of Arundel Conservation Area | Grade II Listed | National | Multi period |

Table B.10: Conservation Areas within the 1km Study Area - Option 2

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|------------------------------|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel | None | Regional | Multi-period | Outside |

Table B.11: Non-Designated Heritage Assets within the 200m Study Area - Option 2

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------------|---|
| MWS4696 | Brickyard on north side of Chichester Road | Local | Industrial | Outside |
| MWS4223 | Lynchets at Broomhurst Farm | Local | Post- medieval | Outside |
| MWS4224 | Lynchets and track at Upper Broomhurst Farm | Local | Late Medieval | Outside but may extend into Scheme Area |
| MWS4363 | Causeway Feature, Priory Farm | Local | Post-medieval | Inside |
| MWS5681 | Brickyard on south side of Arundel Road | Local | Late Medieval | Inside |
| MWS5716 | Malt House | Local | Industrial | Outside |
| MWS6371 | Tortington Priory | Local | Late Medieval | Outside |
| MWS7410 | Site of Arundel Park Hotel, Lyminster | Local | Industrial | Outside |
| MWS7536 | Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |
| MWS2989 | Site of windmill at Arundel Towermill | Local | Industrial | Outside |
| MWS9625 | Calchetto Priory Historic Farmstead within ANA DWS8482 | Local | Late Medieval | Outside |
| MWS4188 | A ditch at Old Scotland Lane | Local | Undated | Outside |

Table B.12: Significant Historic Landscapes within the 200m Study Area - Option 2

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24819 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially Pre medieval | Inside |

Table B.13: Archaeological Notification Areas within the 200m Study Area - Option 2

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------|-------------------|-----------------------------------|
| DWS8132 | Multi-period earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke' | None | Regional | Multi-period | Inside |
| DWS8148 | Napoleonic Barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Inside |
| DWS8481 | Tortington Priory and associated features | None | Regional | Late Medieval | Inside |

Table B.14: Designated Assets within the 1km Study Area - Option 3

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|---|--------------------|-------------|-------------------------|
| 1005895 | Goblestubbs Copse Earthworks within ANA DWS8132 | Scheduled Monument | National | Potentially prehistoric |
| 1003736 | Madehurst Wood Earthworks within ANA DWS8132 | Scheduled Monument | National | Early medieval |
| 1012177 | Ringwork 400m NNW of Batworth Park House | Scheduled Monument | National | Late Medieval |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|---------------------------|---|--------------------|-------------|-------------------|
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct within ANA DWS8132 | Scheduled Monument | National | Late Medieval |
| 1221996 | Tortington Priory Barn to the north of Priory Farm | Grade II* Listed | National | Late Medieval |
| 1034405 | Priory Farmhouse within ANA DWS8482 | Grade II* Listed | National | Post-Medieval |
| Grade II Listed Buildings | 24 Grade II Listed Buildings within the 1km Study Area | Grade II Listed | National | Multi Period |

Table B.15: Conservation Areas within the 1km Study Area - Option 3

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel Conservation Area | None | Regional | Multi-period | Outside |

Table B.16: Non-Designated Heritage Assets within the 200m Study Area - Option 3

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------------------|--|
| MWS2286 | Earthworks - Goblestubbs Copse | Regional | Potentially prehistoric | Outside |
| MWS4693 | Brick Kiln on Arundel Road | Local | Industrial | Inside |
| MWS2979 | Medieval Moated Site - Tortington | Local | Late Medieval | Outside |
| MWS2991 | Site of Medieval park - Tortington | Local | Late Medieval | Outside |
| MWS6371 | Tortington Priory | Local | Late Medieval | Outside |
| MWS4188 | Ditch at Old Scotland Lane | Local | Undated | Outside |
| MWS4223 | Lynchets at Broomhurst Farm | Local | Post- medieval | Outside but potentially extends inside the Scheme Area |
| MWS4224 | Lynchets and Path, Upper Broomhurst Farm | Local | Late Medieval | Outside |
| MWS7536 | Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |
| MWS9560 | Broomhurst Farm Historic Farmstead | Local | Industrial | Outside |

Table B.17: Archaeological Notification Areas within the 200m Study Area - Option 3

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside |
|-----------------|--|-------------|-------------|----------------------------------|-------------------|
| DWS8132 | Multi-period earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke', Arundel | None | Regional | Multi-period | Inside |
| DWS8148 | Napoleonic Barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Inside |
| DWS8481 (north) | Tortington Priory and associated features | None | Regional | Late Medieval | Inside |
| DWS8481 (south) | A probable Romano-British settlement site and a late medieval site of significant size | None | Regional | Romano-British and Late Medieval | Outside |

Table B.18: Significant Historic Landscapes within the 200m Study Area - Option 3

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24611 | Brooks Innings Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24819 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially pre medieval | Inside |

Table B.19: Designated Assets within the 1km Study Area - Option 4

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|---|--------------------|-------------|-------------------------|
| 1005895 | Goblestubbs Copse Earthworks | Scheduled Monument | National | Potentially prehistoric |
| 1003736 | Madehurst Wood Earthworks | Scheduled Monument | National | Early Medieval |
| 1012177 | Ringwork 400m NNW of Batworth Park House | Scheduled Monument | National | Late Medieval |
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1221996 | Tortington Priory Barn to the north of Priory Farm | Grade II* Listed | National | Late Medieval |
| 1034405 | Priory Farmhouse | Grade II* Listed | National | Late Medieval |
| Grade II | 33 Grade II Listed Buildings lie within the Outer Study Area, the majority of which are located within the Historic Town of Arundel Conservation Area | Grade II Listed | National | Multi- Period |

Table B.20: Conservation Areas within the 1km Study Area - Option 4

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel Conservation Area | None | Regional | Multi-period | Outside |

Table B.21: Non-Designated Heritage Assets within the 200m Study Area - Option 4

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------------|---|
| MWS4692 | Brick Kiln at the junction of Binsted Lane and Arundel Road | Local | Industrial | Outside |
| MWS2979 | Medieval Moated Site - Tortington | Local | Late Medieval | Outside |
| MWS2991 | Medieval park - Tortington | Local | Late Medieval | Outside |
| MWS4223 | Lynchets, Broomhurst Farm | Local | Post Medieval | Outside but may extend into Scheme Area |
| MWS4224 | Lynchets and Path, Upper Broomhurst Farm | Local | Late Medieval | Outside |
| MWS7536 | Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |
| MWS9480 | Bramble Barn (Slated Barn) Historic Outfarm, Walberton | Local | Industrial | Outside |

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------------|-----------------------------------|
| MWS9560 | Broomhurst Farm Historic Farmstead, Lyminster and Crossbush | Local | Industrial | Outside |

Table B.22: Significant Historic Landscapes within the 200m Study Area - Option 4

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24611 | Brooks Innings | None | Local | Medieval or Post Medieval | Inside |
| HWS25116 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially pre medieval | Inside |

Table B.23: Archaeological Notification Areas within the 200m Study Area - Option 4

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------|---|-------------|-------------|-------------------|-----------------------------------|
| DWS8132 | Earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke', | None | Regional | Multi-period | Inside |
| DWS8148 | Napoleonic Barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8131 | Medieval Tile Kiln and associated Pottery, Walberton | None | Regional | Late Medieval | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Outside |
| DWS8481 (north) | Tortington Priory and associated features | None | Regional | Late Medieval | Inside |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------|--|-------------|-------------|----------------------------------|-----------------------------------|
| DWS8481 (south) | A probable Romano-British settlement site and a late medieval site of significant size | None | Regional | Romano-British and Late Medieval | Inside |

Table B.24: Statutory designated assets within 1km study area - Option 5

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|--|--------------------|-------------|-------------------------|
| 1005865 | Maison Dieu | Scheduled Monument | National | Late Medieval |
| 1005895 | Goblestubbs Copse Earthworks | Scheduled Monument | National | Potentially prehistoric |
| 1003736 | Madehurst Wood Earthworks | Scheduled Monument | National | Early Medieval |
| 1012177 | Ringwork 400m NNW of Batworth Park House | Scheduled Monument | National | Late Medieval |
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1221996 | Tortington Priory Barn to the north of Priory Farm | Grade II* Listed | National | Late Medieval |
| 1034405 | Priory Farmhouse | Grade II* Listed | National | Late Medieval |
| 1263836 | 51 High Street | Grade II* Listed | National | Post-medieval |
| 1278040 | Stables at No 26 The Vicarage | Grade II* Listed | National | Industrial |
| DWS373 | Arundel Castle Park and Garden | Grade II* | National | Industrial |
| Grade II | # Grade II Listed Buildings lie within the Outer Study Area. | Grade II Listed | National | Multi- Period |

Table B.25: Conservation Areas within the 1km Study Area - Option 5

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel Conservation Area | None | Regional | Multi-period | Outside |

Table B.26: Non-designated heritage assets within 200m study area - Option 5

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--------------------------|-------------|-------------------|-----------------------------------|
| MWS4223 | Lynchet, Broomhurst Farm | Local | Post Medieval | Outside |

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------------|-----------------------------------|
| MWS4224 | Lynchets and Path, Upper Broomhurst Farm | Local | Late Medieval | Outside |
| MWS2301 | Site of building in Binsted Wood | Local | Late Medieval | Inside |
| MWS6979 | Binsted House | Local | Industrial | Outside |
| MWS4192 | Boundary Bank. Spinningwheel Copse | Local | Post-medieval | Outside |
| MWS4191 | Boundary Bank, Tortington Common | Local | Post-medieval | Outside |
| MWS2354 | Park - Binsted House | Local | Industrial | Outside |
| MWS4186 | Small Plantation, Tortington Common | Local | Post-medieval | Outside |
| MWS11901 | Knowels Barn Historic Outfarm, | Local | Industrial | Outside |
| MWS4363 | Causeway Feature, Priory Farm | Local | Post-medieval | Outside |
| MWS2989 | Arundel Towermill | Local | Industrial | Outside |

Table B.27: Significant Historic Landscapes within the 200m Study Area - Option 5

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24611 | Brooks Innings | None | Local | Medieval or Post Medieval | Inside |
| HWS25116 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially pre medieval | Inside |

Table B.28: Archaeological Notification Areas within the 200m Study Area - Option 5

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------|-------------------|-----------------------------------|
| DWS8132 | Earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke', | None | Regional | Multi-period | Inside |
| DWS8130 | Roman Occupation Debris and Cist Burial | None | Regional | Romano-British | Outside |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------|--|-------------|-------------|----------------------------------|-----------------------------------|
| DWS8131 | Medieval Tile Kiln and associated Pottery, Walberton | None | Regional | Late Medieval | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Outside |
| DWS8481 (north) | Tortington Priory and associated features | None | Regional | Late Medieval | Outside |
| DWS8481 (south) | A probable Romano-British settlement site and a late medieval site of significant size | None | Regional | Romano-British and Late Medieval | Outside |

Table B.29: Designated Assets within the 1km Study Area - Option 5A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|----------------|---|--------------------|-------------|-------------------------|
| 1005895 | Goblestubbs Copse Earthworks | Scheduled Monument | National | Potentially prehistoric |
| 1003736 | Madehurst Wood Earthworks | Scheduled Monument | National | Early Medieval |
| 1012177 | Ringwork 400m NNW of Batworth Park House | Scheduled Monument | National | Late Medieval |
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1221996 | Tortington Priory Barn to the north of Priory Farm | Grade II* Listed | National | Late Medieval |
| 1034405 | Priory Farmhouse | Grade II* Listed | National | Late Medieval |
| Grade II | 30 Grade II Listed Buildings lie within the Outer Study Area, the majority of which are located within the Historic Town of Arundel Conservation Area | Grade II Listed | National | Multi- Period |

Table B.30: Conservation Areas within the 1km Study Area - Option 5A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|-------------------|-----------------------------------|
| MWS2689 | The Historic Town of Arundel Conservation Area | None | Regional | Multi-period | Outside |

Table B.31: Archaeological Notification Areas within the 200m Study Area - Option 5A

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|------|-------------|-------------------|-----------------------------------|
|----------------|------|-------------|-------------------|-----------------------------------|

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------------|---|
| MWS4692 | Brick Kiln at the junction of Binsted Lane and Arundel Road | Local | Industrial | Outside |
| MWS2979 | Medieval Moated Site - Tortington | Local | Late Medieval | Outside |
| MWS2991 | Medieval park - Tortington | Local | Late Medieval | Outside |
| MWS4223 | Lynchets, Broomhurst Farm | Local | Post Medieval | Outside but may extend into Scheme Area |
| MWS4224 | Lynchets and Path, Upper Broomhurst Farm | Local | Late Medieval | Outside |
| MWS7536 | Auxiliary Unit Special Duties Outstation | Regional | Modern | Outside |
| MWS9480 | Bramble Barn (Slated Barn) Historic Outfarm, Walberton | Local | Industrial | Outside |
| MWS9560 | Broomhurst Farm Historic Farmstead, Lyminster and Crossbush | Local | Industrial | Outside |

Table B.32: Significant Historic Landscapes within the 200m Study Area - Option 5A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24611 | Brooks Innings | None | Local | Medieval or Post Medieval | Inside |
| HWS25116 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially pre medieval | Inside |

Table B.33: Archaeological Notification Areas within the 200m Study Area - Option 5A

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|---|-------------|-------------|-------------------|-----------------------------------|
| DWS8132 | Earthworks within Goblestubbs Copse, Dalesdown Wood, Rewell Wood, Rewell Hill, Fairmile Bottom Park Farm, Arundel Medieval Park and the 'War Dyke', | None | Regional | Multi-period | Inside |

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------|--|-------------|-------------|----------------------------------|-----------------------------------|
| DWS8148 | Napoleonic Barracks and possible burial ground, Crossbush | None | Regional | Industrial | Outside |
| DWS8131 | Medieval Tile Kiln and associated Pottery, Walberton | None | Regional | Late Medieval | Outside |
| DWS8482 | Site of Pynham Augustinian Priory and Hospital, and Calcetto Priory Medieval Farmstead | None | Regional | Late Medieval | Outside |
| DWS8481 (north) | Tortington Priory and associated features | None | Regional | Late Medieval | Outside |
| DWS8481 (south) | A probable Romano-British settlement site and a late medieval site of significant size | None | Regional | Romano-British and Late Medieval | Outside |

| Table B.9: Designated Assets within the 1km Study Area – HER Ref Number | Name | Designation | Sensitivity | Historical Period |
|---|--|--------------------|-------------|-------------------|
| 1021459 | Tortington Augustinian Priory and ponds, including part of priory precinct | Scheduled Monument | National | Late Medieval |
| 1274629 | Parish of St Mary (in Walberton Conservation Area) | Grade I Listed | National | Late Medieval |
| 1222531 | Walberton House (in Walberton Conservation Area) | Grade II* Listed | National | Industrial |
| 1034405 | Priory Farmhouse | Grade II* Listed | National | Late Medieval |
| 1221966 | Tortington Priory barn, to the north of Priory Farm | Grade II* Listed | National | Post- medieval |
| Grade II Listed Buildings | There are 49 Grade II Listed Buildings within the 1km Study Area, of which 20 are located in Walberton Conservation Area | Grade II Listed | National | Multi period |

Table B.10: Conservation Areas within the 1km Study Area - Option 5B

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------------|-------------|--------------------|--------------------|--------------------------|--|
| None | Walberton | None | Regional | Multi-period | Outside |

Table B.11: Non-Designated Heritage Assets within the 200m Study Area - Option 5B

| HER Ref Number | Name | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------------|---|--------------------|--------------------------|--|
| MWS2991 | Site of Medieval park - Tortington | Local | Late Medieval | Outside |
| MWS4504 | Roman Pottery and Tile, Tortington Priory | Local | Romano-British | Removed |
| MWS4223 | Lynchet, Broomhurst Farm | Local | Post Medieval | Outside |
| MWS6870 | Romano British Pottery, Broomhurst Farm, Lyminster Road | Local | Romano-British | Removed |

Table B.12: Significant Historic Landscapes within the 200m Study Area - Option 5B

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|----------------|--|-------------|-------------|---------------------------|-----------------------------------|
| HWS24767 | Brooks Innings; Ad hoc approach to enclosing and draining alluvial flood plains | None | Local | Medieval or Post Medieval | Inside |
| HWS24611 | Brooks Innings | None | Local | Medieval or Post Medieval | Inside |
| HWS25116 | Cohesive Assart: parcels of land cleared from woodland that have some form of cohesion or regularity about their pattern | None | Local | Potentially pre medieval | Inside |

Table B.13: Archaeological Notification Areas within the 200m Study Area - Option 5B

| HER Ref Number | Name | Designation | Sensitivity | Historical Period | Inside or Outside the Scheme Area |
|-----------------|--|-------------|-------------|----------------------------------|-----------------------------------|
| DWS8481 (north) | Tortington Priory and associated features | None | Regional | Late Medieval | Outside |
| DWS8481 (south) | A probable Romano-British settlement site and a late medieval site of significant size | None | Regional | Romano-British and Late Medieval | Inside |

Table B.34: Summary of potential for hitherto unknown below-ground heritage assets within the scheme area – All Options

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|---------------------------|--|---|--|---|--|---|---|
| Option 0A | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | A ditch containing 2 nd century pottery was found in the north of the study area at Crossbush (MWS5715) There is potential for remains associated with this period to be present in the scheme area. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | ANA DWS8482 (extends into the study area): The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. There is potential for remains associated with these assets to extend into the scheme area. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | ANA DWS8148 (extends into the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground. | There is an Auxiliary Unit Special Duties Outstation (MWS7536) located in the north of the study area. There is potential for such remains in areas of previously undisturbed ground. |
| Option 0B/ 0BA / 1 | ANA DWS8141 (extends into the scheme area): Multi-Period archaeological features within Arundel Park, including Bronze Age pottery, four Bronze Age bowl barrows, an Iron Age- Romano-British settlement located immediately above Box Copse (outside study area), an Iron Age-Romano-British 'circus' or theatre area with Roman pottery, located to the east of Duchess's Lodge (outside study area) have been investigated. There is potential for remains associated with this period to be present in the scheme area. | ANA DWS8141 (extends into the scheme area): Multi-Period archaeological features within Arundel Park, including a Romano British occupation site have been identified at Nanny's Croft, South Wood (outside study area), along with an Iron Age-Romano-British field system, additional Roman occupation sites at Duke's Plantation (outside study area). In the north of the study area, within Arundel town the site of a Romano-British Villa has been identified at the west end of Maltravers Street and finds and features of the same period have been identified at Tarrant Street. There is the potential for remains associated with this period to be present in the scheme area. | There are no known archaeological remains or find spots associated with this period within the study area, although there is the potential for such remains in areas of previously undisturbed ground. | ANA DWS8482 (extends into the study area): The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. There is the potential for remains associated with these assets to extend into the scheme area. ANA DWS8132 (extends into the scheme area): Multi-period earthworks within Goblestubs (SM1005895) comprised of a continuous rectangular or irregular enclosures surrounded by a ditch between two banks associated with wandering bivallate ditches. There is the potential for remains associated with this asset to extend into the scheme area. | There are no known archaeological remains or find spots associated with this period within the study area, although there is the potential for such remains in areas of previously undisturbed ground. | ANA DWS8148 (extends into the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground. | Second World War rifle and infantry posts fall within the ANA DWS8141, although none have been recorded in the study area. |

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|-----------------|--|---|--|--|---|---|---|
| Option 2 | <p>A Mesolithic period tranchet axe was recovered from within the scheme area, east of the Priory Lane. There is potential for remains associated with this period to be present within the scheme area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>Significant quantities of Romano-British Pottery were recovered from investigations at Broomhurst Farm in the east of the scheme area.</p> <p>A ditch containing second century Romano British pottery was found during road widening at Crossbush in the east of the study area. There is potential for remains associated with this period to be present within the scheme area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with historical stock management from this period</p> | <p>ANA DWS8482 (extends in to the scheme area): The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. There is potential for remains associated with these assets to extend into the scheme area. ANA DWS8481 (north) is located immediately south of the scheme and contains the remains of an Augustinian priory (SM 1021459) comprising the church, claustral buildings, ponds and part of the priory precinct. There is potential for below ground remains associated with this asset to extend into the scheme area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>ANA DWS8148 (extends in to the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground.</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> |
| Option 3 | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with historical stock management from</p> | <p>Significant quantities of Romano British Pottery were recovered from investigations at Broomhurst Farm in the east of the study area and A ditch containing second century Romano British pottery was found during road widening at Crossbush also in the east of the study area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground</p> | <p>ANA DWS8482 (extends into the study area): The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. Given the distance between the assets and scheme area it is unlikely that associated remains will be present.</p> <p>ANA DWS8481 north (extends into the scheme area): An Augustinian priory (SM 1021459) comprising the church, claustral buildings, ponds and part of the priory precinct. There is potential for below ground remains associated with this asset to extend into the scheme area.</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground</p> | <p>ANA DWS8148 (extends into the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground.</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> |

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|-----------------|--|---|--|--|--|---|--|
| | this period | associated with historical stock management from this period | archaeology associated with historical stock management from this period | <p>ANA DWS8481 south (extends into the scheme area): A large moated medieval settlement site contained presumably a timber-framed house and the Church of St. Mary Magdelene. There is potential for below ground remains associated with this settlement to extend into the scheme area. ANA DWS8132 (extends into the scheme area): Multi-period earthworks within Goblestubbs (SM1005895) comprised of a continuous rectangular or irregular enclosures surrounded by a ditch between two banks associated with wandering bivallate ditches. There is potential for remains associated with this asset to extend into the scheme area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with historical stock management from this period</p> | archaeology associated with historical stock management from this period | | |
| Option 4 | There are no known archaeological remains or find spots associated with this period within the study area, although there is the potential for such remains in areas of previously undisturbed ground. | There is potential for remains associated with this period to be present with the scheme area. The scheme traverses through ANA DWS8481 (south) which comprises a probable Romano British settlement site, revealed by aerial photography, There is potential for below ground remains associated with this asset to survive within the scheme area. Significant quantities of Romano British Pottery were recovered from | There are no known archaeological remains or find spots associated with this period within the study area, although there is the potential for such remains in areas of previously undisturbed ground. | <p>ANA DWS8482 (extends into the study area): The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. Given the distance between the assets and scheme area it is unlikely that associated remains will be present.</p> <p>ANA DWS8481 north (extends into the scheme area): An Augustinian priory (SM 1021459) comprising the church, claustral buildings, ponds and part of the priory precinct. There</p> | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | ANA DWS8148 (extends into the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. |

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|--------|-------------|--|----------------|--|---------------|-------------------|--------|
| | | <p>investigations at Broomhurst Farm to the east of the study area and a ditch containing second century Romano British pottery was found during road widening at Crossbush also to the east of the study area..</p> | | <p>is potential for below ground remains associated with this asset to extend into the scheme area.</p> <p>ANA DWS8481 south (within scheme area): The proposed scheme extends through a medieval moated medieval settlement site contained presumably a timber-framed house and the Church of St. Mary Magdelene. There is potential for below ground remains associated with this settlement within the scheme area.</p> <p>ANA DWS8132 (extends into the scheme area): Multi-period earthworks within Goblestubbs (SM1005895) comprised of a continuous rectangular or irregular enclosures surrounded by a ditch between two banks associated with wandering bivallate ditches. There is potential for remains associated with this asset to extend into the scheme area.</p> <p>ANA DWS8132 (extends into the study area): The site of an excavated tile and pottery kiln. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present.</p> | | | |

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|-----------------------------|---|--|---|---|--|--|--|
| <p>Option 5 / 5A</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>Significant quantities of Romano British Pottery were recovered from investigations at Broomhurst Farm in the east of the study area.</p> <p>A ditch containing second century Romano British pottery was found during road widening at Crossbush in the east of the study area. There is potential for remains associated with this period to be present with the scheme area.</p> <p>ANA DWS8481 south (outside scheme area): A probable Romano British settlement site, revealed by aerial photography, is located to the east of Goose Green. There is potential for below ground remains associated with this asset to extend into the scheme area.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>ANA DWS8482 extending into the Study Area The sites of Pynham Augustinian Priory and Hospital and Calcetto Priory (DWS8482) are located in the east of the study area. Given the distance between the assets and scheme area it is unlikely that associated remains will be present.</p> <p>ANA DWS8481 (north) extending into the Study Area: An Augustinian priory (SM1021459) comprising the church, claustral buildings, ponds and part of the priory precinct. There is potential for below ground remains associated with this asset to extend into the scheme area.</p> <p>ANA DWS8481 (south) extending into the Study Area): The proposed scheme is located to the north of a medieval moated medieval settlement site contained presumably a timber-framed house and the Church of St. Mary Magdelene. There is potential for below ground remains associated with this settlement to extend into the scheme area.</p> <p>ANA DWS8132 extending into the Study Area: Multi-period earthworks within Goblestubbs (SM1005895) comprised of a continuous rectangular or irregular enclosures surrounded by a ditch between two banks associated with wandering bivallate ditches. There is potential for remains associated with this asset to extend into the scheme area.</p> | <p>A post-medieval lynchet (MWS4223) is located to the south of option 5 scheme area and may extend into the scheme area. There are no known archaeological remains or find spots associated with this period within the study area of Option 5A, but there is the potential for post-medieval remains to exist in areas of previously undisturbed ground.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | <p>ANA DWS8148 (extends into the study area): The site of Napoleonic Barracks and associated burial ground are located in the east of the study area. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present, however, there is the potential for other remains from this period in areas of previously undisturbed ground.</p> | <p>An Auxilliary Unit Special Duties Outstation is located in the north of the study area. There are no known archaeological remains or find spots associated with this period within the scheme area, although there is potential for such remains in areas of previously undisturbed ground.</p> |

| OPTION | PREHISTORIC | ROMANO-BRITISH | EARLY MEDIEVAL | LATE MEDIEVAL | POST-MEDIEVAL | INDUSTRIAL PERIOD | MODERN |
|------------------|--|---|--|--|--|--|---|
| | | | | <p>ANA DWS8131 extending into the Study Area: The site of an excavated tile and pottery kiln. Given the distance between the ANA and the Scheme Area it is unlikely for associated remains to be present.</p> <p>Ancient Woodland at Binstead Park is located within the scheme area. The woodland has the potential to contain earthworks and below-ground archaeology associated with stock management from this period</p> | | | |
| Option 5B | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | The scheme traverses through ANA DWS8481 (south) which comprises a probable Romano British settlement site, revealed by aerial photography, There is potential for below ground remains associated with this asset to survive within the scheme area. Significant quantities of Romano British Pottery were recovered from investigations at Broomhurst Farm to the east of the study area and a ditch containing second century Romano British pottery was found during road widening at Crossbush to the east of the study area. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | The proposed scheme is located to the south of a medieval moated medieval settlement site (ANA DWS8481) Although this area lies outside the study, the site demonstrates the potential for hitherto unknown remains associated with this period to survive below ground. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | There are no known archaeological remains or find spots associated with this period within the study area, although there is potential for such remains in areas of previously undisturbed ground. | There are no known archaeological remains or find spots associated with this period within the scheme area, although there is potential for such remains in areas of previously undisturbed ground. |

Note: Orange highlighting indicates that there is the potential for remains associated with this period to be discovered in previously undisturbed ground; Red highlighting means remains have previously been discovered in the area, and remains associated with this discovery have the potential to extend into the scheme area.

Table B.35: Magnitude of impact and significance of Options 0B and 0BA and Option 1 on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|--------------------------|----------------------------|------------------------|--------------------|
| MWS5681 | Local | Major Adverse | Moderate | Permanent |
| MWS7583 | Regional | Major Adverse | Large | Permanent |
| ANA DWS8141 (includes Arundel Conservation Area) | Regional | Major Adverse | Large | Permanent |
| ANA DWS8132 | Regional | Major Adverse | Large | Permanent |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |

Table B.36: Magnitude of impact and significance of Option 2 on on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|------------------------------|--------------------------|----------------------------|------------------------|--------------------|
| MWS4224 | Local | Major Adverse | Moderate | Permanent |
| MWS4363 | Local | Major Adverse | Moderate | Permanent |
| MWS5681 | Local | Major Adverse | Moderate | Permanent |
| ANA DWS8482 | Regional | Major Adverse | Large | Permanent |
| ANA DWS8132 | Regional | Major Adverse | Large | Permanent |
| ANA DWS8481 (north) | National | Major Adverse | Very Large | Permanent |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24819 Cohesive Assarts | Local | Major Adverse | Moderate | Permanent |

Table B.37: Magnitude of impact and significance of Option 3 on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------------|--------------------------|----------------------------|------------------------|--------------------|
| MWS4693 | Local | Major Adverse | Moderate | Permanent |
| MWS4223 | Local | Major Adverse | Moderate | Permanent |
| ANA DWS8481(north) | National | Major Adverse | Very Large | Permanent |
| ANA DWS8132 | Regional | Major Adverse | Large | Permanent |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24611 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24819 Cohesive Assart | Local | Major Adverse | Moderate | Permanent |

Table B.38: Magnitude of impact and significance of Option 4 on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------------|--------------------------|----------------------------|------------------------|--------------------|
| MWS4223 | Local | Major Adverse | Moderate | Permanent |
| ANA DWS8481 (south) | Regional | Major Adverse | Large | Permanent |
| ANA DWS8132 | Regional | Major Adverse | Large | Permanent |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24611 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS25116 Cohesive Assart | Local | Major Adverse | Moderate | Permanent |

Table B.39: Magnitude of impact and significance of Option 5 on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity Of The Asset | Magnitude Of Harm (Impact) | Significance Of Effect | Duration Of Effect |
|-----------------------|--------------------------|----------------------------|------------------------|--------------------|
| MWS2301 | Local | Major Adverse | Slight/Moderate | Permanent |
| MWS2354 | Local | Moderate Adverse | Slight | Permanent |

Table B.40: Magnitude of impact and significance of Option 5A on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------------|--------------------------|----------------------------|------------------------|--------------------|
| MWS4223 | Local | Major Adverse | Moderate | Permanent |
| ANA DWS8481 (south) | Regional | Major Adverse | Large | Permanent |
| ANA DWS8131 | Regional | Major Adverse | Large | Permanent |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24611 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS25116 Cohesive Assart | Local | Major Adverse | Moderate | Permanent |

Table B.41: Magnitude of impact and significance of Option 5b on non-designated heritage assets within the 200m study area

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------|--------------------------|----------------------------|------------------------|--------------------|
| ANA DWS8481 | Regional | Major Adverse | Large | Permanent |

| Heritage Asset Number | Sensitivity of the asset | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------------|--------------------------|----------------------------|------------------------|--------------------|
| (south) | | | | |
| HWS24767 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS24611 Brooks Innings | Local | Major Adverse | Moderate | Permanent |
| HWS25116 Cohesive Assart | Local | Major Adverse | Moderate | Permanent |

Table B.42: Magnitude of impact and significance of the effect of Option 0B on the setting of designated heritage assets within the 1km study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|-------------------------------|--------------------|
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered by surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the widening of the existing road and increases in noise levels | Slight adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to the railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Moderate adverse The contribution of the setting of the asset to its significance will be reduced appreciably if the treeline which separates the asset from the road is removed or if the A27 is raised above the existing level of the treeline. An increase in noise levels are also expected. | Moderate adverse | Permanent |
| Arundel Conservation Area | Very Substantial The CA contains a wealth of buildings representing architectural form and style though progressive periods which form a contained and cohesive hillside town. | Minor Adverse The proposed Scheme may be seen from the west end of Maltravers Street, at the location of the existing A27, however the characteristics of historic value would still be appreciated. | Moderate/Large adverse | Permanent |

Table B.43: Magnitude of impact and significance of the effect of Option 0BA on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------|----------------------------|----------------------------|------------------------|--------------------|
|-----------------------|----------------------------|----------------------------|------------------------|--------------------|

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|---|--|---------------------------------|--------------------|
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered by surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the widening of the existing road and increases in noise levels | Slight adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to the railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Minor adverse The contribution of setting of the heritage asset to its significance is envisaged to be slightly degraded if the proposed overbridge at Crossbridge Lane is visible above the tree line which separates the A27 from the asset. An increase in noise levels are also expected. | Moderate adverse | Permanent |
| Arundel Conservation Area including Arundel Castle (SM 1012500) | Very Substantial A key view from Arundel Castle commands historically strategic views of the River Arun that includes its managed flood plains and mouth at Littlehampton . | Moderate Adverse The proposed Scheme is likely to be seen from this key view, which would introduce a modern element to a largely undeveloped landscape. The low-lying nature of the scheme means the long distance views will be retained. | Large/Very Large Adverse | Permanent |
| Scheduled Monument 1012177 Ringwork 400m NNW of Batworthpark House | Substantial This late medieval fortification is situated just above the floodplain of the River Arun and resides within a landscape which exhibits features that have the potential to be contemporaneously associated with it. | Minor adverse It is expected that in the summer months foliage from treelines will restrict views south west towards the proposed scheme. During winter months however, when foliage is less dense, the proposed overpass at Crossbridge Lane maybe visible and slightly degrade the appreciation of the historic landscape. | Slight/Moderate Adverse | Permanent |

