In Parliament – Session 2022 - 2023

HS2

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 1 and Additional Provision 1 Environmental Statement

Volume 5 Appendix: CT-003-00000

Alternatives report

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Department for Transport

High Speed Two (HS2) Limited has been tasked by the Department for Transport (DfT) with managing the delivery of a new national high speed rail network. It is a non-departmental public body wholly owned by the DfT.

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1.1 Background to High Speed Two (Crewe – Manchester) and the need for an SES1 and AP1 ES

1.1.1 The High Speed Rail (Crewe – Manchester) Bill ('the Bill') was submitted to Parliament together with an Environmental Statement (ES)[1] ('the main ES') in January 2022. If enacted by Parliament, the Bill will provide the powers to construct, operate and maintain the HS2 Phase 2b Western Leg.

1.1.2 The 'original scheme', that is the Bill scheme submitted to Parliament in January 2022, which was assessed in the main ES, included:

- the HS2 Phase 2b Western Leg from Crewe to Manchester, including:
  - new stations at Manchester Airport and Manchester Piccadilly;
  - a depot north of Crewe;
  - maintenance facilities north of Crewe and at Ashley; and
  - a connection onto the West Coast Main Line (WCML) near Bamfurlong;
- the Crewe Northern Connection, connecting the route of the Proposed Scheme with the WCML and enabling future Northern Powerhouse Rail (NPR) services to connect with HS2;
- provision for the NPR London to Liverpool, Manchester to Liverpool, and Manchester to Leeds junctions, to enable these future NPR routes to connect with HS2; and
- a number of works at locations beyond the Western Leg route corridor, referred to as 'off-route works' including:
  - works to enable HS2 trains to call at existing stations further north on the WCML; and
  - construction of depots to provide overnight stabling for HS2 trains serving the north of England and Scotland.

1.1.3 The original scheme connects with Phase 2a at Hough, to the south of Crewe.

1.1.4 The assessment of the original scheme assumes that construction will commence in 2025, with the start of operation in 2038. The Supplementary Environmental Statement 1 (SES1) and Additional Provision 1 Environmental Statement (AP1 ES) assume the same dates for the assessment.

[1] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement*. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

1.1.5 Changes made through the SES1 and AP1 ES do not change the principle of the original scheme in terms of provision of a route between Crewe and Manchester nor the essential components of the construction and operation of that scheme.

1.1.6 Following the deposit of the Bill, the need for a number of changes which do not require amendments to the Bill including design changes, changes to construction programme and assumptions, new environmental baseline information and corrections to the main ES have been identified. Any new, different or removed significant effects that are likely to result from these changes, where these do not require amendments to the Bill, are reported in the SES1.

1.1.7 There is also a requirement for amendments to the Bill to make changes to the original scheme and these require the submission of the AP1. The AP1 ES reports the likely significant environmental effects of these amendments, having considered the environmental information in the SES1.

1.1.8 These design changes and amendments have arisen through ongoing discussions with stakeholders and as a result of design refinements.

1.1.9 The SES1 and the AP1 ES are separate environmental statements but have been produced as combined volumes. Both the SES1 and AP1 ES provide an update to the main ES and should be read in conjunction with the main ES. The SES1 is presented first, and the AP1 ES follows and bases its comparison upon effects reported in the main ES, as amended by the SES1. The assessments also report any likely significant cumulative effects.

1.2 Purpose of this report

1.2.1 The consideration of reasonable alternatives forms a statutory requirement of Environmental Impact Assessment (EIA) reporting. The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[2] require an ES to include:

"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects."

[2] *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017* (SI 2017 No. 571), London, Her Majesty's Stationery Office. Available online at: http://www.legislation.gov.uk/uksi/2017/571/pdfs/uksi_20170571_en.pdf.

1.2.2 Further, as part of a requirement of the Bill, Parliamentary Standing Order 27A[3,4] requires:

"A report which identifies, describes and evaluates reasonable alternatives to the works authorised by the bill, taking into account the objectives and geographical scope of the bill."

1.2.3 This report describes the reasonable alternatives to the main elements of the SES1 changes and AP1 amendments which have been studied since the deposit of the main ES in January 2022. In each case, this report indicates the main reasons for selecting the chosen option over another, which ultimately resulted in the SES1 scheme and AP1 revised scheme.

[3] House of Commons (2019), *Standing Order 27A relating to private business (environmental assessment),* House of Commons. Available online at: https://www.parliament.uk/business/publications/commons/sessional-orders-private1/.

[4] House of Lords (2018), *Standing Orders - Private Business*, House of Lords. Available online at: https://www.parliament.uk/documents/publications-records/House-of-Lords-Publications/Standing-Orders-Private/privord02.pdf.