Table B.44: Magnitude of impact and significance of the effect of Option 1 on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|------------------------|--------------------|
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered by surrounding | Minor adverse The contribution of the setting of the asset to its significance will be slightly | Slight adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|---|--|-------------------------------|---------------------------|
| | development and the A27 | degraded due to the addition of a new road and increases in noise levels | | |
| Grade II LB 1027603 The Premises of Arundel Builders Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | Moderate The asset is historically and functionally linked to its setting (the railway), however the builders yard in which it is situated detracts from the understanding of its original use. | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the new road across the railway line via a new bridge. | Slight adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to the railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure, thus significantly reducing the interpretation of the asset. | Moderate/Large adverse | Permanent |
| Arundel Conservation Area | Very Substantial The CA contains a wealth of buildings representing architectural form and style though progressive periods which form a contained and cohesive hillside town. | Minor Adverse The proposed Scheme may be seen from the west end of Maltravers Street, at the location of the existing A27, however the characteristics of historic value would still be appreciated. | Moderate/Large adverse | Permanent |

Table B.45: Magnitude of impact and significance of the effect of Option 2 on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|---------------------------------|---------------------------|
| SM 1021459 Tortington Augustinian Priory and associated grounds | Moderate The SM is contemporarily and historically linked to the wider agricultural landscape in which it is located, however the remains of the priory are situated within the grounds of a later farmstead which detracts from the understanding of the heritage asset. | Major The proposed Scheme will traverse across rural land immediately to the north of the SM, resulting the loss of its agricultural setting which is contemporary linked to the asset. There are also expected significant increases noise and air pollutants | Moderate/Large adverse | Permanent |
| Grade II* LB 1221996 Tortington Priory Barn, to the north of priory farm | Substantial The barn is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major The proposed Scheme will traverse across agricultural land to the north of the asset, resulting in a significant loss of its setting including alterations to Priory Road which is historically linked to the asset. There are also expected significant increases noise and air pollutants | Large/Very Large adverse | Permanent |
| Grade II LB 1353714 Nineteenth century windmill | Moderate The setting of the windmill on the edge of the River Arun within an agricultural landscape is key in understanding its significance during the Industrial period. | Major Adverse The proposed Scheme will enclose the asset and traverse across fields directly associated with the asset. There are also expected increases noise and air pollutants. | Moderate/Large adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure. | Moderate/Large adverse | Permanent |
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered by surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the addition of a new road and increase in noise levels | Slight adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|--|---|---------------------------------|--------------------|
| Grade II LB 1027603 The Premises of Arundel Builders Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | Moderate The asset is historically and functionally linked to its setting (the railway), however the builders yard in which it is situated detract from the understanding of its original use. | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the new road across the railway line via a new bridge. | Slight Adverse | Permanent |
| Arundel Conservation Area including Arundel Castle (SM 1012500) | Very Substantial A key view from Arundel Castle commands historically strategic views of the River Arun that includes its managed flood plains and mouth at Littlehampton | Moderate Adverse The proposed Scheme will be seen from this key view, which would introduce a modern element to a largely undeveloped landscape. The low-lying nature of the scheme means the long distance views will be retained. | Large/Very Large Adverse | Permanent |

Table B.46: Magnitude of impact and significance of the effect of Option 3 on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|--|--|---------------------------------|--------------------|
| SM 1021459 Tortington Augustinian Priory and associated grounds | Moderate The SM is functionally and historically linked to the wider agricultural landscape in which it resides; however the remains of the priory are situated within the grounds of a later farmstead which detracts from the understanding of the heritage asset. | Major The proposed Scheme will traverse across rural land immediately to the south of the SM, resulting the loss of its agricultural setting which is contemporary linked to the asset. There are also expected significant increases noise and air pollutants | Moderate/Large Adverse | Permanent |
| Grade II* LB 1221996 Tortington Priory Barn, to the north of priory farm | Substantial The barn is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major The proposed Scheme will traverse across agricultural land to the north of the asset, resulting in a significant loss of its wider setting. There are also expected significant increases noise and air pollutants | Large/Very Large Adverse | Permanent |
| Grade II LB 1353714 Nineteenth century windmill | Moderate The setting of the windmill on the edge of the River Arun within an agricultural landscape is key to understanding its significance during the Industrial period. | Minor Adverse The proposed Scheme may be seen at distance from the asset, however the interpretability of the asset and its setting will not be effected. There are also expected significant increases noise and air pollutants | Slight Adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|---|---|---------------------------------|--------------------|
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to railway station and A27 means the only surviving part of the asset's setting is to the southwest, with which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure, thus significantly reducing its interpretability. | Moderate/Large adverse | Permanent |
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered due to surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the addition of the new road and increase in noise levels | Slight adverse | Permanent |
| Grade II LB 1027603 The Premises of Arundel Builders Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | Moderate The asset is historically and functionally linked to its setting (the railway), however the builders yard in which it is situated detract from the understanding of its original use. | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the new road across the railway line via a new bridge. | Slight Adverse | Permanent |
| Grade II LB 1234219 Brook Lawn (Early 19 th century house) | Substantial The asset is historically and functionally linked to its agricultural setting and to its location next to the A284 | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 122209 The Parish Church of St Mary Magdalene | Very Substantial The 12 th century church is located with ANA DWS8481 (south), a late medieval site of significant size containing associated below ground assets. There are also direct historical associations between the site of the Church and Tortington Augustinian priory (SM 1021459) to the north. | Major adverse The proposed Scheme will traverse across agricultural land between the church and SM 1021459. This will result in the relationship between the asset and its setting being no longer readily appreciable and the interpretability of the significance of the asset would be significantly reduced. There are also expected significant increases noise and air pollutants | Very large adverse | Permanent |
| Grade II LB 1274879 Manor Farmhouse | Substantial The asset resides within a hamlet that has changed little over time. The farmhouse dominates the setting which comprises of agricultural fields functionally and historically linked to the asset | Moderate adverse Due to intervening development and lines of mature trees it is unlikely that the proposed Scheme will be seen from the asset, however significant increases in noise and air pollutants are expected. | Moderate/Large adverse | Permanent |
| Arundel Conservation Area including Arundel | Very Substantial A key view from Arundel Castle commands | Moderate Adverse The proposed Scheme will be seen from this key view and | Large/Very Large Adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|-----------------------|---|---|------------------------|--------------------|
| Castle (SM 1012500) | historically strategic views of the River Arun including its managed flood plains and mouth at Littlehampton. | will introduce a modern element to a largely undeveloped landscape. Long distance views however will be retained. | | |

Table B.47: Magnitude of impact and significance of the effect of Option 4 on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|--|--|---------------------------------|--------------------|
| SM 1021459 Tortington Augustinian Priory and associated grounds | Moderate The SM is functionally and historically linked to the wider agricultural landscape in which it resides, however the remains of the priory are situated within the grounds of a later farmstead which detracts from the understanding of the heritage asset. | Major adverse The proposed Scheme will traverse across rural land immediately to the south of the SM, resulting the loss of its agricultural setting which is contemporary linked to the asset. There are also expected significant increases noise and air pollutants | Moderate/Large adverse | Permanent |
| Grade II* LB 1221996 Tortington Priory Barn, to the north of priory farm | Substantial The barn is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The proposed Scheme will traverse across agricultural land to the north of the asset, resulting in a significant loss of its wider setting. Significant increases in noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure. | Moderate/Large adverse | Permanent |
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered due to surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the addition of a new road and increase in noise levels | Slight adverse | Permanent |
| Grade II LB 1027603 The Premises of Arundel Builders Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | Moderate The asset is historically and functionally linked to its setting (the railway); however the builder's yard in which is it situated detract the understanding of its original use. | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the new road across the railway line via a new bridge. | Slight adverse | Permanent |
| Grade II LB 1353714 Nineteenth century windmill | Moderate The setting of the windmill on the edge of the River Arun within an agricultural landscape is key to understanding its significance | Minor Adverse The proposed Scheme may be seen at distance from the asset, however the interpretability of the asset and its setting will not be | Slight Adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|--|--|---------------------------------|--------------------|
| | during the Industrial period. | affected. There are also expected significant increases noise and air pollutants | | |
| Grade II LB 122198 Church Farmhouse | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1221993 The Glebe House | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274877 The Church of St Mary | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 122201 Morleys Croft | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274878 Meadows Lodge | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB | Substantial The house is located within | Minor Adverse Due to intervening | Slight/Moderate adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|--------------------------------|---------------------------|
| 1274880 The Thatched Cottage | an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | | |
| Grade II LB 1221995 Marsh Farmhouse | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 122209 The Parish Church of St Mary Magdalene | Very Substantial The 12 th century church is located with ANA DWS8481 (south), a late medieval site of significant size containing associated below ground assets. There are also direct historical associations between the site of the Church and Tortington Augustinian priory (SM 1021459) to the north. . | Major adverse The proposed Scheme will traverse across agricultural land between the church and SM 1021459. The relationship between the asset and its setting will no longer be readily appreciable and the interpretability of the significance of the asset will be significantly reduced. There are also expected to be significant increases in noise and air pollutants | Very Large adverse | Permanent |
| Grade II LB 1274879 Manor Farmhouse | Substantial The asset resides within a hamlet that has changed little overtime. The farmhouse dominates the setting which comprises of agricultural fields functionally and historically linked to the asset | Moderate adverse Due to intervening development and lines of mature trees it is unlikely that the proposed Scheme will be seen from the asset, however significant increases noise and air pollutants are expected. | Moderate/Large adverse | Permanent |
| Grade II LB 1274555 The Lodge of Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222535 Swiss Cottage | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222465 Beam Ends (16 TH Century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|--|--|---------------------------------|--------------------|
| Grade II LB 1222534 Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222001 The Forge Cottages | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1237622 The Old Malt House | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1234219 Brook Lawn (Early 19 th century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Arundel Conservation Area | Very Substantial A key view from Arundel Castle commands historically strategic views of the River Arun including its managed flood plains and mouth at Littlehampton. | Moderate Adverse The proposed Scheme will be seen from this key view and will introduce a modern element to a largely undeveloped landscape. Long distance views however will be retained. | Large/Very Large Adverse | Permanent |

Table B.48: Magnitude of impact and significance of the effect of Option 5 on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|--|---|---------------------------------|--------------------|
| SM 1021459 Tortington Augustinian Priory and associated grounds | Moderate The SM is functionally and historically linked to the wider agricultural landscape in which it resides, however the remains of the priory are situated within the grounds of a later farmstead which detracts from the understanding of the heritage asset. | Major adverse The proposed Scheme will traverse across rural land immediately to the north of the SM, resulting in the loss of its agricultural setting which is contemporary linked to the asset. There are also expected significant increases noise and air pollutants | Moderate/Large adverse | Permanent |
| Grade II* LB 1221996 | Substantial The barn is located within an agricultural setting which | Major adverse The proposed Scheme will traverse across agricultural | Large/Very Large adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|---|---|---|---------------------------------|---------------------------|
| Tortington Priory Barn, to the north of priory farm | makes a substantial contribution to the understanding and appreciation of the significance of the asset. | land to the north of the asset, resulting in a significant loss of its wider setting. Significant increases in noise and air pollutants are expected. | | |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure. | Moderate/Large adverse | Permanent |
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered due to surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the addition of a new road and increase in noise levels | Slight adverse | Permanent |
| Grade II LB 1027603 The Premises of Arundel Builders Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | Moderate The asset is historically and functionally linked to its setting (the railway); however the builder's yard in which it is situated detract the understanding of its original use. | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the new road across the railway line via a new bridge. | Slight adverse | Permanent |
| Grade II LB 1353714 Nineteenth century windmill | Moderate The setting of the windmill on the edge of the River Arun within an agricultural landscape is key to understanding its significance during the Industrial period. | Moderate Adverse The proposed Scheme will lie within close proximity to asset and will be visible when looking south from the asset. The scheme is likely to introduce a discordant and discontinuous element to the landscape. Significant increases in noise pollutants are also expected. Relevant setting characteristics such as the course of the River Arun and the wider agricultural landscape can still be appreciated. . | Moderate Adverse | Permanent |
| Grade II LB 1222198 Church Farmhouse | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1221993 | Substantial The house is located within | Major adverse The contribution of the | Large/Very Large adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|--|---------------------------------|---------------------------|
| The Glebe House | an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | | |
| Grade II LB 1274877 The Church of St Mary | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 122201 Morleys Croft | Substantial The house is located within agricultural setting with strong themes of rural tranquillity. The setting makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced as the sense of rural tranquillity will be effectually lost due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274878 Meadows Lodge | Substantial The house is located within agricultural setting with strong themes of rural tranquillity. The setting makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced as the sense of rural tranquillity will be effectually lost due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected | Large/Very Large adverse | Permanent |
| Grade II LB 1274880 The Thatched Cottage | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222209 The Parish Church of St Mary Magdalene | Very Substantial The 12 th century church is located with ANA DWS8481 (south), a late medieval site of significant size containing associated below ground | Minor Adverse The proposed Scheme will traverse across agricultural land over 1km north of the asset. Due to distance and intervening development it is | Moderate/Large adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|-----------------------------------|--------------------|
| | assets. There are also direct historical associations between the site of the Church and Tortington Augustinian priory (SM 1021459) to the north. . | unlikely that the Scheme will be seen or heard from the asset, however a small part of the agricultural landscape to which the asset is historically associated will be lost. | | |
| Grade II LB 1274879 Manor Farmhouse | Substantial The asset resides within a hamlet that has changed little overtime. The farmhouse dominates the setting which comprises of agricultural fields functionally and historically linked to the asset | Minor adverse The proposed Scheme will traverse across agricultural land over 1km north of the asset. Due to distance and intervening development it is unlikely that the Scheme will be seen or heard from the asset, however a small part of the agricultural landscape to which the asset is historically associated will be lost. | Slight/Moderate adverse. | Permanent |
| Grade II LB 1274588 The Royal Oak Inn | Substantial The public house is roughly situated at the junction of the A27 and Yapton Lane. These roads can be seen to be historically and functionally associated with the asset and serve to enhance its economic viability. | Minor Beneficial An additional road the Junction of the A27 and Yapton Lane is likely to improve the assets economic viability, furthermore, the setting of asset will not be change in ways that will degrade the experience of the asset. | Slight/Moderate Beneficial | Permanent |
| Grade II LB 1274555 The Lodge of Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222535 Swiss Cottage | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222465 Beam Ends (16 TH Century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222534 Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|--|--|---------------------------------|--------------------|
| Grade II LB 1234219 Brook Lawn (Early 19 th century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Arundel Conservation Area | Very Substantial A key view from Arundel Castle commands historically strategic views of the River Arun including its managed flood plains and mouth at Littlehampton. | Moderate Adverse The proposed Scheme will be seen from this key view and will introduce a modern element to a largely undeveloped landscape. Long distance views however will be retained. | Large/Very Large Adverse | Permanent |

Table B49: Magnitude of impact and significance of the effect of Option 5A on the setting of designated heritage assets within the study area

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|--|---|---------------------------------|--------------------|
| SM 1021459 Tortington Augustinian Priory and associated grounds | Moderate The SM is functionally and historically linked to the wider agricultural landscape in which it resides, however the remains of the priory are situated within the grounds of a later farmstead which detracts from the understanding of the heritage asset. | Major adverse The proposed Scheme will traverse across rural land immediately to the south of the SM, resulting in the loss of its agricultural setting which is contemporary linked to the asset. There are also expected significant increases noise and air pollutants | Moderate/Large adverse | Permanent |
| Grade II* LB 1221996 Tortington Priory Barn, to the north of priory farm | Substantial The barn is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The proposed Scheme will traverse across agricultural land to the north of the asset, resulting in a significant loss of its wider setting. Significant increases in noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II* LB 1034405 Priory Farm House | Moderate The close proximity of the house to railway station and A27 means the only surviving part of the asset's setting is to the southwest, to which it is historically and functionally linked. | Major adverse The proposed Scheme will traverse across the only surviving part of the asset's original agricultural setting. The property will be completely surrounded by modern infrastructure. | Moderate/Large adverse | Permanent |
| Grade II LB 1027602 The Camellia Hotel | Moderate The setting of the asset has been largely altered due to surrounding development and the A27 | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to the addition of a new road and increase in noise levels | Slight adverse | Permanent |
| Grade II LB 1027603 The Premises of Arundel Builders | Moderate The asset is historically and functionally linked to its setting (the railway); however the builder's yard in which it | Minor adverse The contribution of the setting of the asset to its significance will be slightly degraded due to proposals to extend the | Slight adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|---------------------------------|---------------------------|
| Merchants Ltd at Arundel Station. Originally a nineteenth century goods shed in the railway yard. | situated detract the understanding of its original use. | new road across the railway line via a new bridge. | | |
| Grade II LB 1353714 Nineteenth century windmill | Moderate The setting of the windmill on the edge of the River Arun within an agricultural landscape is key to understanding its significance during the Industrial period. | Minor Adverse The proposed Scheme may be seen at distance from the asset, however the interpretability of the asset and its setting will not be effected. There are also expected significant increases noise and air pollutants | Slight Adverse | Permanent |
| Grade II LB 1222198 Church Farmhouse | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1221993 The Glebe House | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274877 The Church of St Mary | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274878 Meadows Lodge | Substantial The house is located within agricultural setting with strong themes of rural tranquillity. The setting makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced as the sense of rural tranquillity will be effectually lost due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected | Large/Very Large adverse | Permanent |
| Grade II LB | Substantial | Minor Adverse | Slight/Moderate | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|---|---|-----------------------------------|--------------------|
| 1274880 The Thatched Cottage | The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | adverse | |
| Grade II LB 1222209 The Parish Church of St Mary Magdalene | Very Substantial The 12 th century church is located with ANA DWS8481 (south), a late medieval site of significant size containing associated below ground assets. There are also direct historical associations between the site of the Church and Tortington Augustinian priory (SM 1021459) to the north. . | Major adverse The proposed Scheme will traverse across agricultural land between the church and SM 1021459. The relationship between the asset and its setting will no longer be readily appreciable and the interpretability of the significance of the asset will be significantly reduced. There are also expected to be significant increases in noise and air pollutants | Very Large adverse | Permanent |
| Grade II LB 1274879 Manor Farmhouse | Substantial The asset resides within a hamlet that has changed little overtime. The farmhouse dominates the setting which comprises of agricultural fields functionally and historically linked to the asset | Moderate adverse Due to intervening development and lines of mature trees it is unlikely that the proposed Scheme will be seen from the asset, however significant increases noise and air pollutants are expected. | Moderate/Large adverse | Permanent |
| Grade II LB 122201 Morleys Croft | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Major adverse The contribution of the setting of the cultural heritage asset to its significance will be significantly reduced due to the close proximity of the asset to the proposed Scheme. Significant increases noise and air pollutants are expected. | Large/Very Large adverse | Permanent |
| Grade II LB 1274588 The Royal Oak Inn | Substantial The public house is roughly situated at the junction of the A27 and Yapton Lane. These roads can be seen to be historically and functionally associated with the asset and serve to enhance its economic viability. | Minor Beneficial An additional road the Junction of the A27 and Yapton Lane is likely to improve the assets economic viability, furthermore, the setting of asset will not be change in ways that will degrade the experience of the asset. | Slight/Moderate Beneficial | Permanent |
| Grade II LB 1274555 The Lodge of Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222535 | Substantial The house is located within an agricultural setting which | Minor Adverse Due to intervening development it is unlikely the | Slight/Moderate adverse | Permanent |

| Heritage Asset Number | Sensitivity of the setting | Magnitude of harm (Impact) | Significance of Effect | Duration of Effect |
|--|--|--|---------------------------------|---------------------------|
| Swiss Cottage | makes a substantial contribution to the understanding and appreciation of the significance of the asset. | proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | | |
| Grade II LB 1222465 Beam Ends (16 TH Century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1222534 Avisford Park Hotel | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Grade II LB 1234219 Brook Lawn (Early 19 th century house) | Substantial The house is located within an agricultural setting which makes a substantial contribution to the understanding and appreciation of the significance of the asset. | Minor Adverse Due to intervening development it is unlikely the proposed Scheme will be seen from the asset, however noise and air pollutants are likely to increase | Slight/Moderate adverse | Permanent |
| Arundel Conservation Area | Very Substantial A key view from Arundel Castle commands historically strategic views of the River Arun including its managed flood plains and mouth at Littlehampton. | Moderate Adverse The proposed Scheme will be seen from this key view and will introduce a modern element to a largely undeveloped landscape. Long distance views however will be retained. | Large/Very Large Adverse | Permanent |

A27 ARUNDEL BYPASS

PRELIMINARY ECOLOGICAL APPRAISAL

70019688

Project no: 70019688
Date: March 2017

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1

EXECUTIVE SUMMARY

- 1.1.1 WSP | Parsons Brinckerhoff was commissioned by Highways England to undertake a Preliminary Ecological Appraisal for the proposed improvements to the A27 at Arundel, West Sussex.
- 1.1.2 A desk study and Extended Phase 1 Habitat Survey were undertaken with the aim to identify potential impacts of the proposed works on protected and notable species and habitats and designated sites in order to make recommendations on any further surveys, mitigation, compensation and / or licences that may be required to facilitate the proposed works.
- 1.1.3 Designated sites and protected and notable species were considered and assessed in context of the proposed development. Species with potential to be a constraint to the proposed works include nesting birds; commuting and foraging bats; great crested newts; reptiles; otter and water vole.
- 1.1.4 It is recommended that measures are implemented to avoid adverse ecological impacts (for example, the re-siting of construction compounds, or adjustments in road alignment, etc.) should be considered in the first instance. Where adverse impacts cannot be avoided, options to reduce adverse impacts should be implemented. This includes measures such as carrying out works outside of breeding seasons for protected species, such as great crested newts and birds.
- 1.1.5 As a last resort, measures that compensate for the loss of the particular ecological resource that is affected should be considered. For example, like-for-like replacement of lost habitats and enhancement of existing habitats.

2

INTRODUCTION

2.1 BACKGROUND

2.1.1 WSP | Parsons Brinckerhoff was commissioned by Highways England to undertake a Preliminary Ecological Appraisal (PEA) for the proposed improvements to the A27 at Arundel, West Sussex (Appendix A), as part of the Major Project - Projects Control Framework (PCF) Stage 1, to inform the Environmental Study Report (ESR).

2.1.2 This PEA considers ten outline Scheme Options (Appendix B) and has been completed without any detailed design information.

2.1.3 The objectives of this PEA are as follows:

- Obtain detailed baseline information on the current habitats and ecological features in the Survey Area as defined by the scheme extents (as shown in Appendix B) and wider area of the proposed Scheme Options by undertaking a desk study and extended Phase 1 habitat survey.
- Using desk study and extended Phase 1 habitat survey data, assess the potential for habitats within the proposed scheme options to support species protected by law or that are otherwise of particular nature conservation value.
- Identify any potential ecological constraints associated with each of the proposed scheme options, and detail requirements for further surveys, mitigation, compensation and / or licences that may be required to facilitate the development.

2.2 SITE CONTEXT

- 2.2.1 The term Survey Area is used in this assessment to denote the envelope encompassing all ten scheme options it is shown in Appendix B. The term Study Area denotes a wider area beyond the scheme options where biological information was requested from local records centres.
- 2.2.2 All ten outline scheme options are located along or immediately adjacent the A27 carriageway to the south of Arundel, with some partly located within the South Downs National Park (SDNP). The surrounding landscape comprises predominantly farmland with large areas of woodland and occasional residential developments.
- 2.2.3 Option 0A consists of the existing Crossbush Junction only. This option comprises small linear belts of woodland bordering grassland fields/farmland to the north and south, and hedgerows bordering grassland fields to the west.
- 2.2.4 Option 0B and Option 1 include linear belts of ancient woodland (forming the southern boundary of Rewell Wood Complex LWS and northern boundary of Binsted Wood Complex Local Wildlife Site (LWS)) and semi-natural broadleaved woodland, hedgerow and grassland verges to the north and south of the A27 carriageway at the eastern and western extent of survey.
- 2.2.5 Arundel town comprises large areas of buildings and hardstanding, which are predominant towards the centre. Option 1 differs slightly from Option 0B as it departs from the existing A27 carriageway corridor towards the eastern extent of the Survey Area where it crosses farmland for approximately 800m before re-joining the A27 carriageway near to Crossbush Junction.
- 2.2.6 Option 0BA is very similar to Option 0B but includes a short section of route (approximately 600m) that departs from the existing A27 carriageway corridor (and Option 0B) towards the eastern extent of the Survey Area where it crosses farmland for approximately 600m before re-joining the A27 carriageway (and Option 0B) near to Crossbush Junction.
- 2.2.7 Option 2 runs adjacent to Tortington Lane towards the west of the Survey Area for approximately 800m which is bordered by large areas of ancient woodland, and then runs east across the River Arun and over large areas of farmland bordered by a network of ditches and hedgerows where it re-joins the A27 carriageway at Crossbush Junction.
- 2.2.8 Option 3 runs south-east through the centre of a very large area of ancient woodland (forming the majority of the Binsted Wood Complex LWS) for approximately 1.6km and then runs east across the River Arun and over large areas of farmland bordered by a network of ditches and hedgerows where it re-joins the A27 carriageway at Crossbush Junction.
- 2.2.9 Options 4 and 5 are very similar whereby they both run (from east to west) through a small area of ancient woodland (forming part of the Binsted Wood Complex LWS) for approximately 0.6km and then east across the River Arun and over large areas of farmland bordered by a network of ditches and hedgerows where it re-joins the A27 carriageway at Crossbush Junction.
- 2.2.10 Option 5A includes the western half of Option 5 and the eastern half of Option 3 with a short section of route (approximately 500m) that links the two together. Option 5A will cross farmland bordered by a network of ditches and hedgerows.
- 2.2.11 Option 5B proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway

2.3 LEGISLATION AND POLICY CONTEXT

2.3.1 This PEA has been compiled with reference to relevant wildlife and countryside legislation, planning policy and the UK Biodiversity Framework. Their context and applicability is explained as appropriate in the relevant sections of the report and additional details are presented in Appendix C.

2.3.2 The key articles of relevance are:

- The Conservation of Habitats and Species Regulations 2010 (as amended) (Habitats Regulations);
- The Wildlife and Countryside Act 1981, as amended (WCA);
- The Countryside and Rights of Way (CROW) Act 2000;
- The Natural Environment and Rural Communities (NERC) Act 2006;
- National Planning Policy Framework (NPPF) 2012¹;
- Design Manual for Roads and Bridges (DMRB) 1992 (as amended);
- The Protection of Badgers Act 1992;
- The Hedgerow Regulations 1997;
- The UK Post-2010 Biodiversity Framework (2011-2020)²;
- The Sussex Biodiversity Action Plan (accessed online³).

¹ Department for Communities and Local Government (2012). The National Planning Policy Framework. DCLG. London.

² JNCC and Defra (on behalf of the Four Countries' Biodiversity Group) (2012). UK Post-2010 Biodiversity Framework. [on-line] <http://jncc.defra.gov.uk/page-6189> (accessed June 2015).

³ Sussex Biodiversity Partnership (2016). *Biodiversity Action Plan* [online] <https://www.biodiversitysussex.org.uk/> (accessed January 2016)

3

METHODOLOGY

3.1.1 This PEA follows the Chartered Institute of Ecology and Environmental Management (CIEEM) published guidelines for PEA⁴ and comprises a Desk Study and Extended Phase 1 Habitat Survey.

3.2 DESK STUDY

3.2.1 A desk study was undertaken to obtain and review records of designated nature conservation sites, and protected and notable species and habitats within defined Study Areas drawn from the outer limit of all ten Scheme Options as follows:

- International statutory designated sites - 10km radius extending to a 30km radius for Special Areas for Conservation (SAC) designated for bats;
- National statutory and non-statutory designated sites – 2km;
- Protected and notable species – 2km.

3.2.2 These Study Areas were considered suitable to account for the zone of influence, which reflects the scale and type of the proposed development options. The Study Areas are also based on guidance on undertaking ecological assessment provided in the Design Manual for Roads and Bridges (DMRB)⁵. Protected and notable species records were reviewed for the period 2005 to 2015 (a 10 year historical data set).

3.2.3 The designated sites included within this search were as follows:

- Special Areas of Conservation (SAC);
- Special Protection Areas (SPA);
- Ramsar sites;
- Sites of Special Scientific Interest (SSSI);
- National Nature Reserves (NNR);
- Local Nature Reserves (LNR); and
- Local Wildlife Sites (LWS)⁶.

3.2.4 The following data sources were used, contacted and / or reviewed:

- Multi Agency Geographic Information for the Countryside (MAGIC)⁷;
- OS mapping and publically available aerial photography; and
- A bespoke data search provided by Sussex Biodiversity Records Centre (SxBRC) for a 2km radius around all Scheme Options.

⁴ CIEEM (2013). Guidelines for Preliminary Ecological Appraisal. CIEEM Technical Guidance Series

⁵ DMRB (1993). Design manual for roads and bridges (DMRB). DMRB Volume 11 Environmental assessment.

⁶ LWS have now superceded Sites of Nature Conservation Importance (SNCI) in Sussex.

⁷ DEFRA (2014). Magic [online] <http://magic.defra.gov.uk/> (accessed June 2015)

3.2.5

Protected and notable habitats and species were considered if they were listed on any of the following pieces of statute or conservation registers:

- Annex 1 or Annex 2 of the Habitats Directive (Council Directive 92/43/EEC);
- Schedules 1, 5 or 8 of the Wildlife and Countryside Act, 1981 (as amended);
- Species and Habitats of Principal Importance in England, Section 41 of the Natural Environment and Rural Communities Act 2006⁸;
- Sussex BAP⁹;
- Birds of Conservation Concern¹⁰;
- Joint Nature Conservation Committee (JNCC) Conservation Designations for UK Taxa spread sheet containing details of species listed as National Notable, Nationally Rare or Nationally Scarce¹¹; and
- Important Hedgerows as defined by The Hedgerows Regulations 1997¹².

⁸ Natural England (2015). [online] <http://www.naturalengland.org.uk/ourwork/conservation/biodiversity/protectandmanage/habsandspeciesimportance.aspx> (accessed January 2016)

⁹ Sussex Biodiversity Partnership (2016). *Biodiversity Action Plan* [online] <https://www.biodiversitysussex.org.uk/> (accessed January 2016)

¹⁰ Eaton, M et al (2015) *Birds of Conservation Concern 4: the population and status of birds in UK, Channel Islands and Isle of Man*. British Birds (108) 708-746

¹¹ Joint Nature Conservation Committee (2014). *Conservation Designations Spreadsheet* [online] <http://jncc.defra.gov.uk/page-3408> (accessed January 2016)

¹² Defra (2001). *The Hedgerows Regulations 1997: a guide to the law and good practice*. HMSO, London.

3.3 EXTENDED PHASE 1 HABITAT SURVEY

- 3.3.1 An Extended Phase 1 Habitat Survey was undertaken by two suitably experienced WSP | PB ecologists between 12th and 14th January 2016. The Survey Area incorporated each proposed Scheme Option and an approximate 50m radius around each Scheme Option boundary.
- 3.3.2 The Phase 1 Habitat Survey followed standard survey methodology published by the Joint Nature Conservation Committee (JNCC)¹³. This methodology is a standardised technique for rapidly obtaining baseline ecological information over a large area of land. All habitat types present within the Survey Area were recorded on a Phase 1 Habitat map (Appendix B) and plant species were recorded in accordance with standard nomenclature¹⁴. Scientific names are only mentioned the first time the species occurs in the report.
- 3.3.3 In accordance with best practice, the standard survey methodology was extended to consider and include evidence of, or potential for, protected or notable species¹⁵. The assessment of habitat suitability for protected and notable species is based on professional judgement gained from undertaking multiple ecological surveys in both urban and rural environments. This was supplemented by best practice guidance on habitat suitability assessment for key faunal groups including: badger *Meles meles*¹⁶; bats¹⁷; birds; hazel dormouse *Muscardinus avellanarius*¹⁸, great crested newt (GCN) *Triturus cristatus*¹⁹; reptiles²⁰; otter *Lutra lutra*²¹; water vole *Arvicola amphibius*²²; and terrestrial and aquatic invertebrates²³.
- 3.3.4 Target notes were used to record information on specific habitats and features and are presented in Appendix D.

SURVEY LIMITATIONS

- 3.3.5 The survey was restricted to areas within publicly accessible highway or footpaths. Inaccessible areas were therefore mapped from adjacent land boundaries during this visit, with the aid of desktop information such as aerial photographs and OS maps. Land access was restricted immediately east and west of the River Arun, within many fields containing grazing livestock and along arable field margins. A detailed assessment of the grassland habitat type within these fields could therefore not be undertaken. Using a precautionary approach these grasslands were identified as semi-improved neutral grassland although it is probable that a proportion of them are in fact improved grassland.

¹³ Joint Nature Conservation Committee (2010). *Handbook for Phase 1 Habitat Survey - A Technique for Environmental Audit*. Joint Nature Conservation Committee, Peterborough.

¹⁴ Stace, C. (2010). *New Flora of the British Isles*, 3rd edition. Cambridge University Press, Cambridge.

¹⁵ Institute of Ecology and Environmental Management (2012). *Guidelines for Preliminary Ecological Appraisal*; Revised 2nd Edition July 2012.

¹⁶ Roper, T.J. (2010). *Badger*. Harper Collins.

¹⁷ Hundt, L. (2012). *Bat Surveys: Good Practice Guidelines*, 2nd edition. Bat Conservation Trust, London.

¹⁸ English Nature (2006). *The Dormouse Conservation Handbook*, 2nd Edition. Natural England. Peterborough.

¹⁹ English Nature (2001). *Great crested newt mitigation guidelines*. Natural England. Peterborough.

²⁰ Gent, T. and Gibson, S. (Eds) (2003). *Herpetofauna Workers' Manual*. Pelagic Publishing, Exeter.

²¹ Chanin, P. (2003). *Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10*, English Nature, Peterborough.

²² Strachan, R., Moorhouse, T., and Gelling, M. (2011). *Water Vole Conservation Handbook*. Wild Cru. Oxford.

²³ Buglife (2009). *Planning for Brownfield Biodiversity: A best practice guide*. Buglife - The Invertebrate Conservation Trust, Peterborough.

- 3.3.6 Land access was restricted along the A27 carriageway towards the eastern and western ends of the study area due to the dual carriageway having limited areas of clearance between the carriageway and its boundary. The habitat types (predominantly woodland) were therefore identified and mapped from a vehicle whilst driving along the A27 carriageway. The extent and coverage of the survey is considered wholly adequate to enable a preliminary Ecological Impact Assessment.
- 3.3.7 As a result of changes to the outline scheme options at a late stage in the assessment process, the outer edge of the Survey Area has increased in size beyond the area where survey work was undertaken. As a result of this, there are small areas of land which were not surveyed for the Phase 1 Habitat survey. The size of the omitted areas is relatively small. Desk study information and aerial photography have been used to classify these habitats and their nature conservation value has been confidently inferred using this data.
- 3.3.8 The Extended Phase 1 Habitat Survey was carried out during January. As such, seasonal variations could not be observed and potentially only a selection of all species that occur within the Survey Area will have been noted. The Extended Phase 1 Habitat Survey therefore provides a general assessment of potential nature conservation value. However, it is considered that the combination of biological records from the desk study and the site visit provides an accurate representation of the various species and habitat types present or potentially present within the Survey Area.
- 3.3.9 The Extended Phase 1 Habitat Map Figure (Appendix B) has been reproduced from field notes and plans. Whilst this provides a sufficient level of detail to fulfil the requirements of a preliminary ecological impact assessment, the map is not intended to provide exact locations and distributions of key habitats. Furthermore the habitats and the management of the habitats are likely to change over time.

The Phase 1 Habitat survey was carried out (January 2016) prior to the design of Scheme Option 5B (August 2016). The desk study search area already encompasses the land where Scheme Option 5B is proposed because Option 5B sits within 2 km of the original nine scheme options. In addition, Scheme Option 5B shares the alignment of several other scheme options. Specifically, Phase 1 Habitat survey data relating to the area south and east of Arundel town is applicable to Scheme Option 5B. However, the western alignment of Scheme Option 5B, west of Binsted, extends beyond the coverage of the Phase 1 Habitat field data. Desk study information, OS mapping and aerial photography were used to inform the identification of potential ecological constraints in this area. A precautionary approach was adopted where uncertainty over the presence of absence of particular habitat features could not be resolved using these secondary data sources along.

4 RESULTS

4.1 DESK STUDY

DESIGNATED SITES

- 4.1.1 Three SACs designated for bats were identified within 30km of all Scheme Options. These are: Ebernoe Common SAC which is located approximately 19km north of the Scheme Options; The Mens SAC which is located approximately 15.3km north of the Scheme Options; and Singleton and Cocking Tunnels SAC which is located approximately 14km north-west of the Scheme Options. Two bat species, barbastelle (*Barbastelle barbastellus*) and Bechstein's (*Myotis bechsteini*) were identified as the primary reason for the selection of these SACs either as primary or non-primary qualifying features.
- 4.1.2 Two non-bat related statutory designated sites of international importance were identified within 10km of the Scheme Options (see Table 4.1). Arun Valley SAC, SPA and Ramsar site is located approximately 6.8km to the north of the Scheme Options; and the Duncton to Bignor Escarpment SAC is located approximately 6km north of the Scheme Options.
- 4.1.3 The Arun Valley SAC, SPA and Ramsar site consists of low-lying grazing marsh with a rich flora and fauna assemblage. Southern parts of this SAC/SPA/Ramsar site are fed by calcareous springs, while to the north, where the underlying geology is greensand and the water is more acidic. The history of management of the fields, and their water levels, determines the plant communities present, with drier fields dominated by meadow grasses (*Poa* sp.), crested dog's-tail (*Cynosurus cristatus*) and perennial rye-grass (*Lolium perenne*). In wetter areas, rushes, sedges and tufted hair-grass (*Deschampsia cespitosa*) are more frequent. Ungrazed fields have developed into fen, scrub or woodland. Fen areas consist of common reed (*Phragmites australis*), reed sweet-grass (*Glyceria maxima*) and greater tussock-sedge (*Carex paniculata*), often with scattered elder and willow scrub. On firmer ground, there is alder (*Alnus glutinosa*), willow (*Salix* sp.), and birch, oak and hazel woodland on the driest ground. The ditches and margins between grazing marsh fields have a very rich aquatic flora and invertebrate fauna. The Arun Valley SAC / SPA / Ramsar site supports important numbers of wintering waterbirds, which feed in the wetter, low-lying fields and along ditches.
- 4.1.4 The Arun Valley SAC is primarily designated for the presence of Ramshorn snail (*Anisus vorticulus*). The site comprises one of the largest populations of this species in the UK.
- 4.1.5 The Duncton to Bignor Escarpment SAC predominantly consists of mature beech woodland situated on the steep scarp face of the South Downs, with occasional parcels of ash woodland, scrub and grassland. The SAC comprises a diverse mollusc assemblage and rich floral community with rare plant species present including white helliborine (*Cephalanthera damasonium*), yellow bird's-nest (*Monotropa hypopitys*), green hellebore (*Helleborus viridis*) and limestone fern (*Gymnogrammitis robertiana*). This SAC is primarily designated for the presence of the Habitats Directive Annex 1 habitat type Asperulo-Fagetum beech forests.

- 4.1.6 Arundel Park Site of SSSI is within 2km of all Scheme Options; the nearest being Option 1 which is approximately 0.5km north. Arundel Park SSSI is renowned as one of the most important sites in the country for invertebrates including a number of protected / notable species. Fifteen species present here have been classified as endangered and under threat of extinction, including the rare field cricket (*Gryllus campestris*) and the beetle (*Laemophloeus monilis*). The site also comprises a diverse breeding bird community, particularly over-wintering wildfowl such as gadwall (*Anas strepera*) and pochard (*Aythya ferina*). The site comprises a mosaic of species-rich chalk grassland, marsh grassland, scrub and semi-natural broadleaved and mixed woodland. A rich floral community has also been recorded at Swanbourne Lake towards the south of the site. The site also supports at least 25 breeding butterfly species including the duke of burgundy, brown argus (*Aricia agestis*) and chalk hill blue (*Lysandra coridon*). A rare mollusc (*Pseudamnicola confuse*) has also been recorded in the reedbeds within the site.
- 4.1.7 Fairmile Bottom SSSI was identified within 2km of all Scheme Options; the nearest being Option 4 approximately 1.5km north. This SSSI is designated for beech woodland, yew woodland and oak woodland with areas of species-rich chalk grassland and notable invertebrate communities.
- 4.1.8 Five non-statutory designated sites of county importance were identified within 2km of all Scheme Options. Four non-statutory designated sites of county importance were identified within 2km of Options 0A & 0BA. Options 2, 3, 4 and 5 are situated within Binsted Wood Complex Local Wildlife Site (LWS). Options 0A and 1 are situated along the northern boundary of Binsted Wood Complex LWS. All Scheme Options except Options 0A, 0BA and 5A are situated along the southern boundary of Rewell Wood Complex LWS.
- 4.1.9 Binsted Wood Complex LWS comprises a mixture of ancient woodland, recent woodland, conifer plantation, species rich pasture and old tracks. The mix of habitats and geology gives rise to a diverse flora. The paths and rides are especially species rich and Scotland Lane supports an outstanding wet ride flora that includes at least 11 species of sedge including long-stalked yellow-sedge (*Carex viridula* ssp. *brachyrhyncha*), a county rarity at its only recorded West Sussex location. This is the largest block of ancient semi-natural woodland south of the South Downs in Sussex. Oak (*Quercus* sp.) and hazel (*Corylus avellana*) woodland is the predominant habitat type of this complex. Oak dominates the canopy with birch and sweet chestnut (*Castanea sativa*) and an irregular understorey of hazel. Sweet chestnut coppice dominates in some areas. The ground flora is mostly bracken (*Pteridium aquilinum*) and bramble (*Rubus fruticosus*) with carpets of bluebell (*Hyacinthoides non-scripta*) and wood anemone (*Anemone nemorosa*). Early-purple orchids (*Orchis mascula*) occur in abundance and have been counted in thousands in Ash Piece. The rare adder's-tongue fern (*Ophioglossum vulgare*) has also been recorded here. There is a rich butterfly fauna including ringlet (*Aphantopus hyperantus*), silver-washed fritillary (*Argynnis paphia*), white admiral (*Limenitis camilla*) and purple emperor (*Apatura iris*). Freshwater cockles and glow-worms (*Lampyrus noctiluca*) have also been recorded.
- 4.1.10 Rewell Wood Complex LWS comprises ancient semi-natural woodland, worked sweet chestnut coppice, conifer plantation, beech (*Fagus sylvatica*) plantation and species-rich chalk grassland. Wide rides and glades support a rich flora and butterfly fauna. The disused gravel pits are of entomological importance. The semi-natural woodland comprises predominantly oak, beech, ash (*Fraxinus Excelsior*), field maple (*Acer campestre*) and hazel. The woodlands comprise dense carpets of bluebells with wood spurge (*Euphorbia amygdaloides*), honeysuckle (*Lonicera periclymenum*), pignut (*Conopodium majus*), bugle (*Ajuga reptans*) and early-purple orchid. Many of the wide rides and woodland glades support species-rich chalk grassland including the rare white mullein (*Verbascum lychnitis*). There is an extremely rich butterfly fauna including dingy skipper (*Erynnis tages*), grizzled skipper (*Pyrgus malvae*), green hairstreak (*Callophrys rubi*), duke of burgundy (*Hamearis lucina*), pearl-bordered fritillary (*Boloria euphrosyne*), white admiral and purple emperor and a rare species of moth called the drab looper (*Minoa murinata*). Rewell Wood also supports a good population of dormice (*Muscardinus avellanarius*) and approximately six pairs of nightjar (*Caprimulgus europaeus*) which breed annually.

Table 4.1 Designated Sites

| Site Designation | Site Name | Approx. Distance (km) and Aspect from Scheme Options | | | | | | | | Key habitat type | |
|------------------------|-------------------------------|--|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|------------------|------------------|---|
| | | 0A | 0B &0BA | 1 | 2 | 3 | 4 | 5 & 5A | 5B | | |
| SAC | Singleton and Cocking Tunnels | 14km north-west | 14km north-west | 14km north-west | 14km north-west | 14km north-west | 14km north-west | 14km north-west | 14km north-west | 14km north-west | Man-made structure |
| SAC | The Mens | 15.3km north | 15.3km north | 15.3km north | 15.3km north | 15.3km north | 15.3km north | 15.3km north | 15.3km north | 15.3km north | Woodland / wood pasture |
| SAC | Ebernoe Common | 19.2km north | 19.2km north | 19.2km north | 19.2km north | 19.2km north | 19.2km north | 19.2km north | 19.2km north | 19.2km north | Woodland / wood pasture |
| SAC | Duncton to Bignor Escarpment | 6km north | 6km north | 6km north | 6km north | 6km north | 6km north | 6km north | 6km north | 6km north | Heathland and scrub, broad leaved deciduous woodland. |
| Ramsar site, SAC & SPA | Arun Valley | 6.8km north | 6.8km north | 6.8km north | 6.8km north | 6.8km north | 6.8km north | 6.8km north | 6.8km north | 6.8km north | Inland water bodies, wetland and humid grassland. |
| SSSI | Arundel Park | 2km north-west | 0.5km north | 0.5km north | 1km north | 2km north | 2km north | 0.9km north | 1.0km north | | Chalk grassland and variety of woodland. |
| SSSI | Fairmile Bottom | > 5km north-west | 2.9km north west | 2.9km north west | 2.3km north west | 2km north | 1.5km north | 2km north | 2km north | | Yew woodland, yew scrub and chalk grassland. |
| LWS | Binsted Wood Complex | 2km west | Immediately Adjacent | Immediately Adjacent | Crossed by this option | 0.25km north | | Mixture of ancient woodland and recent woodland. |
| LWS | Poling Copse | 0.4km north east | 0.25km north | 0.25km north | 0.4km north east | 0.4km north east | 0.4km north east | 0.4km north east | 0.5km north east | | A large block of ancient woodland. |
| LWS | Warningcamp Hill and New Down | 2km north east | 1.8km north | 1.8km north | 2km north east | 2km north east | 2km north east | 1.8km north | 1.8km north | | Herb-rich chalk grassland and a small area of ancient, semi-natural woodland. |
| LWS | Rewell Wood Complex | 1.7km north-west | Within or adjacent Option | 0.3km north | | Diversity of habitats including ancient semi-natural woodland, worked Sweet |

| | | | | | | | | | | |
|-----|---|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------------|--|
| | | | | | | | | | | Chestnut coppice, conifer plantation, beech plantation and species-rich chalk grassland. |
| LWS | Arun Valley, Watersfield to Arundel (includes Arundel Wetland Centre) | 0.5 km north-west | 0.4 km north | 0.4 km north | 0.4 km north | 0.5 km north | 0.5 km north | 0.3 km north | 0.3km north | Extensive tract of wetland, wet grassland, network of ditches and unimproved meadows. |

4.2 EXTENDED PHASE 1 HABITAT SURVEY

HABITATS

4.2.1 Eleven Phase 1 Habitat types were identified within the Survey Area (Appendix B). Alpha-numeric codes below cross-refer to the JNCC Phase 1 Habitat Survey habitat classifications²⁴.

SEMI-NATURAL BROAD-LEAVED WOODLAND (A1.1.1)

4.2.2 This woodland type was recorded predominantly west of Arundel town and south of the A27 carriageway. A large proportion of this habitat type was Ancient Woodland Inventory²⁵ (AWI) woodland including a larger complex of woodland made-up of Paines Wood, Ash Piece, Binsted Wood, Stewards Copse, Tortington Common and Winchers Copse. This habitat was also recorded immediately north of the A27 carriageway where it was also AWI woodland in Goblestubbs Copse and the large wooded area named Rewell Wood. A large linear belt of AWI woodland including Screens Wood and The Water Woods is located directly west of Arundel and immediately north of the A27 carriageway where it extends north parallel to the Arundel Wetlands Centre and the A284, eventually connecting to Rewell Woods.

4.2.3 Trees within the woodland parcels south of the A27 carriageway comprised predominantly sweet chestnut (*Castanea sativa*) and hazel (*Corylus avellana*) coppice. Other species recorded included oak (*Quercus sp.*), beech (*Fagus sylvatica*) and silver birch (*Betula pendula*). Dense stands of rhododendron (*Rhododendron sp.*) were recorded particularly within the southern half of Tortington Common. The ground cover comprised sparse parcels of bramble (*Rubus fruticosus*) scrub and bracken (*Pteridium aquilinum*).

4.2.4 Detailed species notes could not be obtained for woodland north of the A27 carriageway including Goblestubbs Copse, Rewell Wood, Screens Wood and The Water Woods due to land access restrictions.

4.2.5 Other smaller parcels of semi-natural broadleaved woodland were recorded immediately adjacent the A27 carriageway and were often connected to larger parcels of AWI woodland. The smaller woodland parcels had a lower diversity tree species and a less diverse structure compared to the larger woodland blocks. The predominant tree species were young and semi-mature sycamore (*Acer pseudoplatanus*), and occasional hornbeam (*Carpinus betulus*), hawthorn (*Crataegus monogyna*) and wild cherry (*Prunus avium*).

4.2.6 Ancient woodland is an irreplaceable habitat and, as such, is considered to be of at least County value.

4.2.7 Non-ancient, semi-natural broadleaved woodland habitat is frequent in this part of West Sussex but all trees hold an intrinsic value due to their potential to support a range of flora and fauna. Non-ancient broad-leaved semi-natural woodland within the Survey Area is considered of Local value.

²⁴ Joint Nature Conservation Committee (2010) Handbook for Phase 1 habitat survey - a technique for environmental audit. JNCC, Peterborough.

²⁵ Spencer, J.W. & Kirby, K.J. (1992). An inventory of ancient woodland for England and Wales. *Biological Conservation*, 67: 77-93

CONIFEROUS PLANTATION WOODLAND (A1.2.2)

- 4.2.8 This woodland type was recorded predominantly west of Arundel, south of the A27 carriageway. The majority of this woodland type was recorded within Tortington Common which is a large area of AWI woodland. In the past, coniferous trees were often planted on ancient woodland sites and although the ancient woodland flora is different to a semi-natural woodland, ancient woodland soils and a seed bank may remain.
- 4.2.9 Trees in the plantation woodland comprised predominantly mature Scot's pine (*Pinus sylvestris*) with hazel, yew (*Taxus baccata*), holly (*Ilex aquifolium*) and gorse (*Ulex europaeus*) forming the understorey.
- 4.2.10 Coniferous plantation woodland habitat is not nationally or locally rare but all trees hold an intrinsic value due to their potential to support a range of flora and fauna. Furthermore, coniferous woodland in the Survey Area formed part of a larger network of AWI woodland extending east towards Arundel and may have the potential to be restored to semi-natural broadleaved ancient woodland if the soil seed bank is still intact. Pending detailed survey information and as part of a precautionary assessment, this habitat type was considered to be of up to County value.

SCATTERED BROADLEAVED TREES (A.3.1)

- 4.2.11 This habitat type was recorded within fields throughout the Survey Area. Nine scattered veteran oak trees were recorded within a field towards the western extent of the Survey Area, directly north of the A27 carriageway, adjacent to Park Farm Road.
- 4.2.12 The majority of scattered broad-leaved trees in the Survey Area were young in age and non-veteran in form. This is a commonplace and widespread habitat in West Sussex and within the Survey Area and is of no more than Local value.
- 4.2.13 In contrast, veteran and ancient scattered broad-leaved trees, including those that could not be surveyed owing to access restrictions are an irreplaceable habitat and as a precaution are assumed to be of up to County value.

DENSE / CONTINUOUS SCRUB (A2.1) & SCATTERED SCRUB (A2.2)

- 4.2.14 This habitat type was recorded throughout the Survey Area, but was predominantly recorded immediately adjacent and running parallel to the A27 carriageway boundary and occasionally along field boundaries, particularly towards the centre and western extent of the Survey Area. Species recorded comprised predominantly bramble, and occasional blackthorn (*Prunus spinosa*).
- 4.2.15 Dense stands of scattered scrub comprising bramble and rhododendron had established within a large clearing within Tortington Common.
- 4.2.16 In general, dense/continuous and scattered scrub is a common habitat throughout Sussex and in England. The majority of this habitat in the Survey Area is likely to be of Site value. Species-rich stands of scrub may occur in areas that could not be accessed and may be of a higher value.

POOR SEMI-IMPROVED GRASSLAND (B6)

- 4.2.17 This habitat type was recorded throughout the Survey Area, but was predominantly recorded along the roadside verges alongside the A27 carriageway and the connecting minor roads.

4.2.18 This habitat type was typified by a mixture of common grasses such as cock's foot (*Dactylis glomerata*), Yorkshire fog (*Holcus lanatus*), meadow foxtail (*Alopecurus pratensis*), false oat grass (*Arrhenatherum elatius*) and perennial rye grass (*Lolium perenne*). Other common plant species recorded included broadleaved dock (*Rumex obtusifolius*), greater plantain (*Plantago major*), ribwort plantain (*Plantago lanceolata*), yarrow (*Achillea millefolium*), common daisy (*Bellis perennis*), creeping buttercup (*Ranunculus repens*) and white clover (*Trifolium repens*).

4.2.19 Poor semi-improved grassland is a commonplace and widely distributed habitat throughout Sussex and in England. It is considered of no more than Site value.

SEMI-IMPROVED NEUTRAL GRASSLAND (B2.2)

4.2.20 This habitat type was recorded throughout the Survey Area, but was predominantly recorded on the floodplains of the River Arun, in fields containing livestock and along arable field margins. Much of this land could not be accessed. However, the location of the fields within the River Arun floodplain, the presence of ditches bordering the fields together with desk study information indicates that the majority of fields immediately east of the River Arun are potentially coastal and floodplain grazing marsh Habitat of Principal Importance (HPI). As part of a precautionary assessment it is assumed that this HPI habitat is present.

4.2.21 An HPI is a priority habitat for conservation in England under Section 41 of the NERC Act. On the precautionary basis that this habitat is present in the Study Area, it would be of up to County value

ARABLE LAND (J1.1)

4.2.22 This habitat type was recorded throughout the Survey Area, but was predominantly recorded towards its western end, north of the A27 carriageway; towards the eastern extent of the Survey Area, south of the A27 carriageway; and towards the centre of the Survey Area between Tortington and the River Arun.

4.2.23 Arable vegetation is typically poor in plant species diversity and is of negligible nature conservation interest; this habitat type was therefore considered to be of no more than Site value. Given access restrictions, it is possible that some arable fields, particularly those over chalk soils, may support rare arable weed species – should this be the case these areas may be of higher value.

INTACT SPECIES-POOR HEDGE (J2.1.2), DEFUNCT SPECIES-POOR HEDGE (J2.2.2) AND SPECIES-POOR HEDGE AND TREES (J2.3.2)

4.2.24 This habitat type was recorded throughout the Survey Area, predominantly forming boundaries to many of the fields and along sections of the A27 Highways England (HE) land boundary. The majority of defunct species-poor hedgerows formed the boundaries to many pastoral fields towards the western extent of the Survey Area, all of which appeared to be gappy and showing various degrees of management, some of which appeared to be intensively managed and some appeared to be unmanaged.

4.2.25 The majority of intact species-poor hedgerows and species-poor hedgerow with trees were towards the centre of the Survey Area south of the A27 carriageway, bordering Ford Road and Tortington Lane.

4.2.26 Hedgerow woody species recorded comprised predominantly hawthorn and elder (*Sambucus nigra*) with occasional bramble and dog rose (*Rosa canina*).

4.2.27 Hedgerows are a Sussex BAP Priority habitat and an HPI. However, hedges are also common and widespread in the South Downs and in Sussex. The extent of this habitat in the Survey Area is likely to be of no more than Local value. However, given access restrictions it cannot be discounted that large lengths of species-rich hedgerow or Important Hedges²⁶ may be present and if so they would be of a higher value.

RUNNING WATER (G2)

4.2.28 Ditches containing running water were recorded throughout the Survey Area, predominantly running parallel to many of the field boundaries and adjacent sections of the A27 carriageway and other adjoining minor roads including Ford Road, Tortington Lane and Priory Lane.

4.2.29 The majority of ditches recorded were narrow and shallow containing slow-flowing water. Surveys were undertaken immediately following protracted periods of heavy rainfall. The majority of the ditches are therefore likely to be dry throughout most of the year.

4.2.30 Directly west of and running parallel to the River Arun is a wide and deep ditch, which included areas of reed swamp and other marginal vegetation indicating that the ditch contains high water levels throughout the year.

4.2.31 The River Arun intersects the Survey Area and flows in a north to south direction and eventually joins the English Channel at Littlehampton, approximately 6km south of Arundel.

4.2.32 There are numerous desk study records of notable aquatic plant and invertebrate species for the Survey Area. In addition, running water habitats including the River Arun and the network of ditches are linked to the persistence of the (assumed) coastal and floodplain grazing marsh HPI habitat in this area. Furthermore, reedbed and fen HPI habitats may be present alongside these watercourses in non-accessible areas. For these reasons, running water is considered to be of up to County value.

STANDING WATER (G1)

4.2.33 Multiple waterbodies were recorded throughout the Survey Area. It was not possible to access the majority of these water bodies due to land access restrictions.

4.2.34 A network of waterbodies was recorded directly west of Arundel Station, immediately south of the A27 carriageway. The waterbodies appeared to be deep with steep sided banks and appeared to be regularly used by anglers.

4.2.35 Other smaller ponds, likely to be ephemeral in nature, were recorded within woodland parcels immediately adjacent the A27 carriageway, and in Winchers Copse and Barn's Copse south of the A27 carriageway.

4.2.36 Ponds hold an intrinsic value for wildlife, such as aquatic invertebrates and amphibians, and ponds are a Sussex BAP Priority habitat and many may qualify as a HPI. As such waterbodies including ponds may be of up to County value, although it is probable that many waterbodies are not of this value because of nutrient enrichment by agriculture, stocking with ornamental fish and/or heavily grazing and disturbance caused by common waterfowl species.

²⁶ Defra (2001). The Hedgerows Regulations 1997: a guide to the law and good practice. HMSO, London.

BUILDINGS AND HARDSTANDING (J.3.6)

- 4.2.37 Hardstanding comprised the A27 carriageway and adjoining minor roads including Ford Road, Tortington Lane, Binstead Lane and Priory Lane. Buildings included residential and commercial developments in the Survey Area. Hardstanding and buildings are of negligible value.

PROTECTED AND NOTABLE SPECIES

- 4.2.38 The Survey Area has the potential to support various protected and notable species. The species records collated during the desk study and habitat assessments undertaken during the Extended Phase 1 Habitat survey are summarised below. No targeted species surveys have been undertaken.

NESTING BIRDS

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.39 The majority of UK bird species are protected under the Wildlife and Countryside Act (1981) as amended. It is illegal to intentionally kill, injure, or take any wild bird, or take or destroy an egg of any wild bird. It is also an offence to damage or destroy the nest of any wild bird (whilst being built, or in use). A number of bird species are also listed as Species of Principle Importance (SPI)²⁷, and/or are Birds of Conservation Concern, Red or Amber List species and Sussex BAP Priority Species.
- 4.2.40 Some bird species have extra protection and are listed in Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). It is illegal to intentionally or recklessly disturb a bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

DESK STUDY

- 4.2.41 The desk study identified 1997 records of 28 bird species protected under the Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). These records included numerous Red List Species and Amber List Species. The majority of desk study records, particularly wetland and reedbed specialists were from the Arundel Wetland Centre (which forms part of Arun Valley, Watersfield to Arundel LWS).
- 4.2.42 Desk study records of farmland specialists such as corn bunting (*Emberiza calandra*) and turtle dove (*Streptopelia turtur*) were present in agricultural land north and south of the A27 carriageway at Arundel. Multiple desk study records of barn owl (*Tyto alba*) were present throughout the study area within or immediately adjacent all Scheme Options.
- 4.2.43 Desk study records of woodland specialists such as the hawfinch (*Coccothraustes coccothraustes*) and lesser spotted woodpecker (*Dendrocopos minor*) were present in Binsted and Paines Wood which is situated within or immediately adjacent all Scheme Options. The common crossbill (*Loxia curvirostra*) was also recorded in Rewells Wood which is situated immediately adjacent to the Scheme Options.

²⁷ Species of Principal Importance are those listed on Section 41 of the Natural Environment and Rural Communities Act, 2006.

FIELD SURVEY

- 4.2.44 No targeted bird field surveys were undertaken. Phase 1 Habitat types and locations with greatest potential to support notable and protected bird species included: ancient woodland within Binsted Wood and Rewell Wood; scrub and hedgerows along field margins particularly directly east and west of the River Arun, and grassland (including reedbeds and coastal and floodplain grazing marsh east and west of the River Arun). It is possible that wet grassland in the Survey Area may support wetland specialists including Bewick's swan for which Arun Valley SPA is designated for. Mature or veteran trees within areas of ancient woodland and scattered within fields or along field boundaries, and old buildings were considered suitable to support nesting barn owl.

PROVISIONAL VALUATION

- 4.2.45 The majority of intensive farmland in the Survey Area is likely to support a common assemblage of birds of no more than Local value. However, ancient woodland at Binsted Wood, Paines Wood and Rewell Wood which are located partly within all Scheme Options may support aggregations of notable or protected species and may be of up to County value.
- 4.2.46 Further surveys in respect of breeding birds will be required in order to determine the presence or likely absence of notable and protected species and to confirm key locations where these species occur, and thus an accurate value of the Scheme Options for breeding birds.

BATS

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.47 All UK bat species are protected under the Conservation of Habitats and Species Regulations (2010) as amended and under the Wildlife and Countryside Act 1981 (as amended). Various bats species are also listed as SPIs. Bats are subject to the same legal protection as outlined for GCN.

DESK STUDY

- 4.2.48 The desk study identified 35 confirmed or likely bat roosts within the study area. The most recent records were from 2015. Desk study records for confirmed or likely bat roosts were identified for five bat species. These were common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*Pipistrellus pygmaeus*), brown long-eared (*Plecotus auritus*), serotine (*Eptesicus serotinus*) and barbastelle (*Barbastella barbastellus*).
- 4.2.49 Bat roost locations were widely distributed within the study area. The majority of bat roost records were from the area around Slindon Common and Slindon Wood approximately 1km west of the Survey Area. Common pipistrelle roosts were also found around Arundel Castle approximately 0.4km north of the Survey Area. Barbastelle roosts were recorded within Poling Copse and Slindon Common / Wood, approximately 1km east and west of the Survey Area respectively.

FIELD SURVEY

- 4.2.50 No targeted bat field surveys were undertaken. The habitats present within the Survey Area, particularly woodland edges and to a limited extent hedgerows and ditches were considered to provide suitable foraging and commuting opportunities for bats.

- 4.2.51 Ancient woodland at the western end of the Survey Area including Paines Wood, Ash Piece, Binsted Wood, Stewards Copse, Tortington Common, Winchers Copse, Singers Piece, Goblestubbs Copse and Rewell Wood is likely to contain numerous mature and veteran trees which could support a significant bat roost. A field towards the western end of the Survey Area contained multiple scattered veteran oak trees which had high bat roost potential. Barbastelle is a rare bat species known from desk study information to be present in the study area. This species is associated with mature trees and woodland edges which may occur in the Survey Area. It is possible that other uncommon woodland bat species may also be present in the Survey Area given the large area of AWI woodland present.
- 4.2.52 A number of buildings within the Survey Area including the White Swan Inn and the Arundel Cricket Pavilion exhibited features which are likely to support a bat roost. Numerous other buildings in the Survey Area which could not be viewed owing to access may also have high bat roost potential.
- 4.2.53 In addition, areas of ancient woodland and the network of hedgerows and ditches within the Survey Area were considered to provide likely significant foraging opportunities for bats, and commuting routes linking potential roosting sites and foraging grounds.
- 4.2.54 The diverse range of habitats present in the Survey Area and particularly: large expanses of ancient woodland; veteran and ancient trees; wetlands; and old buildings collectively have high potential to support a bat population of conservation significance.

PROVISIONAL VALUATION

- 4.2.55 Small bat roosts of common species, if present, are likely to be of up to Local value. Large, maternity roosts of rare species such as barbastelle, if present, are likely to be of at least County value. The landscape of hedgerows, wetlands and ancient woodland has the potential to support a bat population of high nature conservation importance including rare and uncommon species which may be of above County value.

Further surveys and detailed roost confirmation and activity surveys will be required in order to determine the presence or likely absence of rare species, and thus an accurate value of the bat population in the Survey Area.

BADGERS

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.56 Badgers are protected under the Protection of Badgers Act 1992. It is illegal to wilfully take, kill, injure or ill-treat a badger, or possess a dead badger or any part of a badger. Under the Act their setts are also protected against obstruction, destruction, or damage in any part.

DESK STUDY

- 4.2.57 No records were provided as part of the desk study.