2 Alternatives considered for the SES1 scheme and AP1 revised scheme

2.1 Introduction

2.1.1 During the design development process for the Phase 2b Western Leg, a series of potential SES1 changes and AP1 amendments have been identified and reviewed by relevant specialists. A comparison was conducted of design options, which included consideration of:

- potential environmental impacts: the likely magnitude and nature of potential environmental impacts (e.g. noise and vibration, landscape and visual);
- engineering requirements: the degree of construction complexity of the alternatives and the impact this would have on construction durations; and
- cost: whether the alternatives would be more cost effective or incur additional costs.

2.1.2 The following sections detail the reasonable alternatives to the SES1 changes and AP1 amendments, and the main reasons for selecting the option to be taken forward into the SES1 scheme and AP1 revised scheme. Options have been reported in terms of whether they are reasonable against environmental impacts, engineering and construction feasibility, and cost. All dimensions in the following sections are approximate.

2.1.3 In considering the environmental impacts of the alternatives, all EIA topics have been considered, however, only those environmental topics where there is a potential for likely significant environmental impacts are reported for the alternatives considered. In accordance with the EIA Directive[5] (2014/52/EU) that was implemented by the Town and Country Planning (Environmental Impact Assessment) Regulations that came into force on 16 May 2017, the main reasons for selecting the chosen SES1 change or AP1 amendment are reported together with a comparison of the likely significant effects of the reasonable alternatives presented against the SES1 change or AP1 amendment. Detailed assessment of the SES1 scheme and AP1 revised scheme is presented in the SES1 and AP1 ES, Volume 2, Hough to Walley's Green (MA01), Wimboldsley to Lostock Gralam (MA02) and Pickmere to Agden and Hulseheath (MA03) Community Area reports.

[5] Official Journal of the European Union, *Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment* that was implemented by the Town and Country Planning (Environmental Impact Assessment) Regulations that came into force on 16 May 2017.

2.2 Hough to Walley's Green (MA01)

Additional land permanently required for the realignment and extension of Crewe tunnel (AP1-001-001)

2.2.1 Consideration has been given to the design of the realignment and extension of Crewe tunnel. This was to address the likely significant ground-borne noise and vibration effects at individual residential properties and to reduce the extent of the likely significant ground-borne noise and vibration effects on the residential community between the B5076 North Street and Parkers Road as the route emerges out of the Crewe tunnel north portal.

2.2.2 Four options were taken forward to an appraisal where environmental impacts, engineering and construction feasibility and cost were considered:

- Baseline option: the tunnel would be 6.2km in length, have an internal diameter of 8.8m and be fitted with slab track. The Crewe tunnel north portal would be porous, 150m in length and within a retained cutting 593m in length. The Crewe tunnel north portal auto-transformer station (28m by 27m in area) would be provided at the Crewe tunnel north portal, 150m north of Bradfield Road, including a railway telecommunications mast up to 15m in height. Middlewich Street vent shaft and headhouse would remain in the location reported in the main ES. The area for construction would be constrained by the Broughton Road housing development. The Crewe tunnel north main compound would be located to the south of Parkers Road and would result in the temporary closure of Parkers Road during construction;
- Option 1: the tunnel would have same horizontal alignment and length as the Baseline option but with a slightly increased internal tunnel diameter to 8.9m to accommodate a slab track with enhanced noise attenuation properties, to reduce ground-borne noise and vibration impacts. The Crewe tunnel north portal would be as per the Baseline option. Middlewich Street vent shaft and headhouse would be located as per the Baseline option. An auto-transformer station would be provided at the Crewe tunnel north portal, 150m north of Bradfield Road, including a railway telecommunications mast up to 15m in height. The Crewe tunnel north main compound would be located to the south of Parkers Road which would result in the temporary closure of Parkers Road during construction;
- Option 2b: the tunnel would be 6.5km in length, an increase of 308m at its northern end and be fitted with slab track, consistent with the Baseline option. The Crewe tunnel north portal would be porous and the same length (150m) as the Baseline option, located south of Parkers Road. The horizontal alignment of the tunnel would be further to the west by 11m with the Middlewich Street vent shaft and headhouse also moved to the west by approximately 8m towards the WCML. The retained cutting length would be reduced by 51m from the Baseline option. The internal diameter and internal fit out of the Crewe tunnel would be the same as the Baseline option. The construction compound

would be located at a site requiring land to the north and south of Parkers Road, with Crewe tunnel north main compound split across Parkers Road. Temporary closure of Parkers Road during construction would be required, for a slightly greater period than the Baseline option; and

- Option 3: the tunnel would be 6.8km in length, an increase of 620m at its northern end and be fitted with slab track, consistent with the Baseline option. The Crewe tunnel north portal would be located north-east of Parkers Road and would be extended by 25m, with the retained cutting extended by 33m. The horizontal rail alignment would be similar to the Baseline option but with a wider track separation from the WCML. The internal diameter and internal fit out of the Crewe tunnel would be the same as the Baseline option. The north portal auto-transformer station would be relocated to the new north portal location. The Crewe tunnel north main compound would be located at a site north of Parkers Road with no requirement for temporary closure of Parkers Road during construction.