FIELD SURVEY

- 4.2.58 No evidence of badger field signs (hairs, latrines, dung pits, snuffle holes, mammal paths or scratching posts) or setts were recorded during the survey. However a thorough walkover of the Survey Area was not possible due to land access restrictions. Therefore badger evidence including setts potentially present within the Survey Area may have been missed during the survey.

4.2.59 The habitats present within the Survey Area including woodland, scrub, hedgerows and grassland were considered to provide suitable foraging opportunities for badgers. The woodland habitats in particular were considered to provide suitable sett building opportunities.

4.2.60 It is therefore considered highly likely that badgers, including their setts, occur within the Survey Area.

PROVISIONAL VALUATION

4.2.61 Badgers are common and widespread in West Sussex²⁸ and in England and are therefore highly likely to be present within the Survey Area. The population of badger in the Survey Area is unlikely to be of more than Local value.

Further survey in respect of badgers will be required in order to determine the presence or likely absence, and thus an accurate valuation for this species.

DORMICE

LEGAL PROTECTION / CONSERVATION STATUS

4.2.62 Dormice (*Muscardinus avellanarius*) are protected under the Conservation of Habitats and Species Regulations (2010) as amended and under the Wildlife and Countryside Act (1981) as amended. Dormice are also listed as an SPI. Dormouse is subject to the same legal protection as outlined for GCN and bats.

DESK STUDY

4.2.63 The desk study identified 488 dormouse records within the study area. The most recent records were from 2014. The majority of records were from Paines Wood, Ash Piece and Rewell Wood which form large areas of ancient woodland towards the western extent of the Survey Area.

FIELD SURVEY

4.2.64 No targeted dormouse field surveys were undertaken. The ancient woodland towards the western extent of the Survey Area, north and south of the A27 carriageway including Paines Wood, Ash Piece, Binsted Wood, Stewards Copse, Tortington Common, Winchers Copse, Singers Piece, Goblestubbs Copse and Rewell Wood were considered to provide suitable breeding, foraging, shelter and hibernating opportunities for dormice. The Survey Area comprised an extensive hedgerow network. However the majority of hedgerows appeared very gappy with limited commuting opportunities. Occasional hedgerows including those adjacent to Ford Road and Tortington Lane exhibited fewer gaps and were considered to provide suitable foraging and commuting opportunities. Given the presence of recent desk study records, it is highly likely that dormice occur within the Survey Area.

²⁸ National Biodiversity Network Gateway (2016). [online] <https://data.nbn.org.uk/> accessed January 2016)

PROVISIONAL VALUATION

- 4.2.65 Following a precautionary approach, it is likely that a large population of hazel dormouse occurs in the Survey Area. Dormouse is nationally rare²⁹ but relatively widespread in Sussex and thus dormouse populations in the Survey Area are likely to be of Local value. If a very large population were present in the large ancient woodlands which are present in the Survey Area this may be of a higher value as it may act as a core population area increasing the resilience and viability of more marginal dormouse habitats in the vicinity.

Further dormouse surveys will be required in order to determine the presence or likely absence of this species and, if present, its population size and likely value.

OTTER

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.66 Otters (*Lutra lutra*) are protected under the Conservation of Habitats and Species Regulations (2010) as amended and under the Wildlife and Countryside Act (1981) as amended. Otters are also listed as an SPI and a UK / Sussex BAP Priority Species. It is subject to the same legal protection as GCN, bats and dormouse.

DESK STUDY

- 4.2.67 No records were provided as part of the desk study.

FIELD SURVEY

- 4.2.68 No targeted otter field surveys were undertaken. The River Arun and the large ditch that runs parallel to the River Arun were considered to provide suitable foraging and commuting opportunities for otters. Use of the river by otters may be limited due to the lack of sheltering opportunities – few old trees, little concealing habitat and sparse vegetation cover was noted along most of the river corridor. The complex network of ditches bordering many of the surrounding fields and waterbodies across the Survey Area is likely to provide extensive and high quality foraging and commuting opportunities for otter.

²⁹ PTES (2016). The Peoples Trust for Endangered Species Hazel Dormouse [online] <https://ptes.org/get-informed/facts-figures/hazel-common-dormouse-musccardinus-avellanarius> (accessed January 2016)

PROVISIONAL VALUATION

- 4.2.69 Otter is a wide ranging species and is known to be increasing in population nationally³⁰. The land encompassed in the Survey Area would be likely to support a small number of otter territories given their wide ranging behaviour³¹. On the basis of these factors the assumed otter population in the Survey Area is likely to be of up to Local value. However, if one or more breeding holts were confirmed or the Survey Area is proven to facilitate otter movement along the Arun Valley, the otter population could be valued at a higher level.
- 4.2.70 Further surveys in respect of otters will be required in order to determine the presence or likely absence, and thus an accurate value of the Scheme Options for otters.

WATER VOLE

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.71 Water voles (*Arvicola amphibius*) are protected under the Wildlife and Countryside Act (1981) as amended, and are also listed as an SPI and a UK / Sussex BAP Priority Species.
- 4.2.72 It is illegal to possess, control or sell water voles or to intentionally kill, injure or take water voles. It is also an offence to intentionally or recklessly damage, destroy or obstruct access to a place that water voles use for shelter or protection or disturb water voles whilst using such a place.

DESK STUDY

- 4.2.73 The desk study identified 1382 water vole records within the study area. The most recent record is from 2015. The majority of the records were from Arundel Wetland Centre approximately 2.0km north of the Survey Area. There were also several records from a variety of streams and ditches towards Poling approximately 1.5km east of the Survey Area.

FIELD SURVEY

- 4.2.74 No targeted water vole field surveys were undertaken. Running water and standing water habitats within the Survey Area including occasional ditches along many of the field boundaries and the scattered ponds recorded throughout the Survey Area were considered to provide suitable foraging and burrowing opportunities for water vole.
- 4.2.75 Occasional ditches, particularly those demarcating field boundaries to the east and west of Tortington were considered to provide some moderate foraging and burrowing opportunities for water voles. A number of ditches surrounding Tortington could not be accessed but may have suitable habitat for water vole.
- 4.2.76 However, the majority of ponds and ditches were considered likely to be ephemeral, drying up for most of the year. In addition, many ditches particularly those running parallel to the A27 carriageway were considered to provide very limited foraging opportunities given the absence of suitable aquatic and marginal vegetation.

³⁰ PTES (2016). The Peoples Trust for Endangered Species Hazel Dormouse [online] <https://ptes.org/get-informed/facts-figures/otter/> (accessed January 2016)

³¹ Chanin P (2003). Ecology of the European Otter. Conserving Natura 2000 Rivers Ecology Series No. 10. English Nature, Peterborough.

PROVISIONAL VALUATION

- 4.2.77 Water vole is a rare and declining mammal in England³². Should a population of water vole be present within the Survey Area, and given the large amount of potentially suitable water vole habitat this may be of at least County vale.
- 4.2.78 Further surveys in respect of water voles will be required in order to determine the presence or likely absence, and thus derive an accurate valuation.

GREAT CRESTED NEWT

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.79 Great crested newt (*Triturus cristatus*) (GCN) is protected under the Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). GCN is also an SPI and a Sussex BAP Priority Species.
- 4.2.80 It is illegal to deliberately capture, injure or kill GCN, to intentionally or recklessly disturb them, or to deliberately take or destroy their eggs. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by a GCN. All life stages of GCN are afforded the same level of protection.

DESK STUDY

- 4.2.81 The desk study identified multiple GCN records clustered around three locations in the Study Area. All records also indicated evidence of breeding activity (e.g. eggs and young). The most recent records were from 2013. The desk study also identified multiple records of palmate newt (*Triturus helveticus*), smooth newt (*Triturus Lissotriton*), common frog (*Rana temporaria*) and common toad (*Bufo bufo*) throughout the study area.
- 4.2.82 The records were either from ditches surrounding fields near the village of Poling approximately 1.2km east of the Scheme Options or from a pond near Walberton approximately 1.0km south west of the Scheme Options.

FIELD SURVEY

- 4.2.83 No presence/likely absence surveys for GCN were undertaken. The terrestrial habitats present throughout the Survey Area and near all Scheme Options, including woodland, scrub and hedgerows, provide suitable shelter, foraging and hibernating opportunities for GCN.
- 4.2.84 The network of waterbodies directly west of Arundel Station, immediately south of the A27 carriageway are likely to be sub-optimal for GCN given their use for commercial angling.
- 4.2.85 Other smaller ponds, likely to be ephemeral in nature, were recorded within woodland parcels immediately adjacent the A27 carriageway, and in Winchers Copse and Barn's Copse south of the A27 carriageway. These were considered to provide foraging and breeding opportunities for GCN.

³² IUCN (2008). The IUCN Red List of Threatened Species Arvicola amphibius [online]
<http://www.iucnredlist.org/details/2149/0> (accessed January 2016)

- 4.2.86 Considering access restrictions all standing water habitat present within the Survey Area and near to all Scheme Options may hold the potential to support GCN.

PROVISIONAL VALUATION

- 4.2.87 Following a precautionary approach, and given that GCN are widespread in West Sussex, the GCN population in the Survey Area and in close proximity to all Scheme Options is to be of Local value. However, if large meta-populations of GCN are found in the Study Area these may be of up to County value.
- 4.2.88 Further detailed habitat assessment and possible presence/absence surveys for GCN will be required in order to determine an accurate value for this receptor.

REPTILES

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.89 The four common native reptiles: grass snake (*Natrix natrix*), common lizard (*Zootoca vivipara*), slow worm (*Anguis fragilis*), and adder (*Vipera berus*) are partially protected under the Wildlife and Countryside Act 1981 (as amended). Under this legislation it is illegal to intentionally kill or injure a reptile. The four widespread reptile species are also SPIs.
- 4.2.90 Other UK reptile species namely smooth snakes (*Coronella austriaca*) and sand lizards (*Lacerta agilis*) have additional protection under the Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife & Countryside Act 1981 (as amended). The known distribution of these species does not overlap with the study area.

DESK STUDY

- 4.2.91 The desk study identified 87 reptile records within the study area, comprising all four widespread native reptiles including; slow worm, common lizard, grass snake and adder. The most recent records were from 2014.
- 4.2.92 The majority of records were near the River Arun near the town of Littlehampton approximately 2km south of the Survey Area. The nearest records comprising all widespread native reptile species were in Rewell Wood, Binsted Wood and Paines Wood situated within or immediately adjacent to all Scheme Options.

FIELD SURVEY

- 4.2.93 No targeted reptile surveys were undertaken. The habitats present within the Survey Area, including woodland and associated glades and rides, scrub, hedgerows and grassland were considered to provide suitable foraging, basking, shelter and hibernating opportunities for reptiles. It is therefore considered highly likely that reptiles occur within the Survey Area. Woodland glades within Binsted Wood, and areas of rough grassland, ditches and hedgerows bordering fields east and west of the River Arun in particular were considered to be of high potential for reptiles.

PROVISIONAL VALUATION

- 4.2.94 Suitable habitats with the potential to support widespread reptile species are likely to be frequent and widespread throughout the Study Area. Those habitats such as rough grassland verges and arable field edges are unlikely to be of more than local value because they are commonplace habitat types in the Survey Area and are only likely to support small populations of reptiles. However, high quality reptile habitats, potentially supporting large reptile populations may be present at a few key locations. If large populations of several species of reptile are present these may be of up to County value. Further reptile surveys will be required in order to determine their presence or likely absence, reptile species diversity and population sizes, before an accurate baseline valuation can be completed.

INVERTEBRATES

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.95 A number of invertebrate species are protected from killing or injury under the Wildlife & Countryside Act (1981) as amended. A number of invertebrate species are also listed as SPIs, and/or are IUCN Red List species and Sussex BAP Priority Species including the duke of burgundy and stag beetle.

DESK STUDY

- 4.2.96 The desk study identified over 1000 invertebrate records comprising 405 species. These records comprised four beetle species, 122 moth species, 272 butterfly species, two true fly species and five hymenopteran species.
- 4.2.97 The majority of records were from Arundel Wetland Centre³³; Fairmile Bottom SSSI; Wykehurst Park Grounds, Rewell Wood Complex LWS and Binsted Wood Complex LWS which intersect or immediately border the Scheme Options.
- 4.2.98 Three invertebrate species listed under Schedule 5 of the Wildlife & Countryside Act (1981) as amended have been previously recorded within study area. These species were the brown hairstreak (*Thecla betulae*) butterfly, stag beetle (*Lucanus cervus*) and a large number of pearl-bordered fritillary butterfly records within Rewell Wood Complex LWS.
- 4.2.99 Five IUCN Red List species were also recorded within the study area, many of which were within Rewell Wood Complex LWS: the grizzled skipper, dingy skipper, the white admiral and the small heath (*Coenonympha pamphilus*) butterflies, and the phantom hoverfly (*Doros profuges*).

FIELD SURVEY

- 4.2.100 No field surveys for invertebrates were undertaken. However, notable invertebrates species recorded in the desk study are likely to be associated with the following Phase 1 Habitat types: broad-leaved semi-natural (ancient) woodland, semi-improved grassland (particularly that which is of floodplain grazing marsh HPI quality) and running and standing water. Given the extensive nature of these habitats it is probable that a range of protected and notable invertebrate species occur within the Survey Area.

³³ Wildfowl and Wetlands Trust (WWT) Reserve

PROVISIONAL VALUATION

- 4.2.101 Following a precautionary approach, given the number of desk study records of protected and notable invertebrate species including those in within Rewell Wood Complex LWS, wetland and (assumed) floodplain grazing marsh HPI habitats which are located either within or immediately adjacent all Scheme Options, invertebrates are considered to be of up to County value. Invertebrate communities present in arable, poor semi-improved grassland and other Phase 1 Habitats types are unlikely to exceed Local value.
- 4.2.102 Further detailed surveys of key habitats likely to support notable or protected invertebrates species will be required in order to fully evaluate invertebrate communities that may be present. These surveys should be undertaken when a more refined scheme design is available.

OTHER PROTECTED AND NOTABLE SPECIES

WHITE CLAWED CRAYFISH

LEGAL PROTECTION / CONSERVATION STATUS

- 4.2.103 The white-clawed crayfish (*Austropotomobius pallipes*) is protected under the Conservation of Habitats and Species Regulations 2010 (as amended) and under the Wildlife and Countryside Act 1981 (as amended). White clawed crayfish is an SPI.

DESK STUDY

- 4.2.104 No desk study records were supplied by Sussex Biological Records Centre for this species.

FIELD SURVEY

- 4.2.105 Ditches that contain water all year round and ponds throughout the Survey Area were considered to provide suitable foraging opportunities and breeding conditions for white clawed crayfish. Such water bodies occur near to all Scheme Options. Given the absence of desk study records, and information suggesting that the species is locally extinct in West Sussex³⁴, white clawed crayfish is considered unlikely to be present within the Study Area. That said, without detailed access to assess individual water bodies there remains a small possibility that isolated populations could remain. If present (although highly unlikely), a viable population of white-clawed crayfish would be of up to County value.
- 4.2.106 Further desk study information from the Environment Agency and targeted habitat assessment work should be undertaken to identify the potential for this species to occur in the Survey Area.

³⁴ IUCN (2010). The IUCN Red List of Threatened Species *Austropotomobius pallipes* [online] Natural England (2015). [online] <http://www.iucnredlist.org/details/2430/0> (accessed January 2016)

HEDGEHOG, BROWN HARE AND HARVEST MOUSE

DESK STUDY

- 4.2.107 The desk study identified multiple records of hedgehog (*Erinaceus europaeus*), brown hare (*Lepus europaeus*) and harvest mouse (*Micromys minutus*) throughout the study area, particularly in Binsted Wood, Paines Wood and Rewells Wood which intersect or immediately border all Scheme Options. Hedgehog, brown hare and harvest mouse are all SPIs. The brown hare is a Sussex BAP Priority Species.

FIELD SURVEY

- 4.2.108 The habitats present within the Survey Area, particularly woodland and arable farmland and to some extent hedgerows and grassland were considered to provide suitable breeding shelter, foraging and commuting opportunities for these species.

PROVISIONAL VALUATION

- 4.2.109 Following a precautionary approach, populations of these species may be of up to County value if present in large numbers.

5

DISCUSSION AND RECOMMENDATIONS

5.1 GENERAL RECOMMENDATIONS

5.1.1

At this stage of the assessment process and without information from detailed surveys or detailed design, only broad recommendations of likely mitigation requirements are possible. Further surveys would be necessary at more detailed stages of design to confirm the exact mitigation requirements necessary for individual Scheme Options and to address specific impacts. In broad terms the following hierarchical approach to mitigation should be adopted – this approach is strongly supported by guidance in the DMRB and national planning policy³⁵:

- Firstly, measures to avoid adverse ecological impacts (for example, the re-siting of construction compounds, or adjustments in road alignment, etc.) should be exhausted;
- Where an adverse impact cannot be avoided, options to ameliorate or reduce an adverse impact should be implemented (e.g. erection of barriers or bunds to reduce noise and vibration; use of Sustainable Drainage Systems to regulate water flows);
- As a last resort, measures that compensate for the loss of the particular ecological resource that is affected should be considered. For example, like-for-like replacement of lost habitats;
- Compensation approaches may include enhancement of existing habitats by improved management and long-term monitoring.

5.1.2

General mitigation measures, falling into one or more of the above categories, which would help to reduce the magnitude and significance of potential construction and operational impacts are³⁶:

- Correct timing of works to avoid key periods for particular species, such as avoidance of the bird breeding season for habitat clearance;
- Habitat creation: either through the translocation of existing habitats or seed banks; the enhancement of existing habitat; and / or the planting of new habitat;
- Translocation and / or exclusion of species (under appropriate licences / agreements) where required from the Scheme Option footprint to pre-prepared receptor sites to minimise impacts of habitat loss and species mortality;
- Appropriate design and use of lighting to minimise impacts on bats and other light sensitive species;
- Re-establishing connectivity between habitats affected by road construction and incorporation of features within the detailed design which would restore connectivity for protected species whose habitat has been fragmented by the road;
- The use of screening during construction to minimise the spread of noise, dust, lighting, etc. and the use of fencing to temporarily exclude species by restricting access into particular areas (such as reptile exclusion fencing);

³⁵ National Planning Policy Framework (2012). *Communities and Local Government*.

³⁶ The following measures only constitute the proposed generic mitigation. At this stage it is not possible to determine detailed mitigation methods.

- Appropriate landscaping and re-landscaping of all new roadside verges and disturbed habitat specifically for species known to be present in the area (where suitable for network and safety priorities). All landscaping should use species of local provenance;
- Installation of surface water run-off attenuation and treatment features to ensure water discharged to watercourses would not compromise the conservation value of the watercourse or the species that live within it; and
- Implementation of general construction environmental best practice. This could include, but is not limited to, providing tool box talks for construction staff informing them of key ecological constraints within the area, the damping of haul routes to minimise the spread of dust, the use of drip trays and spill kits when refuelling vehicles and ensuring that open trenches are not left over night without safe means of egress for animals that may fall into them.

5.2 DESIGNATED SITES

STATUTORY DESIGNATED SITES

5.2.1 An Assessment of Impacts on European Sites (AIES) following DMRB guidance³⁷ is required. The closest international statutory designated sites are Arun Valley SAC, SPA and Ramsar site which are approximately 6.8km north of the Scheme Options, and Duncton to Bignor Escarpment SAC approximately 6km north of the Scheme Options. Indirect impacts and effects on the ecological integrity of these international statutory designated sites, particularly habitat degradation (for example, dust deposition and air quality impacts) are not considered likely for any of the Scheme Options primarily because these European Sites are too distant for indirect impacts to be adverse. Arun Valley Ramsar site, SAC and SPA are immediately adjacent the River Arun which crosses the Survey Area. However this European site is located upriver from all Scheme Options and therefore indirect impacts and effects, particularly habitat degradation associated with pollution run-off are not anticipated. Although unlikely, the AIES has not been able to discount the possibility of the following impacts at this preliminary assessment stage: obstruction or disturbance of bird flight lines along the River Arun to the Arun Valley SPA and Ramsar site caused by bridge or viaduct construction. In addition, wetland habitat in the Survey Area is supporting habitat for waterfowl using the Arun Valley SPA and Ramsar site. Further survey work and consideration of detailed design information will be required to conclude upon these potential impacts.

5.2.2 Following guidance set-out in the DMRB, indirect impacts on SACs with bat qualifying features that are within 30km of a road scheme should be considered. Three such SACs are present in 30km of the Survey Area: Ebernoe Common SAC; The Mens SAC; and Singleton and Cocking Tunnel SAC. Given the distance of these SACs from all proposed Scheme Options and the wide availability of suitable foraging, commuting and roosting opportunities closer to these SACs than in the vicinity of any Scheme Option indirect impacts are unlikely. However, in the absence of detailed design information it is not possible to definitively conclude that there will be no 'likely significant effects' on the ecological integrity of these European Sites. This is because (although unlikely) it may be possible that there are Bechstein's bats or barbastelle bat populations in the vicinity of the Survey Area which may be of supporting value to these SACs. Further analysis of this impact will be required when detailed bat survey data is available.

³⁷ DMRB (1993). Design manual for roads and bridges (DMRB). DMRB Volume 11 Environmental assessment.

5.2.3 The Scheme Options are not situated within or immediately adjacent to any SSSIs or NNRs, the nearest such site is Arundel Park SSSI which is approximately 500m north of Option 0B, 0BA and 1; and approximately 1-2km north of Options 0A, 2, 3, 4, 5 and 5A. On the basis of proximity, direct impacts and effects are not anticipated on any statutory designated site. The DMRB does not require consideration of air quality impacts for any sites located greater than 200m from a proposed road scheme nor are there any hydrological links between SSSIs and NNRs and any Scheme Option. It is anticipated that indirect construction impacts such as dust, noise, vibration and temporary lighting will dissipate a short distance from all Scheme Options and thus adverse effects on a national statutory designated site are unlikely. No potential indirect effects on these sites have been reported in the provisional assessments reported in Chapter 5 – Air quality; Chapter 11 – Noise and vibration; or Chapter 14 – Road Drainage and the Water Environment. This assessment will need to be reviewed and updated when detailed construction methods are available and a preferred Scheme Option is selected.

NON STATUTORY DESIGNATED SITES

5.2.4 All Scheme Options except for Option 0A are situated within or immediately adjacent to non-statutory designated sites. There is potential for both direct and indirect impacts on five LWSs. The level of impact on non-statutory designated sites varies between the Scheme Options.

SCHEME OPTION 0A

5.2.5 The nearest non-statutory designated site to this Scheme Option is Poling Copse LWS which is approximately 400m to the north-east. On the basis of preliminary scheme design information no direct impacts are anticipated on this site. Furthermore given the proximity, no indirect adverse impacts on the site are anticipated.

SCHEME OPTION 0B, 0BA & 1

5.2.6 Binsted Wood Complex LWS is located immediately south of the Scheme Options and Rewell Wood Complex LWS is immediately north of the Scheme Options. The widening of the existing A27 carriageway to a dual carriageway proposed as part of this Scheme Option is likely to result in the permanent loss of a narrow belt of ancient woodland habitat along the northern edge of Binsted Wood Complex LWS and southern edge of Rewell Wood Complex LWS totalling approximately 2ha. This impact would be likely to compromise the ecological integrity of both LWSs and result in a significantly adverse effect at the County level.

SCHEME OPTION 2

5.2.7 Binsted Wood Complex LWS is located partly within Option 2. Option 2 is an off-line route from the existing A27 alignment joining Tortington Lane. It is likely to result in the permanent loss of a small area of the north-east corner of Binsted Wood Complex LWS. In addition, the widening of Tortington Lane would also likely result in the permanent loss of habitat towards the western edge of Binsted Wood Complex LWS. Collectively approximately 2ha of this LWS would be removed. This impact would be likely to compromise the ecological integrity of the LWS resulting in a significantly adverse effect at the County level.

SCHEME OPTION 3

5.2.8 Binsted Wood Complex LWS is located partly within Option 3. Option 3 is an off-line route from the existing A27 alignment which continues in a south east direction through the centre of Binsted Wood Complex LWS. Collectively approximately 4ha of this LWS would be removed. This magnitude of loss would be likely to lead to a significantly adverse impact on this LWS at the County level.

SCHEME OPTION 4

- 5.2.9 Binsted Wood Complex LWS is located partly within Option 4. Option 4 is an off-line route from the existing A27 alignment which commences further west and circumnavigates the majority of Binsted Wood Complex LWS. This Option would likely result in the permanent loss of approximately 2ha of ancient woodland towards the north-west corner of Binsted Wood Complex LWS. This magnitude of habitat loss would be likely to affect the integrity of this LWS. It would be a significantly adverse effect at the County level.

SCHEME OPTION 5 & 5A

- 5.2.10 Binsted Wood Complex LWS is located partly within Options 5 and 5A. Options 5 and 5A are off-line routes which circumnavigate the majority of Binsted Wood Complex LWS (similar to Option 4). This would likely result in the permanent loss of approximately 2ha of ancient woodland habitat towards the north-west corner of Binsted Wood Complex LWS. Overall, up to a moderate adverse impact from Option 5 and 5A is anticipated on the ecological integrity of this LWS.

SCHEME OPTION 5B

- 5.2.1 Binsted Wood Complex LWS is located approximately 0.25 km north of Binsted Wood Complex LWS. No habitat loss would occur from Binsted Wood Complex as a result of construction of Scheme Option 5B. It is also unlikely that construction or operation of Scheme Option 5B would result in air quality impacts on Binsted Wood Complex LWS for reasons already outlined. However, Option 5B crosses a small stream which drains Binsted Wood Complex LWS near to Meadow Lodge. Although Option 5B is downstream of Binsted Wood Complex LWS potential adverse hydrological impacts on the LWS cannot be ruled out without detailed design information. These aquatic impacts may be adverse and significant at up to the County level.

5.3 HABITATS

WOODLAND AND SCRUB

- 5.3.1 All Scheme Options (except Option 0A) would result in the permanent loss of ancient woodland comprising both semi-natural broadleaved woodland and coniferous plantation AWI types. These potential habitat losses are the same as those reported under non-statutory sites.
- 5.3.2 The conservation status of ancient woodland is dependent on maintaining, amongst other things, its extent and species composition and connectivity to similar habitat. As ancient woodland cannot be fully recreated the loss would remain a permanent adverse effect that is significant at the County level.
- 5.3.3 The loss of ancient woodland from Binsted Wood Complex LWS and Rewell Wood Complex LWS already reported in the 'Non-Statutory Designated Sites' section above would be likely to compromise the conservation status of ancient woodland as a habitat type which is likely to result in significantly adverse impact at the County level.
- 5.3.4 All Scheme Options would also be likely to result in the permanent loss of small and narrow areas of semi-natural broadleaved woodland bordering the A27 carriageway. Loss of relatively small areas of semi-natural broad-leaved woodland associated with any Scheme Option is unlikely to affect the conservation status of this habitat type and is unlikely to result in an adverse impact above the Local level which would be unlikely to be a significant effect.

5.3.5 All Scheme Options would also likely result in the permanent loss of dense and scattered scrub, particularly bordering the A27 carriageway. Scrub is a common and widespread habitat type throughout the Survey Area and wider surroundings. Loss of relatively small areas of scrub associated with any Scheme Option is unlikely to affect the conservation status of this habitat type and is unlikely to result in an adverse impact above the Site level which would be unlikely to be a significant effect.

HEDGEROW

5.3.6 All Scheme Options would result in the permanent loss of hedgerow habitat both bordering the A27 carriageway and forming field boundaries which are crossed by different Scheme Options. However, significantly longer lengths of hedgerow would be lost as part of Options 2, 3, 4, 5 and 5A. Loss of this hedgerow habitat associated with all Scheme Options could potentially affect the ecological integrity and function of the hedgerow network as a wildlife corridor. This would be likely to result in an adverse impact of at least Local level which would be likely to be a significant effect.

GRASSLAND

5.3.7 All Scheme Options, in particularly Options 0B, 0BA and 1 would result in the permanent loss of species-poor grassland habitat predominantly recorded along the A27's existing carriageway verges. Poor semi-improved grassland is a common and widespread habitat type throughout the Survey Area and wider surroundings. Loss of this habitat type associated with any Scheme Option is unlikely to affect the conservation status of this habitat type and is unlikely to result in an adverse impact above the Site level which would be unlikely to be a significant effect.

5.3.8 All Scheme Options (except Option 0A & 0B) would result in the permanent loss of semi-improved neutral grassland habitat, which was assumed to be present in pasture fields and along arable field margins within the Survey Area. This habitat type potentially includes coastal and floodplain grazing marshes which is a HPI. HPis are nationally declining habitat types which the Government has identified as priorities for conservation. Loss of HPI grassland may affect the conservation status of this habitat type and is likely to result in an adverse impact at up to the County level which would be likely to be a significant effect.

WATERCOURSES

5.3.9 Scheme Options 2, 3, 4, 5 and 5A all require a new bridge to be constructed across the River Arun. This is likely to lead to permanent loss of riparian vegetation and potentially also adverse impacts on in stream morphology and hydrology. No detailed scheme design information is available but such a bridge may also require flood protection measures both up and down stream, further affecting the hydrology and morphology of the watercourse. This is likely to lead to a significantly adverse effect on the conservation status of river habitat in the River Arun. However, it is not possible to conclude at what geographic level this effect would be significant without detailed scheme design information including hydrological modelling.

WATERBODIES

5.3.10 All Scheme Options (except Option 0A) could result in the permanent loss of both dry and wet ditches which were recorded running parallel to the A27 carriageway and adjoining minor roads and along many field boundaries within the wider farming landscape. In the absence of detailed survey information it is assumed that this habitat type is of high ecological interest and, therefore, its loss associated with any Scheme Option, may compromise the conservation status of this habitat type. Furthermore, the removal of this habitat type could potentially have knock-on hydrological effects to adjacent habitat types particularly areas of coastal and floodplain grazing marsh HPI. This impact would likely result in an adverse impact which may be significant at up to the County level.

OTHER HABITATS

- 5.3.11 Potential losses of all other Phase 1 Habitat types associated with the scheme would be unlikely to lead to an adverse effect above the Site level which would not be likely to result in a significant effect. Such habitats include arable, improved grassland and standing which are of low or negligible nature conservation interest as plant habitats

5.4 PROTECTED AND NOTABLE SPECIES

- 5.4.1 The following protected and notable species are considered highly unlikely to be directly or indirectly adversely impacted by the proposed development and are not considered further: badgers, dormice and invertebrates.

- 5.4.2 However the following protected and notable species were considered potentially present within the Site or immediate surroundings: nesting birds, commuting and foraging bats, GCN, reptiles, water vole and otter. These species are therefore considered to have potential to place ecological constraints on the proposed development and are discussed below.

NESTING BIRDS

- 5.4.3 Loss of breeding and foraging habitats for commonplace bird species and losses of bird habitat associated with Options 0A and 0B are only likely to be adverse at the Site level which would not be significant. This is because of the common and widespread nature of such species and/or the relatively small areas of habitat affected.

- 5.4.4 All other Scheme Options would likely result in the permanent loss of habitats that are potentially utilised by protected and notable breeding birds. Habitats identified as being of greatest potential importance for these bird species include ancient woodland within Binsted Wood Complex LWS and Rewell Wood Complex LWS and grassland and wetland habitats near to the River Arun. It is probable that loss of habitat in these areas will result in a significantly adverse effect on breeding bird conservation status, however, the geographical level at which such an effect would be significant will depend on what species are affected. Option 3 would likely result in an adverse effect significant at the County level given the loss of ancient woodland. Other Scheme Options may result in an effect which would be significant at up to the County level.

- 5.4.5 It is recommended that any vegetation clearance works required take place outside of the bird breeding season (March-August)³⁸. If this is not possible, then a suitably qualified ecologist must be present onsite to supervise vegetation clearance and check for nesting birds. If a nest is discovered, the ecologist will mark a 5 meter buffer zone around the nest which must be avoided until the ecologist advises that the nest is no longer in use.

BATS

- 5.4.6 Loss of foraging and roosting habitats for bats associated with Options 0A and 0B are likely to be relatively small. However, if roosts of rare species are affected this may compromise bat conservation status resulting in a significantly adverse effect at up to the County level.

³⁸ RSPB (2010) *Wild Birds and the Law England and Wales- A Plain Guide to Bird Protection Today* [online] Available at: https://www.rspb.org.uk/Images/WBATL_tcm9-132998.pdf Accessed March 2016

- 5.4.7 All other Scheme Options would likely result in the permanent loss of relatively large areas of bats roosting, commuting and foraging habitat. Habitats identified of highest potential importance for bats include ancient woodland within Binsted Wood Complex LWS and Rewell Wood Complex LWS and wetland and grassland habitat close to the River Arun. Mature trees and old buildings affected by these Scheme Options may also support a roost of a rare bat species which would be of high conservation value.
- 5.4.8 It is probable that losses of potential foraging and commuting habitat and loss of potential roosts associated with all Scheme Options (excluding 0A and 0B) will result in a significantly adverse effect which may compromise bat population conservation status. However, the geographic level at which such an effect would be significant is likely to vary markedly between different schemes and for different species and to this end it is difficult to provide a generalised assessment without detailed survey data. For example, if particularly rare bat species is present in areas of ancient woodland, the loss of this habitat and fragmentation of bat populations may result in an impact that would be significant above the County level. For losses of smaller areas of habitat affecting more commonplace species this may result in effects that are significantly adverse at no more than the Local level.
- 5.4.9 Recent studies by Leeds University have shown that lighting and noise and vibration associated with operational road schemes and physical severance of bat habitat caused by expanses of roadway may lead to negative effects on bat populations either side of a road. These impacts may also be significantly adverse and would be of highest magnitude if one of the operational schemes were to pass through semi-natural habitat such as the ancient woodland in Binsted Wood Complex LWS, Rewell Wood Complex LWS and along the River Arun. The geographic level at which such an effect would be significant is likely to vary markedly between different schemes and for different species.

OTTER

- 5.4.10 Options 0A and 0B are likely to result in relatively small areas of habitat loss affecting otter and are unlikely to lead to significant effects on otter conservation status.
- 5.4.11 Other Scheme Options are likely to result in the permanent loss of terrestrial habitats that are potentially utilised by otters for movement, shelter and breeding. Habitats identified as being of highest potential importance to otter include wetland habitat adjacent to the River Arun. Construction of all other Scheme Options may also lead to disturbance of otters using watercourses across the Survey Area. This may result in severance of otter movement routes – particularly those associated with the River Arun where bridge crossings are proposed. These impacts are likely to lead to a significantly adverse effect on otter conservation status. Given that otter is a relatively widespread species in Sussex and that English otter populations are on the increase, these impacts are unlikely to be significant at the County level.

WATER VOLE

- 5.4.12 All Scheme Options (except Options 0A & 0B) would likely result in the permanent loss of habitats that are potentially utilised by water voles for shelter, foraging and breeding. Habitats identified as potentially significantly important for water voles are the wet ditches which were recorded running parallel to the A27 carriageway and those connected to the River Arun.

- 5.4.13 Given the extent of suitable habitat that is likely to be permanently lost as a result of all proposed Scheme Options (except Options 0A & 0B), water voles if present within the study area could be directly impacted for example through destruction of burrows and loss of foraging habitat. In addition, road construction may sever connections between water vole colonies located either side of the Survey Area. These impacts are likely to result in a significantly adverse impact on water vole populations. Given the rarity of water vole and long term decline in this species in England, such impacts would be likely to be significant at least at the County level

GREAT CRESTED NEWT

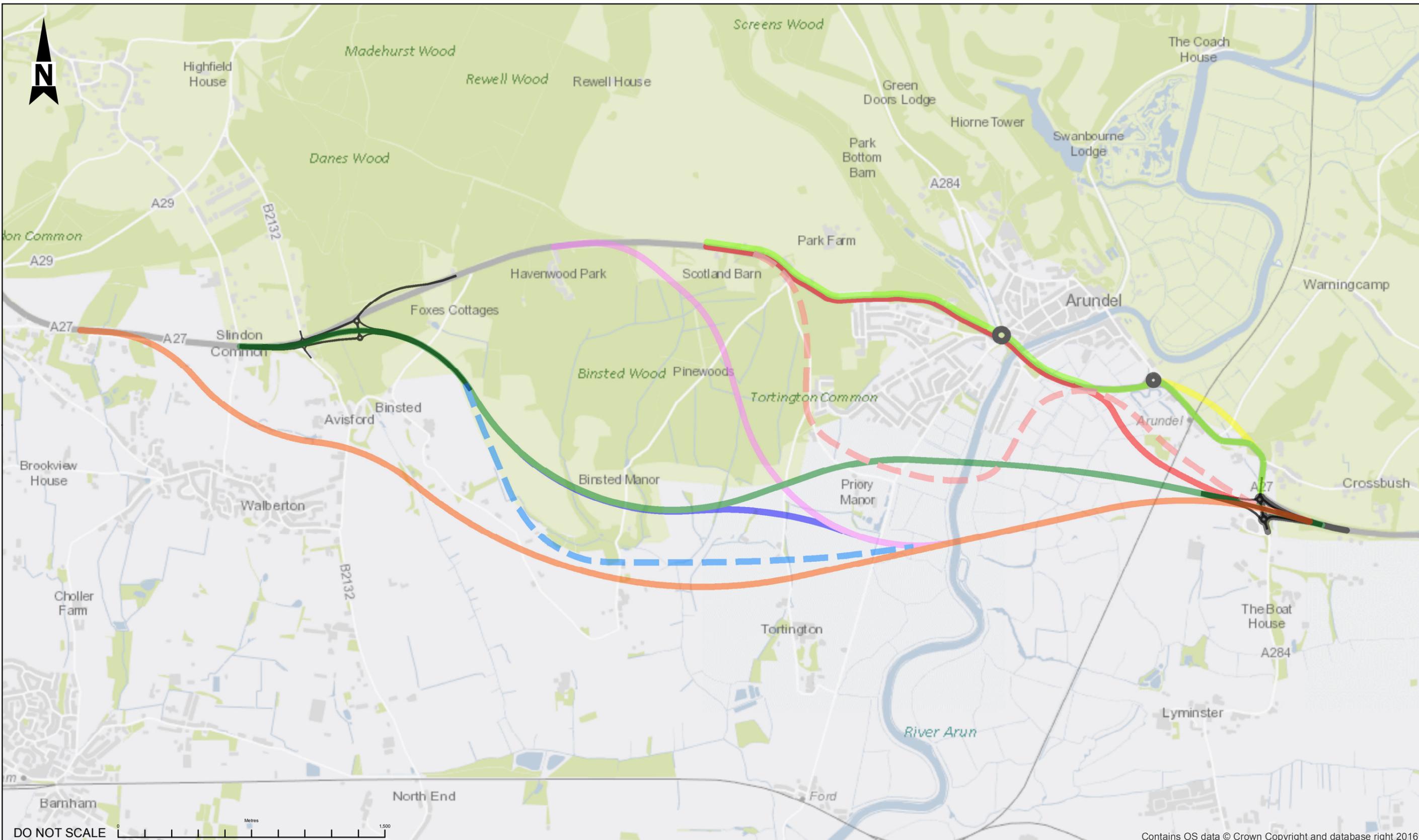
- 5.4.14 All Scheme Options would likely result in the permanent loss of terrestrial and aquatic habitats that are potentially utilised by GCN for breeding, foraging and hibernating. Habitats identified of highest potential importance for GCN include ancient woodland within Binsted Wood Complex LWS and Rewell Wood Complex LWS and the complex of ditches and waterbodies south of Arundel.
- 5.4.15 Options 0A and 0B would result in relatively minor losses of terrestrial and aquatic GCN habitat and it is probable that, although an adverse impact on GCN conservation status, the resulting effect would only be likely to be significant at the Local level.
- 5.4.16 In contrast, large areas of potentially suitable terrestrial and aquatic GCN habitat are likely to be permanently lost as a result of all other proposed Scheme Options. These impacts are also likely to compromise GCN conservation status and are likely to result in a significantly adverse effect. However, the geographical level at which such effect would be significant will depend on the number and size of GCN populations which are affected. Option 3 would likely result in the highest magnitude adverse impact on GCN given the large area of ancient woodland habitat that would be removed. It is probable that this would result in an adverse effect significant at the County level. Effects arising from other Scheme Options may also be significant at up to the County level.

REPTILES

- 5.4.17 All Scheme Options would likely result in the permanent loss of habitats that are potentially utilised by reptiles for basking, commuting, foraging and hibernating. Habitats identified of highest potential importance for reptiles include large area of semi-natural grassland either side of the River Arun and woodland edges and rides associated with Binsted Wood Complex LWS and Rewell Wood Complex LWS.
- 5.4.18 As with other impacts, Options 0A and 0B would involve relatively small losses of reptile habitat and it is probable that this would not compromise reptile conservation status and would be unlikely to be a significant effect.
- 5.4.19 Other Scheme Options all involve large losses of potential reptile habitat. It is probable that this will result in a significantly adverse effect on reptile conservation status, however, the geographical level at which such an effect would be significant will depend on the diversity and size of reptile populations which are affected. If large populations or populations of several reptile species are affected this could result in an effect which is significantly adverse effect at up to the County level.

Appendix A

SITE LOCATION PLAN



KEY:

- OPTION 0A - JUNCTION IMPROVEMENTS ONLY
- OPTION 0B - ONLINE WIDENING INCORPORATING JUNCTION IMPROVEMENTS
- OPTION 0BA - ONLINE WIDENING WITH SHORT OFFLINE SECTION (WSP-PB PROPOSAL)
- OPTION 1 - ONLINE WIDENING + OFFLINE WSCC PROPOSAL
- OPTION 3 - OFFLINE PINK ROUTE
- OPTION 5 - OFFLINE GREEN ROUTE
- OPTION 5A - OFFLINE GREEN/BLUE/PINK ROUTE
- OPTION 5B
- OPTION 2 - NOT CONSIDERED IN STAGE 1
- OPTION 4 - NOT CONSIDERED IN STAGE 1

| 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 to the design hazard log). | |
| Construction | |
| Maintenance / Cleaning | |
| Use | |
| Decommissioning / Demolition | |
| Rev. | Date |
| P01.1 --- First Issue | |
| Rev. | Date |
| Description | By |
| Chkd | App'd |

Drawing Status: **WORK IN PROGRESS**

Suitability: **S0**

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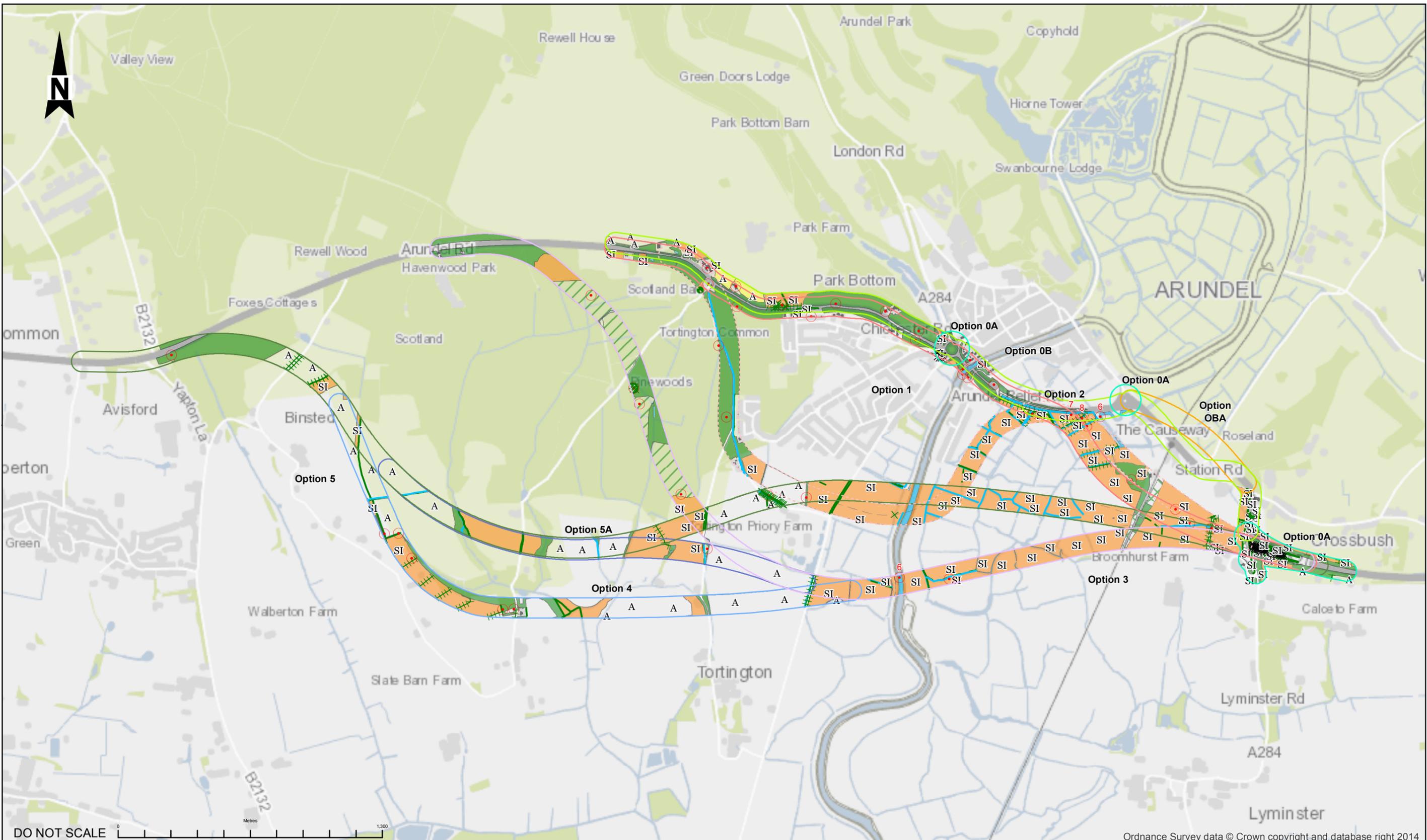
Client: **Working on behalf of**
highways england

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|---|-----------------|-------------|---------------------------|----------------|
| Project Title: REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL | | | | |
| Drawing Title: FIGURE 1.1 STUDY AREA | | | | |
| Scale: 1:20,000 | Drawn: CD | Checked: JL | Approved: RB | Authorised: RB |
| Original Size: A3 | Date: 14/09/16 | Date: --- | Date: --- | Date: --- |
| Drawing Number: HE551523 -WSP - GEN - A27AR- F1 - GIS - 0038 | Originator: --- | Volume: --- | Project Ref. No. 3514447G | |
| Location: --- | Type: --- | Role: --- | Revision: A | |

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Appendix B

PHASE 1 HABITAT MAP



| KEY: | | |
|--------------------|----|---|
| PHASE 1 STUDY AREA | ✕ | SCRUB - SCATTERED |
| OPTION 0A | ● | BROAD-LEAVED PARKLAND/SCATTERED TREES |
| OPTION 0B | ⊗ | CULTIVATED/DISTURBED LAND - EPHEMERAL/SHORT PERENNIAL |
| OPTION 0BA | ○ | TARGET NOTE |
| OPTION 1 | ⊗ | SCRUB - SCATTERED |
| OPTION 3 | — | RUNNING WATER |
| OPTION 5 | — | INTACT HEDGE - SPECIES-POOR |
| OPTION 5A | — | DEFUNCT HEDGE - SPECIES-POOR |
| OPTION 2 | | HEDGE WITH TREES - SPECIES-POOR |
| OPTION 4 | — | BROADLEAVED WOODLAND - SEMI-NATURAL |
| | — | BROADLEAVED WOODLAND - PLANTATION |
| | — | SCRUB - DENSE/CONTINUOUS |
| | — | NEUTRAL GRASSLAND - UNIMPROVED |
| | SI | NEUTRAL GRASSLAND - SEMI-IMPROVED |
| | SI | POOR SEMI-IMPROVED GRASSLAND |
| | — | STANDING WATER |
| | — | RUNNING WATER |
| | A | CULTIVATED/DISTURBED LAND - ARABLE |
| | A | CULTIVATED/DISTURBED LAND - AMENITY GRASSLAND |
| | — | BUILDINGS |

| 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 to the design hazard log). | |
| Construction | |
| Maintenance / Cleaning | |
| Use | |
| Decommissioning / Demolition | |
| Rev. | Date Description By Chkd App'd |
| P01.1 | — First Issue — — — |

Drawing Status: **WORK IN PROGRESS**

Suitability: **S0**

Project Title: **REGIONAL INVESTMENT PROGRAMME A27 ARUNDEL**

Drawing Title: **FIGURE 8.1 PHASE 1 HABITAT SURVEY**

Scale: 1:17,500

Drawn: CD, Checked: JL, Approved: RB, Authorised: RB

Original Size: A3, Date: 18/03/16

Client: **Working on behalf of highways england**

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| Location Type Role Number |

Appendix C

LEGISLATION AND POLICY CONTEXT

LEGISLATION AND POLICY CONTEXT

Introduction

The following Appendix sets out details of legislation within the UK and how this legislation applies to particular species groups. The key pieces of international and national legislation are described after which specific legislation pertaining to species or species groups are described in turn.

International and national legislation

EC Habitats Directive

In 1992 the then European Community adopted Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora, known as the Habitats Directive. The main aim of the EC Habitats Directive is to promote the maintenance of biodiversity by requiring member states to introduce protection for these habitats and species of European importance. The mechanism for protection is through designation of Special Areas of Conservation (SACs), both for habitats and for certain species listed within Annex II. There are a number of species listed within Annex II of the Habitats Directive that are present within the UK; these include four lower plant species, nine higher plant species, six species of molluscs, six species of arthropods, eight species of fish, two species of amphibian, and nine species of mammal.

The Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) came into force in 1982. The principal aims of the Convention are to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase cooperation between contracting parties, and to regulate the exploitation of those species (including migratory species) listed in Appendix 3. To this end the Convention imposes legal obligations on contracting parties, protecting over 500 wild plant species and more than 1000 wild animal species.

Bonn Convention

The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS) was adopted in Bonn, Germany in 1979 and came into force in 1985. Contracting Parties work together to conserve migratory species and their habitats by providing strict protection for endangered migratory species (listed in Appendix 1 of the Convention), concluding multilateral agreements for the conservation and management of migratory species which require or would benefit from international cooperation (listed in Appendix 2 of the Convention), and by undertaking co-operative research activities.

Convention on Biological Diversity

The Convention on Biological Diversity (Biodiversity Convention or CBD) was adopted at the Earth Summit in Rio de Janeiro, and entered into force in December 1993. It was the first treaty to provide a legal framework for biodiversity conservation. Contracting Parties are required to create and enforce national strategies and action plans to conserve, protect and enhance biological diversity.

Wildlife and Countryside Act 1981 (as amended)

The Wildlife and Countryside Act 1981 (as amended) is the principle mechanism for the legislative protection of wildlife in Great Britain. However it does not extend to Northern Ireland, the Channel Islands or the Isle of Man. This legislation is the means by which the Convention on the Conservation of European Wildlife and Natural Habitats (the 'Bern Convention') and the European Union Directives on the Conservation of Wild Birds (79/409/EEC) and Natural Habitats and Wild Fauna and Flora (92/43/EEC) are implemented in Great Britain.

Conservation of Habitats and Species Regulations 2010, as amended

In the UK the Council Directive 92/43/EEC has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended), and the Regulations (Northern Ireland) 1995 (as amended). The Regulations came into force on 30 October 1994, and have been

amended several times. Subsequently the Conservation of Habitats and Species Regulations 2010 was created which consolidates all the various amendments made to the 1994 Regulations in respect of England and Wales and is commonly known as the 'the Habitats Regulations'. In Scotland the Habitats Directive is transposed through a combination of the Habitats Regulations 2010 (in relation to reserved matters) and the 1994 Regulations. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transpose the Habitats Directive in relation to Northern Ireland.

The Regulations contain five Parts and four Schedules, and provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.

Other Legislation

Deer Act 1991

The Deer Act 1991 protects deer from poaching, taking or killing of certain deer in close season, taking or killing deer at night, and the use of prohibited weapons for the trapping or killing of deer.

Wild Mammals (Protection) Act 1996

The Act protects wild mammals from malicious or intentional harm.

Species and Habitat Specific Legislation

Plants

Wild plants are protected under Section 13 of the Wildlife and Countryside Act 1981 (as amended). It prohibits the unauthorised intentional uprooting of any wild plant species and forbids any picking, uprooting or destruction of plants listed on Schedule 8 of which there are over 150.

The Conservation of Habitats and Species Regulations 2010 have nine plants listed within Annex IV these are; shore dock, (*Rumex rupestris*), killamey fern (*Trichomanes speciosum*), early gentian (*Gentianella anglica*), lady's slipper (*Cypripedium calceolus*), creeping marshwort (*Apium repens*), slender naiad (*Najas flexilis*), fen orchid (*Liparis loeselii*), floating-leaved water plantain (*Luronium natans*), and yellow marsh saxifrage (*Saxifraga hirculus*). It is an offence to deliberately pick, collect cut, uproot or destroy any protected plant, or keep, transport, sell, or exchange, any live or dead such plant species, this applies to all stages of its life cycle.

Invasive Species

Schedule 9, Section 14 of the Wildlife and Countryside Act (1981, as amended) prohibits the introduction into the wild of any species that is not ordinarily resident in and is not a regular visitor to Great Britain in a wild state, or any species of the 69 plants listed on Schedule 9.

The frequently encountered invasive species within proposed development sites include Japanese knotweed (*Fallopia japonica*); Giant hogweed (*Heracleum mantegazzianum*); Himalayan balsam (*Impatiens glandulifera*); Floating pennywort (*Hydrocotyle ranunculoides*); New Zealand pygmyweed (*Crassula helmsii*); Rhododendron (*Rhododendron ponticum*); and certain hybrids of the above, some species may be native yet are listed for conservation purposes.

Plant or soil material contaminated by Japanese knotweed that is to be discarded is considered to be a 'controlled waste' under the Environmental Protection Act 1990 (EPA 1990). It is an offence to deposit, treat, keep, or dispose of controlled waste without a licence. Furthermore knotweed that has been cut down and removed must be received by an authorised person to be disposed of correctly. A licence can be obtained from the Environment Agency (EA). The release or planting of a listed species in the wild can be permitted under a licence granted by the relevant statutory body.

Fungi

There are five species of fungi protected under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended). These include the sandy stilt puffball (*Battarrea phalloides*), royal bolete (*Boletus*

regius), and the hedgehog fungus (*Hericium erinaceus*). It is an offence to pick, uproot, trade in, or possess for the purpose of trade, any species listed under schedule 8.

Invertebrates

A number of invertebrates such as stag beetles (*Lucanus cervus*), silver studded blue butterfly (*Plebejus argus*) or white letter hairstreak (*Stymondia w-album*) are fully protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended). This legislation makes it illegal to intentionally kill, injure, or take a protected invertebrate, or to damage, destroy, or obstruct access to any structure or place used for shelter or protection by such a species; and disturb any protected species occupying such a structure or place.

Three invertebrates are listed under Schedule 2 of the Conservation of Habitats and Species Regulations 2010, the large blue butterfly (*Maculinea arion*), fisher's estuarine moth (*Gortyna borelii lunata*), and lesser whirlpool ram's-horn snail (*Anisus vorticulus*). It is an offence deliberately to kill, capture, or disturb a listed species, or to damage or destroy the breeding site or resting place of such an animal.

Amphibians

There are four widespread amphibian species, common frog (*Rana temporaria*), common toad (*Bufo bufo*), palmate newt (*Lissotriton helveticus*), and smooth newt (*Lissotriton vulgaris*). All of the four widespread species receive partial protection under Schedule 5 of the Wildlife and Countryside Act (1981, as amended) making it an offence to offer them for sale or trade.

Great Crested Newts, Natterjack Toads and Pool Frogs

Great crested newts (*Triturus cristatus*) (GCN) and natterjack toads (*Epidalea calamita*) are fully protected under Schedule 5 (in respect of section 9(4)(b) and (c) and (5) only) of the Wildlife and Countryside Act (1981, as amended) and the Conservation of Habitats and Species Regulations 2010. Reintroduced populations of 'native' pool frogs (*Pelophylax lessonae*), currently restricted to one site in Norfolk, also receive the same protection. It is illegal to possess a protected species (alive or dead), deliberately capture, injure or kill, to intentionally or recklessly disturb, or to deliberately take or destroy the eggs of these protected species. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by these protected species'. All life stages of each species' are afforded the same level of protection.

In order to undertake any activity which would otherwise result in any of the above offences being committed, it may be necessary to obtain a European Protected Species (EPS) licence from the relevant statutory body (Natural England (NE), Countryside Council for Wales (CCW) or Scottish Natural Heritage (SNH)). It is possible to undertake surveys which would otherwise involve unlawful acts, such as disturbance, by obtaining a survey license which provides authorisation for scientific and educational purposes

Reptiles

The four common reptile species, adder (*Vipera berus*), grass snake (*Natrix natrix*), common lizard (*Zootoca vivipara*) and slow worm (*Anguis fragilis*), are protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended) against deliberate and/or intentional killing, injuring and trade.

If common reptile species are found to be present or considered potentially present within a proposed development site. To ensure that no subsequent offence will be committed a precautionary method of working (written by a suitably qualified ecologist) and submitted to the relevant authority may be required to enable works to proceed with limited risks of offences being caused.

Birds

All birds, their nests and eggs are protected by the Wildlife and Countryside Act (1981, as amended). It is an offence to intentionally kill, injure, or take any wild bird, or take or destroy an egg of any wild bird. It is also an offence to damage or destroy the nest of any wild bird (whilst being built, or in use). Therefore, clearance of vegetation within the site boundary, or immediately adjacent to the site during

the nesting season could result in an offence occurring under the Act. The bird breeding season can be taken to run between the 1 February and 31 August and is subject to geographical and seasonal factors. There are 79 species of birds listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). It is an offence to intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at a nest containing eggs or young, or disturb the dependent young of such a bird.

Barn Owls

Barn owls (*Tyto alba*) are listed as 'Amber' status under the Birds of Conservation Concern (BoCC) and are categorised as a species of European Conservation Concern. The Barn Owl is given the highest level of legal protection possible under Schedule 1 of the Wildlife and Countryside Act 1981. It is therefore illegal to kill, injure or take a barn owl, or to take or destroy its eggs. It is also illegal to intentionally or recklessly take, damage, or destroy the nest of any wild bird while it is in use or being built, release or allow the escape of a barn owl into the wild or possess any bird (dead or alive) or part of bird without a licence which is obtainable through the country agencies (EN, SNH, and CCW).

Mammals

All wild mammals are protected under the Wild Mammals (Protection) Act 1996 from certain cruel acts; and for connected purposes. It is an offence to mutilate, kick, beat, nail, or otherwise inflict unnecessary suffering on any wild mammal.

Badgers

Badgers (*Meles meles*) are protected under the Protection of Badgers Act (1992) and the Wildlife and Countryside Act (1981, as amended). As such it is an offence to wilfully take, kill, injure or ill-treat a badger, or possess a dead badger or any part of a badger. Under the Act their setts are also protected against obstruction, destruction, or damage in any part.

Sett interference includes damaging or destroying a sett, obstructing access to a sett, and disturbing a badger whilst it is occupying a sett. The Act defines a badger sett as 'any structure or place, which displays signs indicating the current use by a badger' and Natural England takes this definition to include seasonally used setts.

Work that may disturb badgers or their setts is illegal without a development licence from the relevant statutory body (NE, CCW, SNH). As a precautionary principle, a buffer distance between a badger sett and the works will be determined, based upon guidance from an appropriately experienced ecologist. This buffer distance should be based upon the size and activity levels at the sett, the topography between the sett and the works and the nature of the works.

Bats

All native UK bat species are fully protected by UK law under Schedule 5 (in respect of section 9(4)(b) and (c) and (5) only) and Schedule 6 of the Wildlife and Countryside Act (1981, as amended), and under Schedule 2 of the Conservation of Habitats and Species Regulations 2010. It is illegal to deliberately capture, injure or kill a bat or to intentionally or recklessly disturb bats. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a breeding or resting place used by a bat.

Any activity that would result in a contravention of the above legislation would likely require an EPS licence from the relevant statutory body (NE, CCW or SNH). Works or mitigation activities involving interference with bats or bat shelters must be carried out by a licensed bat worker.

Dormice

Dormice (*Muscardinus avellanarius*) are protected under Schedule 5 (in respect of section 9(4)(b) and (c) and (5) only) of the Wildlife and Countryside Act (1981, as amended) and are listed in Schedule 2 of the Conservation of Habitats and Species Regulations 2010. Under the current legislation it is illegal to intentionally or deliberately kill, injure or capture dormice, deliberately disturb dormice (whether in a nest or not); or to damage, or destroy dormouse breeding sites or resting places.

Any activity that would result in a contravention of the above legislation would likely require an EPS licence from the relevant statutory body (NE, CCW or SNH).

Otters

The otter (*Lutra lutra*) is fully protected under Schedule 5 (in respect of section 9(4)(b) and (c) and (5) only) of the Wildlife and Countryside Act (1981, as amended) and are listed under Schedule 2 of the Conservation of Habitats and Species Regulations 2010. It is therefore illegal to deliberately capture, injure or kill an otter, possess an otter (dead or alive), or any other part of an otter, or intentionally or recklessly disturb otters. It is also illegal to damage, destroy or intentionally or recklessly obstruct access to a holt or other resting place used by an otter.

Any activity that would result in a contravention of the above legislation would likely require an EPS licence from the relevant statutory body (NE, CCW or SNH).

Water voles

Water voles (*Arvicola amphibius*) are protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended). It is an offence to possess, control or sell water voles or to intentionally kill, injure or take water voles. It is also an offence to intentionally or recklessly damage, destroy or obstruct access to a place that water voles use for shelter or protection or disturb water voles whilst using such a place.

A licence is required for catching/handling water voles, or for field surveys that are intrusive or disturbing where the surveyor suspects water voles are present. A licence can be obtained by applying to the relevant statutory body (NE, SNH, and CCW,). Please note that the legislation does not permit licences to be issued in relation to development of land.

Hedgerows

The Hedgerows Regulations (1997) make provision for the protection of important hedgerows in England and Wales. The regulations affect hedgerows which are 20m or more in length, or connected at both ends to another hedgerow of any length.

They relate to hedgerows which are on, or adjoining land used for the following purposes: agriculture or forestry; the breeding or keeping of horses, ponies or donkeys; common land; village greens; Sites of Special Scientific Interest (which include all terrestrial SACs, NNRs, and SPAs) and Local Nature Reserves. They do not include hedges that is attached to, or marking the boundaries of a private house.

It is an offence to intentionally or recklessly remove or cause or permit another person to remove a hedgerow or intentionally or recklessly remove, or cause or permit another person to remove, a hedgerow which is the subject of a hedgerow retention notice.

Tree Felling

Up to 5m³ of standing timber can be felled per quarter without requirement for a felling licence provided that no more than 2m³ is sold. There are a number of exemptions, refer to the Forestry Authority Website.

General Guidance on European Protected Species Licence Applications

Should a European Protected Species (EPS) be found on a development site, and where best practice guidance either cannot be followed or is not applicable an EPS licence will be required. The licence permits operations that otherwise would be unlawful and fall outside the Good Practice Guidance, an application for such a licence should be made to the relevant statutory body (NE, CCW or SNH) before any works can proceed. It is also possible to obtain a general licence that may cover an area rather than applying in each individual case for a separate specific/individual licence

Should the survey information be considered insufficient or the statutory body is not satisfied with the application, the licence application may be refused. This could potentially result in significant delays to a project, if not considered in time; however, early consideration of the potential presence of EPS

on a site and an assessment of suitable mitigation measures to derogate such possibilities early in a project will negate this potential delay.

Biodiversity Policies

The key national policies which influence the ecology and nature conservation assessments are the: National Planning Policy Framework (NPPF) (DCLG 2012); The UK Biodiversity Framework (2011-2020).

The NPPF replaces all Planning Policy Statements and sets out the government's national planning policy on the protection of biodiversity. One of the 12 core planning principles is that planning should contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser environmental value.

The UK Biodiversity Framework is an important framework that is owned, governed and implemented by the four UK countries, assisted by Defra and JNCC in their UK co-ordination capacities. Although differing in details and approach, the four UK countries have published strategies which promote the same principles and address the same global targets: joining-up our approach to biodiversity across sectors; and identifying, valuing and protecting our 'Natural Capital' to protect national well-being now and in the future. This new framework has been developed to enhance the recovery of priority habitats and species in England (published under section 41 of the Natural Environment and Rural Communities (NERC) Act 2006), thereby contributing to the delivery of the England Biodiversity Strategy. The framework has been developed and endorsed by the England Biodiversity Group and wider partnership. It is the starting point for a more integrated approach to biodiversity conservation in England, building on the strengths of the former UK Biodiversity Action Plan (BAP) process and improving those areas where insufficient progress was being made.

Appendix D

TARGET NOTES

| TARGET NOTE REFERENCE | TARGET NOTE |
|-----------------------|--|
| TN1 | A large parcel of semi improved neutral grassland was identified within the Site within the grounds of Kings Lynn Power Station. At the time of survey, the sward was short (less than 5 cm). It is understood that the sward is regularly cut in order to dissuade certain protected species such as reptiles and great crested newts if present, which favour grassland exhibiting a taller sward, from inhabiting the area. Floral species recorded included perennial ryegrass <i>Lolium perenne</i> ; red fescue <i>Festuca rubra</i> ; Yorkshire fog grass <i>Holcus lanatus</i> ; daisy <i>Bellis perennis</i> ; ribwort plantain <i>Plantago lanceolata</i> ; white clover <i>Trifolium repens</i> ; yarrow <i>Achillea millefolium</i> ; dandelion <i>Taraxacum</i> agg.; bristly ox-tongue <i>Picris echioides</i> ; creeping buttercup <i>Ranunculus repens</i> ; self heal <i>Prunella vulgaris</i> ; black medick <i>Medicago lupulina</i> ; ladies bedstraw <i>Galium verum</i> and bladder campion <i>Silene vulgaris</i> . |
| TN2 | A small parcel of dense scrub was recorded underneath an electricity pylon within the centre of the large parcel of semi improved neutral grassland within the grounds of Kings Lynn Power Station. Floral species recorded included predominantly bramble <i>Rubus fruticosus</i> agg. Other floral species recorded included hawthorn <i>Crataegus monogyna</i> and elder <i>Sambucus nigra</i> saplings, dogwood <i>Cornus sanguinea</i> ; common nettle <i>Urtica dioica</i> and greater willowherb <i>Epilobium hirsutum</i> . |
| TN3 | A species poor hedgerow with scattered trees formed the western site boundary. The hedgerow was intact, dense and appeared to be 'box shaped' indicating that it is regularly cut. Floral species recorded included hawthorn, blackthorn <i>Prunus spinose</i> ; field maple <i>Acer campestre</i> and hazel <i>Corylus avellana</i> . All emergent trees were of young age and form and species recorded included ash <i>Fraxinus excelsior</i> ; aspen <i>Populus tremula</i> ; rowan <i>Sorbus aucuparia</i> ; pedunculate oak <i>Quercus robur</i> and poplar <i>Populus</i> spp. |
| TN4 | Parcels of scattered bramble scrub and occasional tall ruderal species were identified between the southern boundary fenceline and the adjacent ditch. Floral species recorded included predominantly bramble. Other floral species recorded included common nettle; greater willowherb; white dead nettle <i>Lamium album</i> ; greater burdock <i>Arctium lappa</i> ; hogweed <i>Heracleum sphondylium</i> ; cleavers <i>Galium aparine</i> and reed canary grass <i>Phalaris arundinacea</i> . Larger stands of elder and hawthorn shrubs were recorded towards the eastern extent of the ditch. |
| TN5 | Two drainage ditches were identified directly adjacent to either side of the EA access road running parallel to the southern site boundary. At the time of the survey the ditch directly north of the EA access road appeared to be completely dry. However the ditch is considered to contain water for the majority of the year, after rainfall and during periods when dense vegetation has not become established within the ditch. Scattered scrub (as detailed above) had become established within the ditch. The ditch directly south of the EA access road contained water and formed the boundary to an arable field. No aquatic and marginal vegetation was present within the ditch and along its banks as all vegetation had recently been cut. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 highway improvement works on the nature conservation interests of Arun Valley Ramsar site¹. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives for the A27 highway improvements at Arundel are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design ten options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** Incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** An off-line route from the existing A27 alignment. This alignment is approximately 4.4 km in length and commences from a proposed new interchange adjacent to The White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and ties into the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** An off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will then be joined to the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** An off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then tie into the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** An off-line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4 km):** The proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of a European Site.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on the Arun Valley Ramsar site. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

| | | |
|--|--|---|
| Project Name: | | A27 Arundel Highway Improvements |
| Natura 2000 Site under Consideration: | | Arun Valley Ramsar site |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1. These Options are considered to result in significantly less habitat loss than other Options (detailed below) and therefore potential adverse impacts to protected and notable species, habitats and designated sites of nature conservation value are anticipated to be significantly less.</p> <p>Options 2, 3, 4, 5, 5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of ancient woodland and relatively widespread semi-natural habitat in the study area. These Options are considered to result in significantly amounts of habitat loss potentially resulting in significant adverse impacts to protected and notable species, habitats and designated sites of nature conservation value.</p> <p>At this early stage in the assessment process only scheme alignment information is available. Construction techniques and the design of bridges, embankments, cuttings and other features are not available.</p> | |
| Land-take | There will be no land take habitat loss from the Arun Valley Ramsar site. | |
| Distance from the European Site or key features of the site (from the edge of the project assessment) | Arun Valley Ramsar site is located approximately 6.8 km north from its nearest point to the closest scheme options (0A, 0B, 0AB and 1). Central Grid Ref: TQ035143 | |

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| corridor) | |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts) | The scheme is considered unlikely to require any resources from the Arun Valley Ramsar site. However it is not yet known whether there will be any abstraction of water from the River Arun catchment associated with any scheme option, and this will need to be considered as the design is developed. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>In relation to the likely construction site itself, due to the distance from Arun Valley Ramsar site from the scheme options, there is no probable pathway for these impacts to have an adverse effect.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the Arun Valley Ramsar site is approximately 6.8 km north of the nearest scheme options, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 will be considered for potential air quality impacts on the Ramsar site, should they pass within 200m of the Ramsar site. This assessment will be undertaken when detailed traffic and air quality modelling is available at a later design stage.</p> <p>The Arun Valley Ramsar site is upstream of all scheme options, so there is no pathway for potential aquatic pollution arising from the scheme.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate surrounding area. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the Arun Valley Ramsar site is 6.8 km from the study area, the transportation requirements during the construction and operational phase are considered unlikely to have a significant negative effect on the features for which the Ramsar site was designated. However, this assessment needs to be verified when the construction traffic routes are known.</p> |
| Duration of construction, operation etc. | Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As Arun Valley Ramsar site is 6.8 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects on Arun Valley Ramsar site. |
| Other | Not applicable |
| Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on: | |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

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| | |
|---|--|
| Nature of proposals | <p>High level and generic avoidance and mitigation measures have been identified, to reflect this early design stage. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>A range of measures will be proposed to prevent unintentional killing, injury and disturbance of protected and notable species which occur near to the construction zone. However, at this early stage of assessment these measures cannot be confirmed. Ecological surveys will be carried out to determine where protected/notable species may be present and appropriate mitigation will be designed on the basis of survey findings.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected / notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU code | Ramsar site (UK11004). |
| Location and distance of the European Site from the proposed works | Arun Valley Ramsar site is located approximately 6.8 km north from its nearest point to the closest scheme option. Central Grid Ref: TQ035143 |

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| European Site size | The Arun Valley Ramsar site is 528.62 ha. |
| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | The Arun Valley Ramsar site is listed for its presence of British Red Data Book (BRDB) threatened (and endangered) invertebrate species, nationally rare and scarce plant species, diverse flora within ditches across the site, assemblages of waterfowl of international importance and the presence of the northern pintail (<i>Anas acuta</i>) at levels of national importance. |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | <p>The Information Sheet on Ramsar Wetlands for Arun Valley Ramsar³ states that threats to the Ramsar are predominantly from water extraction for the public water supply.</p> <p>The Arun Valley Ramsar site shares the same boundary and some of the same qualifying features (birds) as the Arun Valley SPA. The Site Improvement Plan for Arun Valley SPA⁴ states that threats to the SPA include inappropriate water levels, water pollution and inappropriate ditch management. These threats are likely to be equally applicable to the Arun Valley Ramsar site.</p> |
| European Site conservation objectives – where these are readily available | <p>The Information Sheet on Ramsar Wetlands for Arun Valley Ramsar⁵ broadly states that conservation and management objectives include:</p> <ul style="list-style-type: none"> • The sympathetic management of the lowland were grassland / grazing marsh to achieve favourable conservation status; • Management of effects by water level control and grazing regimes; and <p>Continued influence of private landowners and their land management.</p> <p>The Arun Valley Ramsar site shares the same boundary and some of the same qualifying features (birds) as the Arun Valley SPA. The conservation objectives for Arun Valley SPA⁶ are likely to be equally applicable to the Arun Valley Ramsar site. They are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; |

³ JNCC (2008 – version 3.0). Information Sheet on Ramsar Wetlands (RIS) Arun Valley Ramsar.

⁴ Natural England (2014 – version 1). Improvement Programme for England's Natura 2000 Sites (IPENS) Planning for the future.

⁵ JNCC (2008 – version 3.0). Information Sheet on Ramsar Wetlands (RIS) Arun Valley Ramsar.

⁶ Natural England (2014 – version 2). European Site Conservation Objectives for Arun Valley Special Protection Area Site Code: UK9020281

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| | <ul style="list-style-type: none"> • The populations of qualifying species; and • The distribution of qualifying species within the site⁷. |
| <p>Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.</p> | |
| <p>The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated as further detailed design information becomes available.</p> <p>Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to adversely affect the Arun Valley Ramsar site have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant projects or proposals.</p> | |
| <p>Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:</p> | |
| Reduction in habitat area | <p>The scheme will not result in any direct land take or habitat loss to Arun Valley Ramsar site.</p> <p>However, at this early stage in the assessment it cannot be determined whether direct land-take or habitat loss caused by the scheme could result in loss of supporting habitat which may be used for foraging by waterfowl species for which the Arun Valley Ramsar is designated. Further survey information is required to further review the potential for an adverse effect.</p> |
| Disturbance to key species | <p>During the construction phase, activities will generate noise and visual disturbance (including movement and lighting changes). Construction activities will take place on both the existing road corridors and additional land, located beyond the road corridors within the study area.</p> <p>The operational phase is likely to generate permanent increases in noise and visual disturbance associated with increases in traffic volumes and artificial lighting.</p> <p>These effects are unlikely to directly impact the Arun Valley Ramsar site as it is located 6.8 km to the north of the site. However, if supporting habitat for waterfowl species for which the Arun Valley Ramsar site is designated is present in the study area, and is disturbed, this could result in an adverse effect on the site. It is possible that birds use the River Arun as a flight path, if this is the case, then the construction of bridges across the River Arun may disrupt these flight paths.</p> <p>Further survey information, particularly on movement of migratory birds, and detail regarding scheme option designs is required to accurately determine whether those scheme options which cross the River Arun and its floodplain are likely to result in significant disturbance to qualifying species which use the Ramsar site.</p> |

⁷ Natural England (2014 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for Arun Valley Special Protection Area (Site Code: UK9020281). <http://publications.naturalengland.org.uk/file/6701685409841152>

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| Habitat or species fragmentation | <p>The project is may cause fragmentation of important bird flight paths and commuting routes, potentially used by waterfowl, and therefore obstruct movement of waterfowl along the River Arun to the Arun Valley Ramsar site. This could adversely affect the waterfowl populations for which the Ramsar site is designated.</p> <p>Further survey information and detailed design for all scheme options is required to accurately determine whether habitat or species fragmentation is likely to result in adverse impacts.</p> |
| Reduction in species density | <p>The potential impacts on waterfowl foraging areas and movement routes that are already reported in this AIES could reduce species density.</p> |
| Changes in key indicators of conservation value (water quality etc.) | <p>Direct or indirect impacts to key indicators of conservation value (e.g. air quality, water quality and low levels of disturbance) within Arun Valley Ramsar are unlikely to occur given the distance between the scheme options and the Ramsar site, and the fact that the Arun Valley Ramsar site is upstream of the Scheme.</p> <p>It is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. Given that the Scheme is downstream of the Ramsar site, there is unlikely to be a pathway for a significant effect. However, this assumption must be verified when detailed scheme design information is available.</p> |
| Climate change | <p>The cumulative impacts associated with climate change cannot be assessed until the potential for indirect impacts on the Ramsar site are fully understood. This will be assessed at a later design stage.</p> |
| Interference with the key relationships that define the structure of the site | <p>Structure is taken here to mean the distribution and abundance of habitats in the Arun Valley Ramsar site. Direct impacts on the structure of habitats in the Ramsar site is considered unlikely as the site is located 6.8 km from the scheme options and there will be no habitat loss from the Ramsar site.</p> |
| Interference with the key relationships that define the function of the site | <p>Function is taken here to mean the capacity of Arun Valley Ramsar site to support species populations for which it was designated. It is considered necessary to undertake further survey work to assess the function (if any) of habitat in the study area as a supporting foraging resource for Bewick's swan and waterfowl, and as a flight path to the Ramsar site. This will then need to be assessed following the survey work.</p> |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | <p>None of the scheme options will result in habitat loss from the Arun Valley Ramsar site. Therefore significant impacts on Arun Valley Ramsar site resulting from a habitat loss are considered unlikely.</p> |
| Disturbance to key species | <p>Further survey work is required to verify the likelihood of disturbance impacts on qualifying bird species for the Ramsar site specifically relating to the role of the study area as supporting habitat and as a flight path for qualifying waterfowl species of the Ramsar site.</p> |
| Habitat or species fragmentation | <p>Further survey work is required to verify the likelihood of fragmentation impacts on qualifying bird species for the Ramsar site relating to scheme options that require bridge construction across the River Arun.</p> |
| Loss | <p>None of the scheme options will result in habitat loss from the Arun Valley Ramsar site, therefore significant impacts on the site are considered unlikely.</p> |

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| Fragmentation | Further survey work is required to verify the likelihood of fragmentation impacts on qualifying bird species for the Ramsar site relating to scheme options that require bridge construction across the River Arun. |
| Disruption | Further survey work is required to verify the likelihood of disruption impacts on qualifying bird species for the Ramsar site relating to scheme options that require bridge construction across the River Arun. |
| Disturbance | Further survey work is required to verify the likelihood of disturbance impacts on qualifying bird species for the Ramsar site relating to scheme options that require bridge construction across the River Arun. |
| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | <p>All scheme options are 6.8 km, and downstream, from the Arun Valley SPA and Ramsar site. Therefore, air quality and water quality changes affecting the Ramsar site are unlikely. However, it is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. The Scheme is located downstream of the Ramsar site so there is unlikely to be a pathway for significant effect. However, this assumption must be verified when detailed scheme design information is available.</p> <p>The A284 road passes within approximately 300 m of Arun Valley Ramsar site. The A284 intersects with the A27 at Arundel. It is feasible that the A284 may be used for construction traffic required for the Scheme which could in turn lead to indirect air quality impacts on the Ramsar site arising from passage of vehicles along the A284. It will be necessary to review construction traffic routes (when available) to ascertain the likelihood of air quality effects on the Ramsar site should any pass nearby to it.</p> |
| <p>Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known</p> | |
| <p>In general, on the basis of proximity, adverse effects on the Arun Valley Ramsar site are unlikely. However, further survey information and detailed scheme design is required to accurately verify this conclusion. Several issues in particular also require specific assessment: potential bird disturbance and fragmentation of flight paths; potential water abstraction from the River Arun catchment; potential loss of bird supporting habitat in the study area used by qualifying Ramsar site bird species; and indirect air quality effects relating to possible construction traffic use of the A284 which passes adjacent to the Ramsar site.</p> <p>The following further ecological survey work in the study area has been programmed for 2017 to inform a more detailed assessment of potential impacts on the Arun Valley Ramsar site:</p> <ul style="list-style-type: none"> • Wintering bird surveys of the River Arun, its floodplain and the location where a possible new crossings over the river Arun is proposed. These surveys will occur monthly between February and March 2017 and again between October 2017 and March 2018. The surveys will document bird species diversity, abundance and key bird flight paths used in this area. • Breeding and passage bird surveys to obtain the same information as the wintering bird surveys but in the breeding season and capturing the bird passage period in spring and autumn. These surveys will occur between April and June 2017 and August and September 2017. <p>Consultation will be undertaken with key stakeholders to ascertain additional information on bird movements and distribution to further inform future updates of this AIES:</p> <ul style="list-style-type: none"> • The Wildfowl and Wetlands Trust; • The Royal Society for the Protection of Birds; • The South Downs National Park Authority; and • Natural England. • Sussex Biodiversity Records Centre. | |

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| Outcome of screening stage (delete as appropriate) | Significant Effects are Likely Sufficient Uncertainty Remains Not Likely to be Significant Effects |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 highway improvement works on the nature conservation interests of Arun Valley Special Area of Conservation (SAC)¹. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives for the A27 highway improvements at Arundel are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design ten options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** Incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** An off-line route from the existing A27 alignment. This alignment is approximately 4.4 km in length and commences from a proposed new interchange adjacent to The White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and ties into the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** An off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will then be joined to the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** An off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then tie into the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** An off line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4km):** The proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of a European Site.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on the Arun Valley SAC. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

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| Project Name: | | A27 Arundel Highway Improvements | |
| Natura 2000 Site under Consideration: | | Arun Valley SAC | |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): | |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist | |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1.</p> <p>Options 2, 3, 4, 5, 5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of woodland and relatively widespread semi-natural habitat in the study area.</p> <p>At this early stage in the assessment process only scheme alignment information is available. Construction techniques and the design of bridges, embankments, cuttings and other features are not available.</p> | | |
| Land-take | There will be no land-take habitat loss from the Arun Valley SAC. | | |
| Distance from the European Site or key features of the site (from the edge of the project assessment corridor) | The Arun Valley SAC is located approximately 6.8 km north from its nearest point to the closest scheme options (0A, 0B, 0AB and 1). Central Grid Ref: TQ035143 | | |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of | The scheme is considered unlikely to require any resources from the Arun Valley SAC. However, it is not yet known whether there will be any abstraction of water from the River Arun catchment associated with any scheme options, and this will need to be considered as the design is | | |

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| impacts) | developed. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>In relation to the likely construction site itself, due to the distance from Arun Valley SAC there is no probable pathway for these impacts to have an adverse effect on the SAC.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the Arun Valley SAC site is approximately 6.8 km north of the nearest scheme options, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 will be considered for potential air quality impacts on the SAC, should they pass within 200m of the SAC. This assessment will be undertaken when detailed traffic and air quality modelling is available at a later design stage.</p> <p>The Arun Valley SAC is upstream of all scheme options, so there is no pathway for potential aquatic pollution arising from the scheme to enter the SAC.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate surrounding area. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the Arun Valley SAC is 6.8 km from the study area, the transportation requirements during the construction and operational phases are considered unlikely to have a significant negative effect on the features for which the SAC was designated. However, this assessment needs to be verified when the construction traffic routes are known.</p> |
| Duration of construction, operation etc. | <p>Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As Arun Valley SAC is 6.8 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects.</p> |
| Other | Not applicable |
| <p>Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:</p> | |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

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| Nature of proposals | <p>High level and generic avoidance and mitigation measures have been identified to reflect this early design stage. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>The presence of protected and notable species will be identified through preliminary and on-going surveys, with appropriate mitigation measures incorporated into planning, design, construction and operation. Ecological surveys will be carried out to determine where protected/notable species may be present and appropriate mitigation will be designed on the basis of survey findings.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected / notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU code | Arun Valley SAC (UK0030366). |
| Location and distance of the European Site from the proposed works | Arun Valley SAC is located approximately 6.8 km north from its nearest point to the closest scheme option. Central Grid Ref: TQ035143 |

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| European Site size | Arun Valley SAC is 487.48ha. |
| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | The Arun Valley SAC is primarily designated for the presence of the European protected Ramshorn snail (<i>Anisus vorticulus</i>). The site comprises one of the largest populations of this species in the United Kingdom. |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | The JNCC Standard Data Form for this SAC states that the principal threats to habitats within the SAC are human induced changes to hydraulic conditions. |
| European Site conservation objectives – where these are readily available | <p>The conservation objectives are to ensure that the integrity of the Arun Valley SAC is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site³. |
| <p>Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.</p> | |
| <p>The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated when as further detailed design information becomes available.</p> <p>Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to adversely affect the Arun Valley SAC have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant road projects or proposals.</p> | |
| <p>Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:</p> | |
| Reduction in habitat area | <p>There will be no direct land take/habitat loss from the SAC. The SAC is 6.8 km from the nearest scheme option. It is possible that ditches and wetland habitats connected to the River Arun, in the vicinity of the scheme options, may support the ramshorn snail (further aquatic survey required to verify). However given proximity, it is highly unlikely that populations which may be present in the area crossed by the scheme options, have a supporting role in</p> |

³ Natural England (2014 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for Arun Valley Special Area of Conservation (Site Code: UK0030366). <http://publications.naturalengland.org.uk/file/5408659735576576>

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| | sustaining ramshorn snail populations which are present in the SAC. |
| Disturbance to key species | <p>During the construction phase, activities will generate noise and visual disturbance (including movement and lighting changes). Construction activities will take place on both the existing road corridors and additional land, located beyond the road corridors within the study area.</p> <p>The operational phase is likely to generate permanent increases in noise and visual disturbance associated with increases in traffic volumes and artificial lighting.</p> <p>Adverse disturbance impacts to the Ramshorn snail population for which Arun Valley SAC is designated are considered unlikely given the distance (6.8 km) between the scheme and this SAC.</p> |
| Habitat or species fragmentation | <p>Further survey information and detailed design for all scheme options is required to accurately determine whether habitat or species fragmentation is likely to result in adverse impacts.</p> <p>Any habitat or species fragmentation due to the scheme is considered unlikely to adversely impact the Ramshorn snail population for which Arun Valley SAC is designated, as the population focus for this species is located within the SAC, which is 6.8 km from any scheme option.</p> |
| Reduction in species density | There are no predicted reductions in the density of Ramshorn snail. |
| Changes in key indicators of conservation value (water quality etc.) | <p>Direct or indirect impacts to key indicators of conservation value (e.g. air quality, water quality and low levels of disturbance) within Arun Valley SAC and are unlikely to occur given the distance between Arun Valley SAC and the Scheme options, and the fact that the Arun Valley SAC is upstream of the Scheme.</p> <p>It is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. Given that the Scheme is downstream of the SAC, there is unlikely to be a pathway for a significant effect. However, this assumption must be verified when detailed scheme design information is available.</p> |
| Climate change | The cumulative impacts associated with climate change cannot be assessed until the potential for indirect impacts on the SAC are fully understood. This will be assessed at a later design stage. |
| Interference with the key relationships that define the structure of the site | Structure is taken here to mean the distribution and abundance of habitats in the Arun Valley SAC. Direct impacts on the structure of habitats in the SAC are considered unlikely as the SAC is located 6.8 km from the scheme options. |
| Interference with the key relationships that define the function of the site | Function is taken here to mean the capacity of Arun Valley SAC to support species populations for which it was designed. The ramshorn snail is an aquatic species. Any impact on the hydrology of the River Arun could conceivably affect the hydrological processes that sustain the ramshorn snail population in the Arun Valley SAC. Although marked hydrological impacts on the River Arun are unlikely, this must be confirmed once water abstraction requirements for the scheme are confirmed or ruled-out. |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | None of the scheme options will result in the reduction of habitat area from the Arun Valley SAC, therefore significant impacts on the SAC are considered |

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| | unlikely. |
| Disturbance to key species | It is unlikely that significant disturbance to key species will occur as a result of the Scheme. |
| Habitat or species fragmentation | It is unlikely that significant habitat or species fragmentation will occur as a result of the Scheme. |
| Loss | None of the scheme options will result in habitat loss from the Arun Valley SAC, therefore significant impacts on the SAC are considered unlikely. |
| Fragmentation | It is unlikely that significant fragmentation will occur as a result of the scheme. |
| Disruption | It is unlikely that significant disruption will occur as a result of the scheme. |
| Disturbance | It is unlikely that significant disturbance will occur as a result of the scheme. |
| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | <p>All scheme options are 6.8 km, and downstream, from the Arun Valley SAC. Therefore air quality and water quality changes affecting the SAC are unlikely, although it is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. The Scheme is located downstream of the SAC so there is unlikely to be a pathway for significant effects. However, this assumption must be verified when detailed scheme design information is available.</p> <p>The A284 road passes within approximately 300 m of Arun Valley SAC. The A284 intersects with the A27 at Arundel. It is feasible that the A284 may be used for construction traffic required for the Scheme which could in turn lead to indirect air quality impacts on the SAC arising from passage of vehicles along the A284. It will be necessary to review construction traffic routes (when available) to ascertain the likelihood of air quality effects on the SAC should any pass nearby to it.</p> |
| Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known | |
| In general, on the basis of proximity, adverse effects on the Arun Valley SAC are unlikely. However, further survey information and detailed scheme design is required to accurately verify this conclusion. Several issues in particular also require specific assessment: potential water abstraction from the River Arun catchment; and indirect air quality effects relating to possible construction traffic use of the A284 which passes adjacent to the SAC. | |
| Outcome of screening stage (delete as appropriate) | <p>Significant Effects are Likely</p> <p>Sufficient Uncertainty Remains</p> <p>Not Likely to be Significant Effects</p> |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 highway improvement works on the nature conservation interests of Arun Valley Special Protection Area (SPA)¹. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives for the A27 highway improvements at Arundel are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design nine options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** Incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** An off-line route from the existing A27 alignment. This alignment is approximately 4.4 km in length and commences from a proposed new interchange adjacent to The White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and ties into the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** An off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will then be joined to the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** An off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then tie into the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** An off-line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4 km):** The proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of a European Site.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on the Arun Valley SPA. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

| | | | |
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| Project Name: | | A27 Arundel Highway Improvements | |
| Natura 2000 Site under Consideration: | | Arun Valley SPA | |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): | |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist | |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1. These Options are considered to result in significantly less habitat loss than other Options (detailed below) and therefore potential adverse impacts to protected and notable species, habitats and designated sites of nature conservation value are anticipated to be significantly less.</p> <p>Options 2, 3, 4, 5, 5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of ancient woodland and relatively widespread semi-natural habitat in the study area. These Options are considered to result in significantly amounts of habitat loss potentially resulting in significant adverse impacts to protected and notable species, habitats and designated sites of nature conservation value.</p> <p>At this early stage in the assessment process only scheme alignment information is available. Construction techniques and the design of bridges, embankments, cuttings and other features are not available.</p> | | |
| Land-take | There will be no land take habitat loss from the Arun Valley SPA. | | |
| Distance from the European Site or key features of the site (from the edge of the project assessment) | Arun Valley SPA is located approximately 6.8 km north from its nearest point to the closest scheme options (0A, 0B, 0AB and 1). Central Grid Ref: TQ035143 | | |

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| corridor) | |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts) | The scheme is considered unlikely to require any resources from the Arun Valley SPA. However it is not yet known whether there will be any abstraction of water from the River Arun catchment associated with any scheme option, and this will need to be considered as the design is developed. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>In relation to the likely construction site itself, due to the distance from Arun Valley SPA from the scheme options, there is no probable pathway for these impacts to have an adverse effect.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the Arun Valley SPA is approximately 6.8 km north of the nearest scheme options, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 will be considered for potential air quality impacts on the SPA, should they pass within 200m of the Ramsar site. This assessment will be undertaken when detailed traffic and air quality modelling is available at a later design stage.</p> <p>The Arun Valley SPA is upstream of all scheme options, so there is no pathway for potential aquatic pollution arising from the scheme.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate surrounding area. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the Arun Valley SPA is 6.8 km from the study area, the transportation requirements during the construction and operational phase are considered unlikely to have a significant negative effect on the features for which the SPA and Ramsar site was designated. However, this assessment needs to be verified when the construction traffic routes are known.</p> |
| Duration of construction, operation etc. | Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As Arun Valley SPA is 6.8 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects on Arun Valley SPA. |
| Other | Not applicable |
| Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on: | |
| Nature of proposals | High level and generic avoidance and mitigation measures have been |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

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| | <p>identified, to reflect this early design stage. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>A range of measures will be proposed to prevent unintentional killing, injury and disturbance of protected and notable species which occur near to the construction zone. However, at this early stage of assessment these measures cannot be confirmed. Ecological surveys will be carried out to determine where protected/notable species may be present and appropriate mitigation will be designed on the basis of survey findings.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected / notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU code | Arun Valley SPA (UK9020281). |
| Location and distance of the European Site from the proposed works | Arun Valley SPA is located approximately 6.8 km north from its nearest point to the closest scheme option. Central Grid Ref: TQ035143 |
| European Site size | The Arun Valley SPA is 528.62 ha. |

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| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | The Arun Valley SPA qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting internationally important populations of Bewick's swan (<i>Cygnus columbianus bewickii</i>) which is listed in Annex I of the Directive. In addition, the site qualifies under Article 4.2 of the same directive by regularly supporting over 20,000 waterfowl. |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | The Site Improvement Plan for Arun Valley ³ states that threats to the SPA include inappropriate water levels, water pollution and inappropriate ditch management. |
| European Site conservation objectives – where these are readily available | <p>The conservation objectives for Arun Valley SPA⁴ are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site⁵. |
| Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site. | |
| <p>The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated as further detailed design information becomes available.</p> <p>Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to adversely affect the Arun Valley SPA have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant projects and proposals.</p> | |
| Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of: | |
| Reduction in habitat area | <p>The scheme will not result in any direct land take or habitat loss to Arun Valley SPA.</p> <p>However, at this early stage in the assessment it cannot be determined</p> |

³ Natural England (2014 – version 1). Improvement Programme for England's Natura 2000 Sites (IPENS) Planning for the future.

⁴ Natural England (2014 – version 2). European Site Conservation Objectives for Arun Valley Special Protection Area Site Code: UK9020281

⁵ Natural England (2014 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for Arun Valley Special Protection Area (Site Code: UK9020281). <http://publications.naturalengland.org.uk/file/6701685409841152>

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| | <p>whether direct land-take or habitat loss caused by the scheme could result in loss of supporting habitat which may be used for foraging by Bewick's swan and other waterfowl species for which the Arun Valley SPA is designated. Further survey information is required to further review the potential for an adverse effect.</p> |
| Disturbance to key species | <p>During the construction phase, activities will generate noise and visual disturbance (including movement and lighting changes). Construction activities will take place on both the existing road corridors and additional land, located beyond the road corridors within the study area.</p> <p>The operational phase is likely to generate permanent increases in noise and visual disturbance associated with increases in traffic volumes and artificial lighting.</p> <p>These effects are unlikely to directly impact the Arun Valley SPA as it is located 6.8 km to the north of the nearest scheme option. However, if supporting habitat for Bewick's swan and other waterfowl species for which the Arun Valley SPA are designated is present in the study area, and is disturbed, this could result in an adverse effect on the site. It is possible that birds use the River Arun as a flight path, if this is the case, then the construction of bridges across the River Arun may disrupt these flight paths.</p> <p>Further survey information, particularly on movement of migratory birds including Bewick's swan, and detail regarding scheme option designs is required to accurately determine whether those scheme options which cross the River Arun and its floodplain are likely to result in significant disturbance to qualifying species which use the SPA.</p> |
| Habitat or species fragmentation | <p>The project may cause fragmentation of important bird flight paths and commuting routes, potentially used by Bewick's swan, and therefore obstruct movement of Bewick's swan and other waterfowl species along the River Arun to the Arun Valley SPA. This could adversely affect the Bewick's swan and other waterfowl populations for which the SPA is designated.</p> <p>Further survey information and detailed design for all scheme options is required to accurately determine whether habitat or species fragmentation is likely to result in adverse impacts.</p> |
| Reduction in species density | <p>The potential impacts on waterfowl foraging areas and movement routes that are already reported in this AIES could reduce species density.</p> |
| Changes in key indicators of conservation value (water quality etc.) | <p>Direct or indirect impacts to key indicators of conservation value (e.g. air quality, water quality and low levels of disturbance) within Arun Valley SPA are unlikely to occur given the distance between the scheme options and the SPA, and the fact that the Arun Valley SPA is upstream of the Scheme.</p> <p>It is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. Given that the Scheme is downstream of the SPA, there is unlikely to be a pathway for a significant effect. However, this assumption must be verified when detailed scheme design information is available.</p> |
| Climate change | <p>The cumulative impacts associated with climate change cannot be assessed until the potential for indirect impacts on the SPA are fully understood. This will be assessed at a later design stage.</p> |

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| Interference with the key relationships that define the structure of the site | Structure is taken here to mean the distribution and abundance of habitats in the Arun Valley SPA. Direct impacts on the structure of habitats in the SPA is considered unlikely as the site is located 6.8 km from the scheme options and there will be no habitat loss. |
| Interference with the key relationships that define the function of the site | Function is taken here to mean the capacity of Arun Valley SPA to support species populations for which it was designated. It is considered necessary to undertake further survey work to assess the function (if any) of habitat in the study area as a supporting foraging resource for Bewick's swan and waterfowl, and as a flight path to the SPA. This will then need to be assessed following the survey work. |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | None of the scheme options will result in habitat loss from the Arun Valley SPA. Therefore significant impacts on Arun Valley SPA resulting from a habitat loss are considered unlikely. |
| Disturbance to key species | Further survey work is required to verify the likelihood of disturbance impacts on qualifying bird species for the SPA specifically relating to the role of the study area as supporting habitat and as a flight path for qualifying SPA bird species. |
| Habitat or species fragmentation | Further survey work is required to verify the likelihood of fragmentation impacts on qualifying bird species for the SPA relating to scheme options that require bridge construction across the River Arun. |
| Loss | None of the scheme options will result in habitat loss from the Arun Valley SPA, therefore significant impacts on the site are considered unlikely. |
| Fragmentation | Further survey work is required to verify the likelihood of fragmentation impacts on qualifying bird species for the SPA relating to scheme options that require bridge construction across the River Arun. |
| Disruption | Further survey work is required to verify the likelihood of disruption impacts on qualifying bird species for the SPA relating to scheme options that require bridge construction across the River Arun. |
| Disturbance | Further survey work is required to verify the likelihood of disturbance impacts on qualifying bird species for the SPA relating to scheme options that require bridge construction across the River Arun. |
| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | <p>All scheme options are 6.8 km, and downstream, from the Arun Valley SPA. Therefore, air quality and water quality changes affecting the SPA are unlikely. However, it is not yet clear whether construction and operation of the Scheme will require abstraction from the River Arun catchment. The Scheme is located downstream of the SPA so there is unlikely to be a pathway for significant effect. However, this assumption must be verified when detailed scheme design information is available.</p> <p>The A284 road passes within approximately 300 m of Arun Valley SPA. The A284 intersects with the A27 at Arundel. It is feasible that the A284 may be used for construction traffic required for the Scheme which could in turn lead to indirect air quality impacts on the SPA arising from passage of vehicles along the A284. It will be necessary to review construction traffic routes (when available) to ascertain the likelihood of air quality effects on the SPA should any pass nearby to it.</p> |
| Describe from the above those elements of the project, or combination of elements, where the above impacts | |

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are likely to be significant or where the scale or magnitude of impacts is not known

In general, on the basis of proximity, adverse effects on the Arun Valley SPA are unlikely. However, further survey information and detailed scheme design is required to accurately verify this conclusion. Several issues in particular also require specific assessment: potential bird disturbance and fragmentation of flight paths; potential water abstraction from the River Arun catchment; potential loss of bird supporting habitat in the study area used by notified SPA bird species; and indirect air quality effects relating to possible construction traffic use of the A284 which passes adjacent to the SPA.

The following further ecological survey work in the study area has been programmed for 2017 to inform a more detailed assessment of potential impacts on the Arun Valley SPA:

- Wintering bird surveys of the River Arun, its floodplain and the location where a possible new crossings over the river Arun is proposed. These surveys will occur monthly between February and March 2017 and again between October 2017 and March 2018. The surveys will document bird species diversity, abundance and key bird flight paths used in this area.
- Breeding and passage bird surveys to obtain the same information as the wintering bird surveys but in the breeding season and capturing the bird passage period in spring and autumn. These surveys will occur between April and June 2017 and August and September 2017.

Consultation will be undertaken with key stakeholders to ascertain additional information on bird movements and distribution to further inform future updates of this AIES:

- The Wildfowl and Wetlands Trust;
- The Royal Society for the Protection of Birds;
- The South Downs National Park Authority; and
- Natural England.
- Sussex Biodiversity Records Centre.

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| Outcome of screening stage (delete as appropriate) | <p>Significant Effects are Likely Sufficient Uncertainty Remains Not Likely to be Significant Effects</p> |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 Arundel highway improvement works upon the nature conservation interests of Ebernoe Common Special Area of Conservation (SAC)¹. The primary qualifying feature of this site is bats. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The A27 Arundel improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design ten options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** an off-line route from the existing A27 alignment. This alignment is approximately 4.4 km in length and commences from a proposed new interchange adjacent to The

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and joins the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** is an off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will join the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** is an off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then join the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** is an off line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored.
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4 km):** proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway.

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of Ebernoe Common SAC.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on Ebernoe Common SAC which is designated for bats. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

| | | |
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| Project Name: | | A27 Arundel Highway Improvements |
| Natura 2000 Site under Consideration: | | Ebernoe Common SAC |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1. These Options are considered to result in significantly less habitat loss than other Options (detailed below) and therefore potential adverse impacts to protected and notable species, habitats and designated sites of nature conservation value associated with scheme options 0A, 0B and 0BA are anticipated to be significantly less than for other scheme options.</p> <p>Options 2, 3, 4, 5, 5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of ancient woodland and relatively widespread semi-natural habitat in the study area. These Options are considered to result in significantly amounts of habitat loss potentially resulting in significant adverse impacts to protected and notable species, habitats and designated sites of nature conservation value.</p> <p>At this early stage in the assessment process only scheme alignment information is available. There is no information on the construction techniques; the design of bridges; embankments; cuttings; and other features.</p> | |
| Land-take | There will be no land take habitat loss from Ebernoe Common SAC | |
| Distance from the European Site or key features of the site (from the | The Ebernoe Common SAC is located approximately 14.5 km north from its nearest point to the closest scheme option. Central Grid Ref: SU977273 | |

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| edge of the project assessment corridor) | |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts) | The scheme is considered unlikely to require resources from the SAC. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>Wetland habitats in the Ebernow Common SAC are highly unlikely to be hydrological connected to watercourses in the Study Area – significant hydrological impacts on the SAC are improbable.</p> <p>The grassland, scrub and woodland bat foraging habitats and bat roosting sites themselves are not known to be particularly sensitive to changes in air quality of the type associated with construction of a new road. In addition, there is little evidence of lethal or sub-lethal effects on bat physiology arising from air pollution associated with road construction or operation. The following analysis is based on available guidance on assessing air quality impacts on ecological features.</p> <p>In relation to the likely construction site itself, due to the distance of the Ebernoe Common SAC from the scheme options, there is no probable pathway for these impacts to have an adverse effect.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the SAC is approximately 14.5 km north of the nearest scheme options, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 are also unlikely to have an adverse impact on this SAC given the distance between the scheme options and the SAC.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate area surrounding the scheme options. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the SAC is 14.5 km from the nearest scheme option, the transportation requirements during the construction and operational phase are considered unlikely to have a significant negative effect upon the features for which the SAC is designated. However, this assessment will be validated when traffic information and construction routes are available.</p> |
| Duration of construction, operation etc. | Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As the |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

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| | SAC is 14.5 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects on the Ebernoe Common SAC. |
| Other | Not applicable |
| Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on: | |
| Nature of proposals | <p>High level and generic avoidance and mitigation measures have been identified to reflect this early design stage, as detailed below. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>The presence of protected and notable species will be identified through preliminary and on-going surveys, with appropriate mitigation measures incorporated into planning, design, construction and operation.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The final construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected and notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU | Ebernoe Common SAC (UK0030337) |

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| code | |
| Location and distance of the European Site from the proposed works | Ebernoe Common SAC is located approximately 14.5 km north from its nearest point to the closest scheme option. Central Grid Ref: SU977273 |
| European Site size | Ebernoe Common SAC is 234.93ha. |
| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | <p>Annex I habitats that are a primary reason for selection of this SAC:</p> <p><u>9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</u></p> <p>Ebernoe Common has an extensive block of beech (<i>Fagus sylvatica</i>) high forest and former wood-pasture over dense holly (<i>Ilex aquifolium</i>), and has a very rich epiphytic lichen flora, including <i>Agonimia octospora</i> and <i>Catillaria atropurpurea</i>. It represents Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range. The beech woodland is associated with other woodland types, open glades, and pools, which contribute to a high overall diversity. The woods are important for a number of bat species, in particular Bechstein's bat <i>Myotis bechsteinii</i> and barbastelle <i>Barbastella barbastellus</i>.</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p><u>1308 Barbastelle</u></p> <p>A maternity colony of barbastelles utilises a range of tree roosts in this area of old sessile oak woods, as well as open glades and open water. Maternity roost sites are usually located in dead tree stumps. The species appears to be present throughout the year, with individuals utilising a range of roost sites in tree holes and under bark.</p> <p><u>1323 Bechstein`s bat</u></p> <p>A maternity colony of Bechstein's bat <i>Myotis bechsteinii</i> is associated with this area. Roosts are mainly located in old woodpecker holes in the stems of live mature oak trees.</p> |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | The principal threats to this SAC are the modification cultivation practices, human induced changes to hydraulic conditions, current forest and plantation management and use, changes in biotic conditions and other ecosystem modifications (reported in the JNCC Standard Data Form). |
| European Site conservation objectives – where these are readily available | <p>The conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; |

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| | <ul style="list-style-type: none"> The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; The populations of qualifying species; and The distribution of qualifying species within the site³. |
| Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site. | |
| <p>The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated as further detailed design information becomes available.</p> <p>Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to adversely affect the Ebernoe Common SAC have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant road improvement schemes.</p> | |
| Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of: | |
| Reduction in habitat area | There will be no land take habitat loss from the SAC. |
| Disturbance to key species | During the construction phase, activities will generate noise and visual disturbance (including movement and lighting changes). These impacts are unlikely to affect the SAC as it is located over 14.5 km from the scheme. Acoustic, visual and other disturbances during construction would be expected to dissipate or be screened from view within a short distance from the scheme. The operation impacts are also unlikely to disturb key species as the SAC is located over 14.5 km from the scheme. In contrast to the DMRB (30 km), the Bat Conservation Guidance ⁴ recommends 10 km as a suitable search radius for consideration of possible impacts on SACs with bat qualifying features. The scheme options are all beyond 10 km from Ebernoe Common SAC. |
| Habitat or species fragmentation | As the scheme is located over 14.5 km from the SAC, it is unlikely to have habitat or species fragmentation effects. This is due the distance between the scheme options and the SAC and the large areas of existing suitable connective habitat between them. Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES. |
| Reduction in species density | As the scheme is located over 14.5 km from the SAC, it is unlikely to bring about a reduction in the abundance (density) of barbastelle or Bechstein's bats. This is because there will be no direct habitat loss from the SAC and the home ranges of the Bechstein's bat and barbastelle bat populations are unlikely to overlap the area where the scheme will be built (see justification below). An area of uncertainty remains regarding potential presence of Bechstein's |

³ Natural England (2014 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for Ebernoe Common Special Area of Conservation (Site Code: UK0012715). <http://publications.naturalengland.org.uk/file/4891566543994880>

⁴ Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

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| | <p>bat and barbastelle bat in the scheme area – which although not part of the SAC populations - may provide a supporting function to the SAC by providing a source population exchange and maintenance of genetic diversity.</p> <p>Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES.</p> |
| Changes in key indicators of conservation value (water quality etc.) | <p>Direct or indirect impacts to key indicators of conservation value (e.g. air quality, water quality and low levels of disturbance) within the SAC are unlikely to occur, due to the distance between the scheme options and the SAC. See further commentary under the section on 'Interference with the key relationships that define the function of the site' in this AIES.</p> |
| Climate change | <p>Direct and indirect ecological impacts on the SAC are unlikely to arise as a result of the scheme options. Therefore the cumulative impacts associated with climate change are also unlikely.</p> |
| Interference with the key relationships that define the structure of the site | <p>Structure is taken here to mean the distribution and abundance of habitats in the SAC. Impacts on the structure of the SAC are considered to be unlikely as the SAC is over 14.5 km from any scheme option.</p> |
| Interference with the key relationships that define the function of the site | <p>Function is taken here to mean the capacity of the SAC to support the bat species / populations for which it was designated.</p> <p>Negative adverse impacts on the bat populations within the SAC are considered unlikely because of the following:</p> <ul style="list-style-type: none"> • Bechstein's bat is strongly associated with woodland habitat. One estimate of its typical home range is approximately 23 ha with directed nightly movements between roosts and foraging locations of approximately 4 km⁵. This would make it unlikely that bats using the SAC would utilise habitats in and around the A27. • Barbastelle is known to have a relatively large home range (e.g. one estimate is between 1 km and 20 km from the centre of a territory⁶). This would mean that, although unlikely, barbastelle bats present in the SAC could potentially encompass habitats within the study area. As the scheme is over 14.5 km from the SAC, and there are large areas of habitat that are likely to be suitable for roosting and foraging closer to the SAC, any potential barbastelle populations within the study area are likely to be separate from the barbastelle populations in the SAC. <p>However, uncertainty remains in relation to two specific issues:</p> <ul style="list-style-type: none"> • Desk study records of barbastelle bat roosts are present for Poling Copse and Slindon Common / Wood, which are approximately 1 km east and west of the study area respectively. In addition, there are large areas of ancient woodland in the study area that some scheme options may directly impact through habitat loss and this woodland may also support barbastelle bat. Although barbastelle populations (if present) in the study area would be unlikely to form part of the SAC populations, |

⁵ Palmer *et al.* (2013). *A study on the population size, foraging range and roosting ecology of Bechstein's bats at Grafton wood SSSI Worcestershire*. A report to the Wildlife Trusts and PTES

⁶ Zeale, M., d and Jones, G. (2012). Home range use and habitat selection by barbastelle bats (*Barbastella barbastellus*): implications for conservation. *Journal of Mammalogy*. 93(4):1110-1118.

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| | <p>they may provide a supporting function to the SAC by providing a source of population exchange which is important for maintaining genetic diversity.</p> <ul style="list-style-type: none"> Some scheme options may result in land-take from relatively large areas of ancient woodland, which have the potential to support a population of Bechstein's bat. If present, these bats may use the SAC as a hibernation site and/or act as supporting populations to Bechstein's bat populations in the surrounding area. Further data on possible Bechstein's bat use of the study area is required before the potential for significant effects on the SAC can be ruled out. |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | Given the distance between the scheme and the Ebernoe Common SAC none of the scheme options will result in habitat loss from the SAC. Therefore significant impacts on the SAC resulting from a reduction in habitat area are considered unlikely. |
| Disturbance to key species | Disturbance impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of both bat species and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Habitat or species fragmentation | Fragmentation impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the scheme area as a supporting population for either of the two bat species, and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Loss | Given the distance between the scheme and the Ebernoe Common SAC none of the scheme options will result in habitat loss from the SAC. Therefore significant impacts on the SAC resulting from a habitat loss are considered unlikely. |
| Fragmentation | Fragmentation impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the area which surrounds the junction options, as a supporting population for either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |
| Disruption | Disruption impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |
| Disturbance | Disturbance impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |

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| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | The scheme options are unlikely to result in a change to the key elements of the SAC as they are all located over 14.5 km from the SAC. |
| Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known | |
| <p>Although adverse impacts on the bat qualifying features of the Ebernoe Common SAC are unlikely, it is necessary to fully understand potential use of the study area by Bechstein's bat and barbastelle bat populations before such impacts may be ruled out. Further assessment is required, to consider the potential for habitat in the survey area to support Bechstein's bat and barbastelle bat populations, which may be linked to those using the SAC.</p> <p>The following further ecological survey work in the study area has been programmed for 2017 to inform a more detailed assessment of potential impacts on bat populations in the study area:</p> <ul style="list-style-type: none"> • Bat activity surveys and bat emergence/re-entry surveys following the Bat Conservation Trust methodology. • Bat crossing point surveys following the DEFRA methodology. • Possible trapping and radio tracking surveys following the BCT methodology and bespoke radio tracking methods to ascertain key bat flight paths and home range behaviour. • Bat hibernation surveys (if required). <p>Consultation will be undertaken with key stakeholders to ascertain additional information on bats in the study area:</p> <ul style="list-style-type: none"> • Sussex Bat Group; • The South Downs National Park Authority; • Natural England; and • Sussex Biodiversity Records Centre. | |
| Outcome of screening stage (delete as appropriate) | <p>Significant Effects are Likely</p> <p>Sufficient Uncertainty Remains</p> <p>Not Likely to be Significant Effects</p> |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 Arundel highway improvement works upon the nature conservation interests of Singleton and Cocking Tunnels Special Areas of Conservation (SAC)¹. The primary qualifying feature of this site is bats. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The A27 Arundel improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design ten options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** Incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** An off-line route from the existing A27 alignment. This alignment is approximately 4.4 km in length and commences from a proposed new interchange adjacent to The

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and joins the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** An off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will join the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** An off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then join the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** An off-line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4 km):** The proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway.

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of Singleton and Cocking Tunnels SAC.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on Singleton and Cocking Tunnels SAC which is designated for bats. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

| | | | |
|--|--|---|--|
| Project Name: | | A27 Arundel Highway Improvements | |
| Natura 2000 Site under Consideration: | | Singleton and Cocking Tunnels SAC | |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): | |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist | |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1. These Options are considered to result in significantly less habitat loss than other Options (detailed below) and therefore potential adverse impacts to protected and notable species, habitats and designated sites of nature conservation value associated with scheme options 0A, 0B and 0BA are anticipated to be significantly less than for other scheme options.</p> <p>Options 2, 3, 4, 5,5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of ancient woodland and relatively widespread semi-natural habitat in the study area. These Options are considered to result in significant amounts of habitat loss potentially resulting in significant adverse impacts to protected and notable species, habitats and designated sites of nature conservation value.</p> <p>At this early stage in the assessment process only scheme alignment information is available. There is no information on the construction techniques; the design of bridges; embankments; cuttings; and other features.</p> | | |
| Land-take | There will be no land take habitat loss from Singleton and Cocking Tunnels SAC | | |
| Distance from the European Site or | The Singleton and Cocking Tunnels SAC is located approximately 12 km | | |

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| key features of the site (from the edge of the project assessment corridor) | north west from its nearest point to the closest scheme option. Central Grid reference: SU872144 |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts) | The scheme is considered unlikely to require resources from the SAC. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>Wetland habitats are not linked to the favourable conservation management of the in Singleton and Cocking Tunnels SAC which is a bat hibernation site – significant hydrological impacts on the SAC are improbable.</p> <p>The tunnels themselves are not known to be particularly sensitive to changes in air quality of the type associated with construction of a new road. In addition, there is little evidence of lethal or sub-lethal effects on bat physiology arising from air pollution associated with road construction or operation. The following analysis is based on available guidance on assessing air quality impacts on ecological features.</p> <p>In relation to the likely construction site itself, due to the distance of the Singleton and Cocking Tunnels SAC from the scheme options, there is no probable pathway for these impacts to have an adverse effect.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the SAC is approximately 12.0 km north west of the nearest scheme options, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 are also unlikely to have an adverse impact on this SAC given the distance between the scheme options and the SAC.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate area surrounding the scheme options. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the SAC is 12 km from the nearest scheme option, the transportation requirements during the construction and operational phase are considered unlikely to have a significant negative effect upon the features for which the SAC is designated. However, this assessment will be validated when traffic information and construction routes are available.</p> |
| Duration of construction, operation etc. | Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As the |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

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| | SAC is 12 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects on the Singleton and Cocking Tunnels SAC. |
| Other | Not applicable. |
| Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on: | |
| Nature of proposals | <p>High level and generic avoidance and mitigation measures have been identified to reflect this early design stage. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>The presence of protected and notable species will be identified through preliminary and on-going surveys, with appropriate mitigation measures incorporated into planning, design, construction and operation if required.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The final construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected and notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU | Singleton and Cocking Tunnels SAC (UK0030337) |

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| code | |
| Location and distance of the European Site from the proposed works | Singleton and Cocking Tunnels SAC is located approximately 12 km north-west from its nearest point to the closest scheme option. Grid Ref: SU8728513999 |
| European Site size | Singleton and Cocking Tunnels SAC is 1.88ha. |
| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | Annex II species present as a qualifying feature, but not a primary reason for selection of this SAC: <u>1308 Barbastelle</u> Hibernating populations of barbastelle bat occur in disused railway tunnels. <u>1323 Bechstein's bat</u> Hibernating populations of Bechstein's bat occur in disused railway tunnels. |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | Principal threats to this SAC reported in the JNCC Standard Data Form are the modification of cultivation practices, changes in biotic conditions, outdoor sports and leisure activities, and other ecosystem modifications. |
| European Site conservation objectives – where these are readily available | The conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring: <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; • The populations of qualifying species; and • The distribution of qualifying species within the site³. |
| Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site. | |
| The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated as further detailed design information becomes available. | |

³ Natural England (2014 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for Singleton and Cockings Tunnels Special Area of Conservation (Site Code: UK0030337).
<http://publications.naturalengland.org.uk/file/6270221568442368>

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Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to cause to adversely affect the Singleton and Cocking Tunnels SAC have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant projects or proposals.

Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:

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| Reduction in habitat area | There will be no land take habitat loss from the SAC. |
| Disturbance to key species | During the construction phase, activities will generate noise and visual disturbance (including movement and lighting changes). These impacts are unlikely to affect the SAC as it is located over 12 km from the scheme. Acoustic, visual and other disturbances during construction would be expected to dissipate or be screened from view within a short distance from the scheme. The operation impacts are also unlikely to disturb key species as the SAC is located over 12 km from the scheme. In contrast to the DMRB (30 km), the Bat Conservation Guidance ⁴ recommends 10 km as a suitable search radius for consideration of possible impacts on SACs with bat qualifying features. The scheme options are all beyond 10 km from Singleton and Cocking Tunnels SAC. |
| Habitat or species fragmentation | As the scheme is located over 12 km from the SAC, it is unlikely to have habitat or species fragmentation effects. This is due the distance between the scheme options and the SAC and the large areas of existing suitable connective habitat between them. Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES. |
| Reduction in species density | As the scheme is located over 12 km from the SAC, it is unlikely to bring about a reduction in the abundance (density) of barbastelle or Bechstein's bats. This is because there will be no direct habitat loss from the SAC and the home ranges of the Bechstein's bat and barbastelle bat populations are unlikely to overlap the area where the scheme will be built (see justification below). An area of uncertainty remains regarding potential presence of Bechstein's bat and barbastelle bat in the scheme area – which although not part of the SAC populations - may provide a supporting function to the SAC by providing a source population exchange and maintenance of genetic diversity. Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES. |
| Changes in key indicators of conservation value (water quality etc.) | As the scheme is located over 12 km from the SAC, these effects are unlikely to impact the SAC. |
| Climate change | Direct and indirect ecological impacts on the SAC are unlikely to arise as a result of the scheme options. Therefore the cumulative impacts associated with climate change are also unlikely. |
| Interference with the key | Structure is taken here to mean the distribution and abundance of habitats in |

⁴ Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

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| relationships that define the structure of the site | the SAC. Impacts on the structure of the SAC are considered to be unlikely as the SAC is over 12 km from any scheme option. |
| Interference with the key relationships that define the function of the site | <p>Function is taken here to mean the capacity of the SAC to support the hibernating bat species / populations for which it was designated.</p> <p>Negative adverse impacts on the bat populations within the SAC are considered unlikely because of the following:</p> <ul style="list-style-type: none"> There will be no direct or indirect impacts on the hibernation roost itself and thus its physical functioning of the tunnels as a hibernation site for bats will not be impaired. <p>However, uncertainty remains in relation to two specific issues:</p> <ul style="list-style-type: none"> Desk study records of barbastelle bat roosts are present for Poling Copse and Slindon Common / Wood, which are approximately 1 km east and west of the study area respectively. In addition, there are large areas of ancient woodland in the study area that some scheme options may directly impact through habitat loss. This woodland may support barbastelle bat or Bechstein's bat. If present, these bats may use the SAC as a hibernation site. Further data on possible bat use of the study area is required before the potential for significant effects on the SAC can be ruled out. |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | Given the distance between the scheme and the SAC, none of the scheme options will result in habitat loss from the SACs. Therefore significant impacts on the SAC resulting from a reduction of habitat area are considered unlikely. |
| Disturbance to key species | Disturbance impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of both bat species and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Habitat or species fragmentation | Fragmentation impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the scheme area as a supporting population for either of the two bat species, and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Loss | Given the distance between the scheme and the SAC, none of the scheme options will result in habitat loss from the SACs. Therefore significant impacts on the SAC resulting from a habitat loss are considered unlikely. |
| Fragmentation | Fragmentation impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the area which surrounds the junction options, as a supporting population for either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |
| Disruption | Disruption impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. |

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| | However, the value of the scheme area as a supporting population of either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |
| Disturbance | Disturbance impacts on Bechstein's bat or barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of either of the two bat species, and its relationship to the SAC, needs to be determined before adverse effects can be ruled out. |
| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | The scheme options are unlikely to result in a change to the key elements of the SAC as they are all located over 12 km from the SAC. |
| Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known | |
| <p>Although adverse impacts on the bat qualifying features of the Singleton and Cocking Tunnels SAC are unlikely, it is necessary to fully understand potential use of the study area by Bechstein's bat and barbastelle bat populations before such impacts may be ruled out. Further assessment is required, to consider the potential for habitat in the survey area to support Bechstein's bat and barbastelle bat populations, which may be linked to those using the SAC.</p> <p>The following further ecological survey work in the study area has been programmed for 2017 to inform a more detailed assessment of potential impacts on bat populations in the study area:</p> <ul style="list-style-type: none"> • Bat activity surveys and bat emergence/re-entry surveys following the Bat Conservation Trust methodology. • Bat crossing point surveys following the DEFRA methodology. • Possible trapping and radio tracking surveys following the BCT methodology and bespoke radio tracking methods to ascertain key bat flight paths and home range behaviour. • Bat hibernation surveys (if required). <p>Consultation will be undertaken with key stakeholders to ascertain additional information on bats in the study area:</p> <ul style="list-style-type: none"> • Sussex Bat Group; • The South Downs National Park Authority; • Natural England; and • Sussex Biodiversity Records Centre. | |
| Outcome of screening stage (delete as appropriate) | <p>Significant Effects are Likely</p> <p>Sufficient Uncertainty Remains</p> <p>Not Likely to be Significant Effects</p> |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

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A27 ARUNDEL IMPROVEMENTS

INTRODUCTION

This Assessment of Implications on European Sites (AIES) relates to the assessment of the implications of the A27 Arundel highway improvement works upon the nature conservation interests of The Mens Special Area of Conservation (SAC)¹. The primary qualifying feature of this site is bats. AIES is an iterative process, commencing at project inception and ensuring that information regarding implications is systematically collected, assessed, reported and taken into account throughout the project lifecycle. There is an inter-relationship between AIES and the wider Environmental Assessment process and cross-reference is made where appropriate.

The A27 Arundel improvement works involve reconfiguring the layout of the A27 carriageway at Arundel. The high-level objectives are:

- To enhance capacity and connectivity to support national and local economic activity;
- To support and improve journey quality, reliability and safety;
- To join communities and link them effectively to each other;
- To support the delivery of environmental goals and move to a low carbon economy; and
- To improve road safety with a reduction in the number of collisions.

At this early stage in the project design ten options are being considered, and the option information will continue to be refined. The ten scheme options that are currently being considered are:

- **Options 0A:** Option 0A consists of improvements to the Crossbush junction and at-grade improvements at the Ford Road Junction and the Causeway Junction.
- **Option 0B (4.4 km):** Localised improvement which will consist of a narrowed urban dual all-purpose carriageway corridor along the existing A27 alignment, in addition to junction improvements at Crossbush, Causeway and Ford Road roundabouts.
- **Option 0BA (4.3 km):** Incorporates the improvements to the Crossbush junction of Option 0A, the online widening regime of Option 0B, and also adds a new small offline section of road between, the existing access to Batworth Park House on the A27 and A27/The Causeway roundabout.
- **Option 1 (4 km):** Online dualling with junction improvements on current existing A27 alignment up to Ford Road and then offline south of Arundel Station up to Crossbush roundabout.
- **Option 2 (4.4 km):** An off-line route from the existing A27 alignment. This alignment is approximately 4.4km in length and commences from a proposed new interchange adjacent to The

¹ SACs and SPAs are designated under two European Council Directives which have been transposed into UK law. The UK Government affords Ramsar sites designated under the Intergovernmental Convention on Wetlands ('the Ramsar convention') the same level of protection as SACs and SPAs. All sites are collectively referred to as European Sites.

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White Swan Public House to the west of Arundel on the existing A27 Chichester Road. The alignment then runs to the south adjacent to Tortington Lane and then south-eastwards towards the River Arun. The alignment continues in a south east direction, and will require and overbridge at the River Arun. It then runs northwards to the existing A27 Arundel By-pass. This alignment then continues on to cross over the Arun Valley Railway and joins the existing A27 via a new grade separated interchange at Crossbush Junction.

- **Option 3 (5.1 km):** An off-line route from the existing A27 alignment. This alignment diverges from the A27 at Havenwood Park in a south east direction. It requires four new underbridges at Old Scotland Lane, Binsted Lane, Tortington Lane and at Ford Road. The alignment then runs eastwards and requires two new overbridges over the River Arun and then the Arun Valley Railway. The proposed alignment will join the existing A27 via new grade separated interchange at Crossbush Junction.
- **Option 4 (6.8 km):** An off-line route from the existing A27 alignment. This option commences near Yapton Lane and is aligned to reduce the potential adverse effects on ancient woodland, and the South Downs National Park (SDNP). The alignment continues in a south east direction, adjacent to the border to the SDNP, and will require four new underbridges at Binsted Lane (North), Old Scotland Lane, Binsted Lane (South) and at Ford Road. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will then join the existing A27 via a new grade separated interchange at Crossbush Junction.
- **Option 5 (6.5 km):** An off-line route from the existing A27 alignment. The option commences near Yapton Lane, and runs north of Tortington Priory. This is the off-line option that travels shortest distance over the floodplain. The alignment then continues east, similar to Option 3 above, and will require two new overbridges at the River Arun and at the Arun Valley Railway. The proposed alignment will tie into the existing A27 via a new grade separated interchange at Crossbush Junction. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland. Therefore, an alternative arrangement for the western tie-in of this option is currently being explored.
- **Option 5A (6.45 km):** Option 5A is a sub-option of Option 5. This option commences at Yapton Lane and follows the alignment of Option 5 until the route reaches Binsted Lane, when it diverges along a new alignment for a short distance to Ford Road, at which point it continues along the alignment proposed by Option 3. Approximately 3 ha of this option is situated within ancient woodland. It is not possible to mitigate the loss of ancient woodland.
- **Option 5B (7.4 km):** proposed alignment ties into the existing A27 at the eastern end to form a new grade separated interchange at Crossbush Junction. It runs west across the Arun floodplain between Tortington Priory and Tortington village, skirting south of the ancient woodland and running to the north of Walberton, to join the existing A27 dual carriageway west of the existing junction with Mill Road / Tye Lane. The alignment will create two new overbridges at the River Arun and at the Arun Valley Railway.

The envelope encompassed by all of these scheme options is collectively referred to as the study area in this AIES.

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Although the scheme is at an early design stage, and limited design information is available, there is sufficient information to ascertain that the current options will not be directly linked to, or necessary for, the management of a European Site.

This AIES provides a high-level screening of the likelihood of significant effects resulting from any of the nine scheme options on The Mens SAC which is designated for bats. It also considers the need for more a detailed Appropriate Assessment (AA) and further ecological survey work.

AIES

Table template taken from Annex C: Screening Matrix, Design Manual for Roads and Bridges (DMRB) Volume 11 Section 4 Part 1 HS 44/09.

| | | | |
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| Project Name: | | A27 Arundel Highway Improvements | |
| Natura 2000 Site under Consideration: | | The Mens SAC | |
| Date: | Author (Name/Organisation): | Verified (Name/Organisation): | |
| 10 th March 2017 | Thomas Knight WSP Parsons Brinckerhoff Ecologist | Richard Gowing WSP Parsons Brinckerhoff Principal Ecologist | |
| Description of the Project: Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of: | | | |
| Size and scale (road type and probable traffic volume) | <p>Ten scheme options are currently being considered for the highway improvement works on the A27 Arundel as outlined in the introduction. The length of each scheme option is described above.</p> <p>Options 0A, 0B, 0BA and 1 will provide relatively localised improvements to the current A27 alignment, as well as short sections of new off-line routes for options 0BA and 1. These Options are considered to result in significantly less habitat loss than other Options (detailed below) and therefore potential adverse impacts to protected and notable species, habitats and designated sites of nature conservation value associated with scheme options 0A, 0B and 0BA are anticipated to be significantly less than for other scheme options.</p> <p>Options 2, 3, 4, 5, 5A and 5B are all major off-line diversions of the existing A27 alignment and all require a new crossing of the River Arun, construction on its floodplain and loss of ancient woodland and relatively widespread semi-natural habitat in the study area. These Options are considered to result in significantly amounts of habitat loss potentially resulting in significant adverse impacts to protected and notable species, habitats and designated sites of nature conservation value.</p> <p>At this early stage in the assessment process only scheme alignment information is available. There is no information on the construction techniques; the design of bridges; embankments; cuttings; and other features.</p> | | |
| Land-take | There will be no land take habitat loss from The Mens SAC | | |
| Distance from the European Site or key features of the site (from the | The Mens SAC is located approximately 14 km north from its nearest point to the closest scheme option. Central Grid reference TQ023234 | | |

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| edge of the project assessment corridor) | |
| Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts) | The scheme is considered unlikely to require resources from the SAC. |
| Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution) | <p>The scheme is likely to generate water-borne and air-borne pollution during the construction and operation phases.</p> <p>Wetland habitats in the Mens SAC are highly unlikely to be hydrological connected to watercourses in the Study Area – significant hydrological impacts on the SAC are improbable.</p> <p>The grassland, scrub and woodland bat foraging habitats and bat roosting sites themselves are not known to be particularly sensitive to changes in air quality of the type associated with construction of a new road. In addition, there is little evidence of lethal or sub-lethal effects on bat physiology arising from air pollution associated with road construction or operation. The following analysis is based on available guidance on assessing air quality impacts on ecological features.</p> <p>In relation to the likely construction site itself, due to the distance of the Mens SAC from the scheme options, there is no probable pathway for these impacts to have an adverse effect.</p> <p>The DMRB air quality guidance states that only designated sites within 200m of roads affected by the scheme need to be considered within an air quality assessment². As the SAC is approximately 14.0 km north of the nearest scheme options, therefore, air quality changes arising from the A27 are not expected to have air quality impacts on this European site. Altered road traffic flows on the wider route network connecting to the A27 are also unlikely to have an adverse impact on this SAC given that bats because of the distance between the scheme options and the SAC.</p> |
| Transportation requirements | <p>The transportation requirements during construction are currently unknown. However, construction traffic is likely to access the construction area via the existing road network and using haul roads within the immediate area surrounding the scheme options. Movement between local site compounds, storage depots and other facilities will also be required during construction.</p> <p>As the SAC is 14 km from the nearest scheme option, the transportation requirements during the construction and operational phase are considered highly unlikely to have a significant negative effect upon the features for which the SAC is designated. However, this assessment will be validated when traffic information and construction routes are available.</p> |
| Duration of construction, operation etc. | Construction would likely take approximately two years, starting in 2020. However, this will depend on the option selected. The DMRB states that the design life for carriageways is approximately 120 years; therefore it can be considered that the scheme would be operational for the same period. As the |

² Design Manual for Roads and Bridges-Volume 11 Section 3- Air Quality

A27 Arundel Improvements

Preliminary Assessment of Implications on European Sites: The Mens Special Area of Conservation

Version 4.0 dated 10th March 2017

| | |
|---|--|
| | SAC is 14 km from the nearest scheme option, the duration of the construction and operational phases are considered unlikely to have significant negative effects on the SAC. |
| Other | Not applicable |
| Description of Avoidance and/or Mitigation Measures: Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on: | |
| Nature of proposals | <p>High level and generic avoidance and mitigation measures have been identified to reflect this early design stage. These include:</p> <p>Pollution prevention measures, designed in accordance with Environment Agency (EA) Pollution Prevention Guidelines (PPGs), will be used during construction. Although these guidelines were withdrawn in December 2015, they are still considered relevant and no alternative guidelines have been issued by the EA.</p> <p>Screens, barriers and temporary drainage solutions will be used during construction, as part of a construction phase drainage strategy designed to minimise the risk of uncontrolled pollution events to existing surface and/or ground water. The final drainage strategy to be implemented during the operational phase will similarly seek to minimise the risk of pollution events resulting from the scheme. This will include Sustainable Urban Drainage Systems (SuDS) and future ready designs to mitigate the potential effects of climate change.</p> <p>To mitigate adverse effects on air quality, construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Dust from Demolition and Construction. This may include measures such as vegetating spoil stockpiles and damping down the construction area.</p> <p>The presence of protected and notable species will be identified through preliminary and on-going surveys, with appropriate mitigation measures incorporated into planning, design, construction and operation.</p> |
| Location | Hydrological and air quality mitigation measures (see 'nature of proposals' above) will be applied where construction and operation may affect surface and/or ground water or generate construction dust if required. |
| Evidence for effectiveness | The standard PPG mitigation measures to be implemented are proven to be effective in minimising the risk of pollution. |
| Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations) | Detailed avoidance and mitigation measures will be developed as part of the design process. The final construction phase avoidance and mitigation measures will be implemented as part of Construction Method Statements and Construction Environmental Management Plans, in accordance with standard best practice and DMRB requirements. Natural England will be consulted on all works involving protected and notable species and designated sites of nature conservation value. Where licences and consents are required, these will be gained prior to works commencing. |
| Characteristics of European Site: A brief description of the European Site should be produced, including information on: | |
| Name of European Site and its EU | The Mens SAC (UK0030337) |

A27 Arundel Improvements

Preliminary Assessment of Implications on European Sites: The Mens Special Area of Conservation

Version 4.0 dated 10th March 2017

| | |
|--|---|
| code | |
| Location and distance of the European Site from the proposed works | The Mens SAC is located approximately 14 km north from its nearest point to the closest scheme option. Central Grid Ref: TQ023234 |
| European Site size | The Mens SAC is 204.69ha. |
| Key features of the European Site including the primary reasons for selection and any other qualifying interests (taken from the SAC Citation Information Sheet) | <p>Annex I habitats that are a primary reason for selection of this site:</p> <p><u>9120 Atlantic acidophilous beech forests with <i>Ilex</i> and sometimes also <i>Taxus</i> in the shrublayer (<i>Quercion robori-petraeae</i> or <i>Ilici-Fagenion</i>)</u></p> <p>The Mens is an extensive area of mature beech (<i>Fagus sylvatica</i>) woodland rich in lichens, bryophytes, fungi and saproxylic invertebrates, and is one of the largest tracts of Atlantic acidophilous beech forests in the south-eastern part of the habitat's UK range. It is developing a near-natural high forest structure, in response to only limited silvicultural intervention over the 20th century, combined with the effects of natural events such as the 1987 great storm.</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection.</p> <p><u>1308 Barbastelle</u></p> <p>The Mens SAC supports a population of barbastelle bat.</p> |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | Principal threats to this SAC reported in the JNCC Standard Data Form are the modification of cultivation practices, changes in biotic conditions, outdoor sports and leisure activities, and other ecosystem modifications. |
| Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways (Taken from the Standard Data Natura 2000 form for the SAC) | Principal threats to this SAC reported in the JNCC Standard Data Form are the modification of cultivation practices, changes in biotic conditions, outdoor sports and leisure activities, and other ecosystem modifications. |
| European Site conservation objectives – where these are readily available | <p>The conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; |

A27 Arundel Improvements

Preliminary Assessment of Implications on European Sites: The Mens Special Area of Conservation

Version 4.0 dated 10th March 2017

| | |
|--|---|
| | <ul style="list-style-type: none"> • The populations of qualifying species; and • The distribution of qualifying species within the site³. |
| Assessment Criteria: Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site. | |
| <p>The scheme design is at the options identification stage, however, the approximate boundaries of the possible construction and operational areas for all the options has been estimated, although it will need further development in the latter design stages. This AIES will be updated as further detailed design information becomes available.</p> <p>Schemes that have the potential to act cumulatively with the A27 Arundel improvement works to adversely affect The Mens SAC have not been identified at this early stage in the design process. The potential for cumulative effects arising from other schemes will be considered at a later design stage, and this will include the A27 in both Worthing and Lancing and other relevant projects or proposals.</p> | |
| Initial Assessment: The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of: | |
| Reduction in habitat area | There will be no land take habitat loss from the SAC. |
| Disturbance to key species | During the construction phase, activities will generate noise and vibration and visual disturbance. However, such impacts are unlikely to adversely effect the barbastelle bat population in the SAC given the distance separating the scheme from the SAC. The operation impacts are also unlikely to disturb key species as the SAC is located over 14 km from the scheme. In contrast to the DMRB (30 km), the Bat Conservation Guidance ⁴ recommends 10 km as a suitable search radius for consideration of possible impacts on SACs with bat qualifying features. The scheme options are all beyond 10 km from Singleton and Cocking Tunnels SAC. |
| Habitat or species fragmentation | As the scheme is located over 14 km from the SAC it is unlikely to have habitat or species fragmentation effects. This is due to the distance between the scheme and the SAC and the large areas of existing suitable connective habitat between them. Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES. |
| Reduction in species density | <p>As the scheme is located over 14 km from the SAC, it is unlikely to bring about a reduction in the abundance (density) of barbastelle bats. This is because there will be no direct habitat loss from the SAC and the home ranges of barbastelle bat populations are unlikely to overlap the area where the scheme will be built (see justification below).</p> <p>An area of uncertainty remains regarding potential presence of barbastelle bats in the scheme area – which although not part of the SAC population - may provide a supporting function to the SAC by providing a source population exchange and maintenance of genetic diversity.</p> <p>Further information is provided in the section on 'Interference with the key relationships that define the function of the site' in this AIES.</p> |

³ Natural England (2019 – version 2, replaces earlier version dated 2012). European Site Conservation Objectives for The Mens Special Area of Conservation (Site Code: UK0012716). <http://publications.naturalengland.org.uk/file/5671292070002688>

⁴ Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London.

A27 Arundel Improvements

Preliminary Assessment of Implications on European Sites: The Mens Special Area of Conservation

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| | |
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| Changes in key indicators of conservation value (water quality etc.) | As the scheme is located over 14 km from the SAC, these effects are unlikely to impact the SAC. |
| Climate change | Direct and indirect ecological impacts on the SAC are unlikely to arise as a result of the scheme options. Thus cumulative impacts associated with climate change are also unlikely. |
| Interference with the key relationships that define the structure of the site | Structure is taken here to mean the distribution and abundance of habitats in the SAC. Impacts on the structure of the SAC are considered to be highly unlikely as the SAC is over 14 km from any scheme option. |
| Interference with the key relationships that define the function of the site | <p>Function is taken here to mean the capacity of the SAC to support the bat species / populations for which it was designated.</p> <p>Negative adverse impacts on the barbastelle bat populations within the SAC are considered unlikely because of the following:</p> <ul style="list-style-type: none"> Barbastelle is known to have a relatively large home range (e.g. one estimate is between 1 km and 20 km from the centre of a territory⁵). This would mean that, although unlikely, barbastelle bats present in the SAC in this AIES could potentially encompass habitats within the study area. As the scheme is over 14 km from the SAC, and there are large areas of habitat that are likely to be suitable for roosting and foraging closer to the SAC, any potential barbastelle populations within the study area are likely to be separate from the barbastelle populations in the SAC. <p>However, uncertainty remains in relation to two specific issues:</p> <ul style="list-style-type: none"> Desk study records of barbastelle bat roosts are present for Poling Copse and Slindon Common / Wood, which are approximately 1km east and west of the study area respectively. In addition, there are large areas of ancient woodland in the study area that some scheme options may directly impact through habitat loss and this woodland may also support barbastelle bat. Although barbastelle populations (if present) in the study area would be unlikely to form part of the SAC populations, they may provide a supporting function to the SAC by providing a source of population exchange which is important for maintaining genetic diversity. |
| Indicate the significance as a result of the identification of impacts set out above in terms of: | |
| Reduction of habitat area | Given the distance between the scheme and the SAC, none of the scheme options will result in habitat loss from the SACs. Therefore significant impacts on the SAC resulting from a reduction of habitat area are considered unlikely. |
| Disturbance to key species | Disturbance impacts on barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of barbastelle bats and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |

⁵ Zeale, M., d and Jones, G. (2012). Home range use and habitat selection by barbastelle bats (*Barbastella barbastellus*): implications for conservation. *Journal of Mammalogy*. 93(4):1110-1118.

A27 Arundel Improvements

Preliminary Assessment of Implications on European Sites: The Mens Special Area of Conservation

Version 4.0 dated 10th March 2017

| | |
|---|--|
| Habitat or species fragmentation | Fragmentation impacts on barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the scheme area as a supporting population of barbastelle bats and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Loss | Given the distance between the scheme and the SAC, none of the scheme options will result in habitat loss from the SACs. Therefore significant impacts on the SAC resulting from a habitat loss are considered unlikely. |
| Fragmentation | Fragmentation impacts on barbastelle bat populations inside the SAC are unlikely on the basis that there will be no loss of habitat inside the SAC. However, the value of the scheme area as a supporting population of barbastelle bats and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Disruption | Disruption impacts on barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of barbastelle bats and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Disturbance | Disturbance impacts on barbastelle bat populations inside the SAC are unlikely on the basis of distance as outlined earlier in this AIES. However, the value of the scheme area as a supporting population of barbastelle bats and its relationship to the SAC needs to be determined before adverse effects can be ruled out. |
| Change to key elements of the site (e.g. water quality, hydrological regime etc.) | The scheme options are unlikely to result in a change to the key elements of the SAC as they are all located over 14 km from the SAC. |

Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known

Although adverse impacts on the bat qualifying features of The Mens SAC considered in this AIES are unlikely, it is necessary to fully understand potential use of the study area by barbastelle bat populations before such impacts may be ruled out. Further assessment is required, to consider the potential for habitat in the survey area to support barbastelle bat populations, which may be linked to those using the SAC.

The following further ecological survey work in the study area has been programmed for 2017 to inform a more detailed assessment of potential impacts on bat populations in the study area:

- Bat activity surveys and bat emergence/re-entry surveys following the Bat Conservation Trust methodology.
- Bat crossing point surveys following the DEFRA methodology.
- Possible trapping and radio tracking surveys following the BCT methodology and bespoke radio tracking methods to ascertain key bat flight paths and home range behaviour.
- Bat hibernation surveys (if required).

Consultation will be undertaken with key stakeholders to ascertain additional information on bats in the study area:

- Sussex Bat Group;
- The South Downs National Park Authority;
- Natural England; and
- Sussex Biodiversity Records Centre.

A27 Arundel Improvements

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Version 4.0 dated 10th March 2017

| | |
|---|--|
| Outcome of screening stage (delete as appropriate) | Significant Effects are Likely Sufficient Uncertainty Remains Not Likely to be Significant Effects |
| Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attach relevant correspondence) | No consultation has been undertaken to date. |

Glossary of Acoustics Terminology

Glossary of Acoustics Terminology

| | |
|--|---|
| Decibel (dB) | The decibel scale is used in relation to sound because it is a logarithmic rather than a linear scale. The decibel scale compares the level of a sound relative to another. The human ear can detect a wide range of sound pressures, typically between 2×10^{-5} and 200 Pa, so the logarithmic scale is used to quantify these levels using a more manageable range of values. |
| Sound Pressure Level (SPL) | <p>The Sound Pressure Level has units of decibels, and compares the level of a sound to the smallest sound pressure generally perceptible by the human ear, or the reference pressure. It is defined as follows:</p> <p>SPL (dB) = $20 \text{ Log}_{10}(P/P_{\text{ref}})$ where P = Sound Pressure (in Pa) P_{ref} = Reference Pressure 2×10^{-5} Pa</p> <p>An SPL of 0dB suggests the Sound Pressure is equal to the reference pressure. This is known as the <i>threshold of hearing</i>.</p> <p>An SPL of 140dB represents the <i>threshold of pain</i>.</p> |
| A-Weighting | The human ear can detect a wide range of frequencies, from 20Hz to 20kHz, but it is more sensitive to some frequencies than others. Generally, the ear is most sensitive to frequencies in the range 1 to 4 kHz. The A-weighting is a filter that can be applied to measured results at varying frequencies, to mimic the frequency response of the human ear, and therefore better represent the likely perceived loudness of the sound. SPL readings with the A-weighting applied are represented in dB(A). |
| L ₁₀ or L _{A10} and other percentile measures Noise | <p>This represents the SPL which is exceeded 10% of the time, expressed in dB or dB(A). L_{A10} is used to quantify road noise levels. Other percentiles exist and are used for various types of noise assessment. These include L₀₁, L₅₀, L₉₀, L₉₉.</p> <p>A noise can be described as an unwanted sound. Noise can cause nuisance.</p> |
| Noise Sensitive Receptors (NSR's) | Any identified receptor likely to be affected by noise. These are generally human receptors, which may include residential dwellings, work places, schools, hospitals, and recreational spaces. |



CERTIFICATE OF CALIBRATION

Date of Issue: 17 September 2015

Certificate Number: TCRT15/1254

Issued by:

ANV Measurement Systems
 Beaufort Court
 17 Roebuck Way
 Milton Keynes MK5 8HL
 Telephone 01908 642846 Fax 01908 642814
 E-Mail: info@noise-and-vibration.co.uk
 Web: www.noise-and-vibration.co.uk

Page 1 of 2 Pages
 Approved Signatory

M. Breslin [] K. Mistry [] J. Harriman [✓]

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

| Customer | Parsons Brinckerhoff Ltd Amber Court William Armstrong Drive Newcastle Business Park Newcastle upon Tyne NE4 7YQ | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--|---------------------|-----------------------------|-------------|-----------------------------|------|-------------------|-------|----------|------|----------|--|-----|------|---------------|-------|-------|------|------------|-------|-------|------|------------|-------|----------|--|---------------------------------------|--|-----------|
| Order No. | 87404 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Description | Sound Level Meter / Pre-amp / Microphone / Associated Calibrator | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Identification | <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><i>Manufacturer</i></th> <th style="text-align: left;"><i>Instrument</i></th> <th style="text-align: left;"><i>Type</i></th> <th style="text-align: left;"><i>Serial No. / Version</i></th> </tr> </thead> <tbody> <tr> <td>Rion</td> <td>Sound Level Meter</td> <td>NL-52</td> <td>00632043</td> </tr> <tr> <td>Rion</td> <td>Firmware</td> <td></td> <td>1.5</td> </tr> <tr> <td>Rion</td> <td>Pre Amplifier</td> <td>NH-25</td> <td>32071</td> </tr> <tr> <td>Rion</td> <td>Microphone</td> <td>UC-59</td> <td>05210</td> </tr> <tr> <td>Rion</td> <td>Calibrator</td> <td>NC-74</td> <td>34536109</td> </tr> <tr> <td></td> <td>Calibrator adaptor type if applicable</td> <td></td> <td>NC-74-002</td> </tr> </tbody> </table> | <i>Manufacturer</i> | <i>Instrument</i> | <i>Type</i> | <i>Serial No. / Version</i> | Rion | Sound Level Meter | NL-52 | 00632043 | Rion | Firmware | | 1.5 | Rion | Pre Amplifier | NH-25 | 32071 | Rion | Microphone | UC-59 | 05210 | Rion | Calibrator | NC-74 | 34536109 | | Calibrator adaptor type if applicable | | NC-74-002 |
| <i>Manufacturer</i> | <i>Instrument</i> | <i>Type</i> | <i>Serial No. / Version</i> | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rion | Sound Level Meter | NL-52 | 00632043 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rion | Firmware | | 1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rion | Pre Amplifier | NH-25 | 32071 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rion | Microphone | UC-59 | 05210 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rion | Calibrator | NC-74 | 34536109 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Calibrator adaptor type if applicable | | NC-74-002 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Performance Class | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Test Procedure | TP 2.SLM 61672-3 TPS-49 <i>Procedures from IEC 61672-3:2006 were used to perform the periodic tests.</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type Approved to IEC 61672-1:2002 | YES Approval Number 21.21 / 13.02 <i>If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003</i> | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date Received | 16 September 2015 ANV Job No. TRAC15/09134 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Date Calibrated | 17 September 2015 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| | | | |
|----------------------|-----------------------------------|---------------------------------------|--|
| Previous Certificate | <i>Dated</i> 18 September 2013 | <i>Certificate No.</i> TCRT13/1292 | <i>Laboratory</i> ANV Measurement Systems |
|----------------------|-----------------------------------|---------------------------------------|--|

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT15/1254

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Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

| | | |
|--|-------------------|---|
| SLM instruction manual title | Sound Level Meter | NL-42 / NL-52 |
| SLM instruction manual ref / issue | | 11-03 |
| SLM instruction manual source | | Manufacturer |
| Internet download date if applicable | | N/A |
| Case corrections available | | Yes |
| Uncertainties of case corrections | | Yes |
| Source of case data | | Manufacturer |
| Wind screen corrections available | | Yes |
| Uncertainties of wind screen corrections | | Yes |
| Source of wind screen data | | Manufacturer |
| Mic pressure to free field corrections | | Yes |
| Uncertainties of Mic to F.F. corrections | | Yes |
| Source of Mic to F.F. corrections | | Manufacturer |
| Total expanded uncertainties within the requirements of IEC 61672-1:2002 | Yes | |
| Specified or equivalent Calibrator | | Specified |
| Customer or Lab Calibrator | | Lab Calibrator |
| Calibrator adaptor type if applicable | | NC-74-002 |
| Calibrator cal. date | | 15 September 2015 |
| Calibrator cert. number | | UCRT15/1239 |
| Calibrator cal cert issued by | | ANV Measurement Systems |
| Calibrator SPL @ STP | 94.03 | dB Calibration reference sound pressure level |
| Calibrator frequency | 1001.86 | Hz Calibration check frequency |
| Reference level range | 25 - 130 | dB |

Accessories used or corrected for during calibration - Wind Shield WS-10

Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

| Environmental conditions during tests | Start | End | |
|---------------------------------------|-------|-------|------------|
| Temperature | 22.89 | 22.94 | ± 0.20 °C |
| Humidity | 49.4 | 49.1 | ± 3.00 %RH |
| Ambient Pressure | 98.81 | 98.92 | ± 0.03 kPa |

Response to associated Calibrator at the environmental conditions above.

| | | | | | |
|--|------|----|--------------------------|------|----|
| Initial indicated level | 94.3 | dB | Adjusted indicated level | 94.0 | dB |
| The uncertainty of the associated calibrator supplied with the sound level meter ± | | | | 0.10 | dB |

Self Generated Noise This test is currently not performed by this Lab.

| | | | |
|--|-----|----|-------------|
| Microphone installed (if requested by customer) = Less Than | N/A | dB | A Weighting |
| Uncertainty of the microphone installed self generated noise ± | N/A | dB | |

Microphone replaced with electrical input device - UR = Under Range indicated

| Weighting | A | | C | | Z | |
|--|------|----|------|----|------|----|
| | dB | UR | dB | UR | dB | UR |
| | 10.5 | UR | 15.3 | UR | 20.9 | UR |
| Uncertainty of the electrical self generated noise ± | | | | | 0.12 | dB |

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

END

Calibrated by: A Patel

R 1

Additional Comments

None



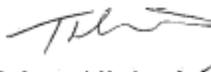
CERTIFICATE OF CALIBRATION

Date of Issue: 15 June 2015

Certificate Number: TCRT15/1165

Issued by:
 ANV Measurement Systems
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 17 Roebuck Way
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Page 1 of 2 Pages
 Approved Signatory


 M. Breslin [] K. Mistry [] J. Harriman [✓]

Acoustics Noise and Vibration Ltd trading as ANV Measurement Systems

Customer Parsons Brinckerhoff Ltd
 Queen Victoria House
 Redland Hill
 Bristol
 BS6 6US

Order No. Warranty Repair
Description Sound Level Meter / Pre-amp / Microphone / Associated Calibrator
Identification

| Manufacturer | Instrument | Type | Serial No. / Version |
|--------------|---------------------------------------|-------|----------------------|
| Rion | Sound Level Meter | NL-52 | 01021290 |
| Rion | Firmware | | 1.3 |
| Rion | Pre Amplifier | NH-25 | 21332 |
| Rion | Microphone | UC-59 | 04346 |
| Rion | Calibrator | NC-74 | 34536109 |
| | Calibrator adaptor type if applicable | | NC-74-002 |

Performance Class 1
Test Procedure TP 2.SLM 61672-3 TPS-49
Procedures from IEC 61672-3:2006 were used to perform the periodic tests.
Type Approved to IEC 61672-1:2002 YES Approval Number 21.21 / 13.02
If YES above there is public evidence that the SLM has successfully completed the applicable pattern evaluation tests of IEC 61672-2:2003
Date Received 10 June 2015 ANV Job No. TRAC15/06084
Date Calibrated 15 June 2015

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

| Previous Certificate | Dated | Certificate No. | Laboratory |
|----------------------|-----------------|-----------------|---------------------|
| | 16 January 2015 | 17777 | Campbell Associates |

This certificate provides traceability of measurement to recognised national standards, and to units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

CERTIFICATE OF CALIBRATION



Certificate Number

TCRT15/1165

Page 2 of 2 Pages

Sound Level Meter Instruction manual and data used to adjust the sound levels indicated.

| | | |
|--|-------------------------|---|
| SLM instruction manual title | Sound Level Meter | NL-42 / NL-52 |
| SLM instruction manual ref / issue | | 11-03 |
| SLM instruction manual source | Manufacturer | |
| Internet download date if applicable | | N/A |
| Case corrections available | | Yes |
| Uncertainties of case corrections | | Yes |
| Source of case data | Manufacturer | |
| Wind screen corrections available | | Yes |
| Uncertainties of wind screen corrections | | Yes |
| Source of wind screen data | Manufacturer | |
| Mic pressure to free field corrections | | Yes |
| Uncertainties of Mic to F.F. corrections | | Yes |
| Source of Mic to F.F. corrections | Manufacturer | |
| Total expanded uncertainties within the requirements of IEC 61672-1:2002 | Yes | |
| Specified or equivalent Calibrator | Specified | |
| Customer or Lab Calibrator | Lab Calibrator | |
| Calibrator adaptor type if applicable | | NC-74-002 |
| Calibrator cal. date | | 02 June 2015 |
| Calibrator cert. number | | UCRT15/1155 |
| Calibrator cal cert issued by | ANV Measurement Systems | |
| Calibrator SPL @ STP | 94.07 | dB Calibration reference sound pressure level |
| Calibrator frequency | 1001.88 | Hz Calibration check frequency |
| Reference level range | 25 - 130 | dB |

Accessories used or corrected for during calibration - Wind Shield WS-10

Note - if a pre-amp extension cable is listed then it was used between the SLM and the pre-amp.

| Environmental conditions during tests | Start | End | |
|---------------------------------------|--------|--------|------------|
| Temperature | 22.97 | 22.94 | ± 0.20 °C |
| Humidity | 35.1 | 35.4 | ± 3.00 %RH |
| Ambient Pressure | 101.26 | 101.25 | ± 0.03 kPa |

Response to associated Calibrator at the environmental conditions above.

| | | | | | |
|--|------|----|--------------------------|------|----|
| Initial indicated level | 94.1 | dB | Adjusted indicated level | 94.1 | dB |
| The uncertainty of the associated calibrator supplied with the sound level meter ± | | | 0.10 | | |

Self Generated Noise This test is currently not performed by this Lab.

| | | | |
|--|-----|----|-------------|
| Microphone installed (if requested by customer) = Less Than | N/A | dB | A Weighting |
| Uncertainty of the microphone installed self generated noise ± | N/A | dB | |

Microphone replaced with electrical input device - UR = Under Range indicated

| Weighting | A | C | Z |
|-----------|------|------|------|
| | 11.7 | 16.4 | 22.1 |
| | dB | dB | dB |
| | UR | UR | UR |

| | | |
|--|------|----|
| Uncertainty of the electrical self generated noise ± | 0.12 | dB |
|--|------|----|

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

For the test of the frequency weightings as per paragraph 12. of IEC 61672-3:2006 the actual microphone free field response was used.

The acoustical frequency tests of a frequency weighting as per paragraph 11 of IEC 61672-3:2006 were carried out using an electrostatic actuator.

END

Calibrated by: A Patel

R 1

Additional Comments

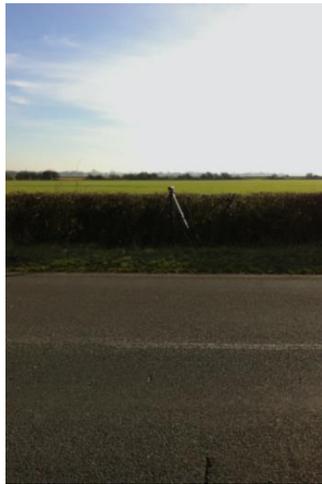
None

Noise Monitoring Form



| | | | |
|--------------------------------|-------------------|-------------------------------------|-------------------|
| Project: | A27 Arundel | Job Number: | 62105362 |
| Equipment: | NA-28 Sn 00632043 | Engineer: | Adam Price |
| Pre-Calibration Level: | 94 | General Weather Description: | Calm, Sunny & Dry |
| Post-Calibration Level: | 94 | Location: | ML 1 |

| Measurement Period | | Weather | | | Statistical Noise Levels / dB | | | | | Description of Audible Noise |
|--------------------|-----------------|------------------|-----------------------|------------------|-------------------------------|-------------------|-------------------|------------------|------------------|--|
| Date/Time | Elapsed Minutes | Wind Speed (m/s) | Wind Direction (from) | Temperature (°C) | L _{Aeq} | L _{Amax} | L _{Amin} | L _{A10} | L _{A90} | |
| 19/01/2016 10:05 | 60 | 0-1 | N | 1 | 69 | 90 | 40 | 81 | 44 | Dominated by road traffic noise on the A27 |
| 19/01/2016 11:05 | 60 | 0-1 | N | 1 | 70 | 90 | 38 | 81 | 44 | Dominated by road traffic noise on the A27 |
| 19/01/2016 12:05 | 60 | 0-1 | N | 2 | 70 | 88 | 34 | 82 | 41 | Dominated by road traffic noise on the A27 |



Noise Monitoring Form



| | | | |
|--------------------------------|-------------------|-------------------------------------|-------------------|
| Project: | A27 Arundel | Job Number: | 62105362 |
| Equipment: | NA-28 Sn 00632043 | Engineer: | Adam Price |
| Pre-Calibration Level: | 94.0 | General Weather Description: | Calm, Sunny & Dry |
| Post-Calibration Level: | 94.0 | Location: | ML 2 |

| Measurement Period | | Weather | | | Statistical Noise Levels / dB | | | | | Description of Audible Noise |
|--------------------|-----------------|------------------|-----------------------|------------------|-------------------------------|-------------------|-------------------|------------------|------------------|--|
| Date/Time | Elapsed Minutes | Wind Speed (m/s) | Wind Direction (from) | Temperature (°C) | L _{Aeq} | L _{Amax} | L _{Amin} | L _{A10} | L _{A90} | |
| 19/01/2016 13:55 | 60 | 0-1 | N | 3 | 72 | 92 | 45 | 79 | 62 | Dominated by road traffic noise on the A27 |
| 19/01/2016 14:55 | 60 | 0-1 | N | 2 | 73 | 85 | 48 | 79 | 64 | Dominated by road traffic noise on the A27 |
| 19/01/2016 15:55 | 60 | 0-1 | N | 1 | 73 | 83 | 49 | 78 | 66 | Dominated by road traffic noise on the A27 |



Noise Monitoring Form



| | | | |
|--------------------------------|-------------------|-------------------------------------|-------------------|
| Project: | A27 Arundel | Job Number: | 62105362 |
| Equipment: | NA-28 Sn 01021290 | Engineer: | Angela Lorenzo |
| Pre-Calibration Level: | 94.0 | General Weather Description: | Calm, Sunny & Dry |
| Post-Calibration Level: | 94.0 | Location: | ML 3 |

| Measurement Period | | Weather | | | Statistical Noise Levels / dB | | | | | Description of Audible Noise |
|--------------------|-----------------|------------------|-----------------------|------------------|-------------------------------|-------------------|-------------------|------------------|------------------|--|
| Date/Time | Elapsed Minutes | Wind Speed (m/s) | Wind Direction (from) | Temperature (°C) | L _{Aeq} | L _{Amax} | L _{Amin} | L _{A10} | L _{A90} | |
| 19/01/2016 11:22 | 60 | 0-1 | N | 1 | 64.6 | 75.4 | 49.1 | 67.2 | 58.9 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |
| 19/01/2016 12:22 | 60 | 0-1 | N | 1 | 64.7 | 76.8 | 46.7 | 67.2 | 59.2 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |
| 19/01/2016 13:22 | 60 | 0-1 | N | 2 | 65.7 | 94.0 | 44.8 | 67.0 | 58.3 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |



Noise Monitoring Form



| | | | |
|--------------------------------|-------------------|-------------------------------------|-------------------|
| Project: | A 27Arundel | Job Number: | 62105362 |
| Equipment: | NA-28 Sn 01021290 | Engineer: | Angela Lorenzo |
| Pre-Calibration Level: | 94.0 | General Weather Description: | Calm, Sunny & Dry |
| Post-Calibration Level: | 94.0 | Location: | ML4 |

| Measurement Period | | Weather | | | Statistical Noise Levels / dB | | | | | Description of Audible Noise |
|--------------------|-----------------|------------------|-----------------------|------------------|-------------------------------|-------------------|-------------------|------------------|------------------|--|
| Date/Time | Elapsed Minutes | Wind Speed (m/s) | Wind Direction (from) | Temperature (°C) | L _{Aeq} | L _{Amax} | L _{Amin} | L _{A10} | L _{A90} | |
| 19/01/2016 14:30 | 60 | 0-1 | S | 3 | 68 | 92 | 33 | 72 | 48 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |
| 19/01/2016 15:30 | 60 | 0-1 | S | 2 | 69 | 92 | 35 | 73 | 49 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |
| 19/01/2016 16:30 | 60 | 0-1 | S | 1 | 68 | 86 | 35 | 73 | 48 | Dominated by road traffic noise on the A27 with intermittent aircraft noise. |