2.2.3 Option 3 was taken forward into the AP1 revised scheme (refer to SES1 and AP1 ES Volume 2, MA01 Map Book: Map Series CT-06, maps CT-06-301 to CT-06-308a-R1). Option 1 was removed from further consideration as the slab track with enhanced noise attenuation properties was not proven for HS2 operational speeds.

2.2.4 Option 3 was selected as it will remove significant ground-borne noise and vibration effects at scattered individual residential properties and will affect fewer residential properties within the community between the B5076 North Street and Parkers Road, when compared to the other options.

2.2.5 Option 3 will allow retention of Bridge Farm, an undesignated heritage asset, which will avoid agricultural and historic environment impacts at this location. There will however be significant ground borne noise and vibration effects on this residential property.

2.2.6 Option 3 will have fewer community effects as a result of the Crewe tunnel north main compound being located to the north of Parkers Road, which will enable Parkers Road to remain open during construction and allow access to local facilities to be maintained during construction. Option 3 will also have fewer traffic and air quality impacts as a result of Parkers Road remaining open during construction and will avoid a 2.4km long traffic diversion that would be required under the other options.

2.2.7 Option 3 will have slightly lower visual impacts as the tunnel portal and associated structures will be moved to the north of Parkers Road, further away from residential properties. Option 3 will have a greater ecological impact due to the loss of ponds, in an area known to support a rare species of beetle (lesser silver water beetle), as a result of the movement of the north portal and Crewe tunnel north main compound to the north of Parkers Road. Option 3 will have a longer construction programme and will have the greatest cost in comparison to the other options.

2.2.8 Table 1 provides a summary of the outcomes of the appraisal of the alternative options compared to the AP1 revised scheme, as described above.

Table 1: Consideration of local alternatives for the realignment and extension of Crewe tunnel

Option	Outcome of analysis
Baseline option	Comparison of the Baseline option against the AP1 revised scheme: • significant ground-borne noise and vibration effects at scattered individual residential properties on the residential community between the B5076 North Street and Parkers Road; • substantially greater traffic impacts on local roads as a result of the temporary closure of Parkers Road during construction, which would cause traffic delays as a result of a 2.4km long diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • substantially greater air quality impacts on residential and non-residential properties along the B5076 North Street/Bradfield Road as a result of the temporary closure of Parkers Road during construction, requiring a 2.4km diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • greater community impacts on residential properties along Broughton Road and disruption to access to local facilities due to the Crewe tunnel north main compound being located to the south of Parkers Road and the temporary closure of Parkers Road during construction; • greater agricultural impact due to the removal of Bridge Farm; • greater historic environment impact due to the removal of Bridge Farm, an undesignated heritage asset; • fewer ecological impacts due to location of the Crewe tunnel north main compound to the south of Parkers Road, with no impact on ponds located to the north of Parkers Road, which are known to support a rare species of beetle (lesser silver water beetle); • slightly greater visual impact on receptors south of Parkers Road as a result of construction activity south of Parker Road; and • shorter construction programme and lower construction costs.
Option 1	Comparison of Option 1 against the AP1 revised scheme: • slightly greater ground-borne noise and vibration effects at scattered individual residential properties and ground-borne noise and vibration effects on the residential community between the B5076 North Street and Parkers Road; • substantially greater traffic impacts on local roads as a result of the temporary closure of Parkers Road during construction, which would cause traffic delays as a result of a 2.4km long diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • substantially greater air quality impacts on residential and non-residential properties along the B5076 North Street/Bradfield Road as a result of the temporary closure of Parkers Road during construction, requiring a 2.4km diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • greater community impacts on residential properties along Broughton Road and disruption to access to local facilities due to the Crewe tunnel north main compound being located to the south of Parkers Road and the temporary closure of Parkers Road during construction; • greater agricultural impact due to the removal of Bridge Farm; • greater historic environment impact due to the removal of Bridge Farm, an undesignated heritage asset; • fewer ecological impacts due to the location of the Crewe tunnel north main compound to the south of Parkers Road, with no impact on ponds located to the north of Parkers Road, which are known to support a rare species of beetle (lesser silver water beetle); • slightly greater visual impacts on receptors south of Parkers Road as a result of construction activity south of Parker Road; and • shorter construction programme and lower construction costs.
Option 2b	Comparison of Option 2b against the AP1 revised scheme:

Option	Outcome of analysis
	• similar removal of significant ground-borne noise and vibration effects at scattered individual residential properties and similar ground-borne noise and vibration effects on the residential community between the B5076 North Street and Parkers Road; • substantially greater traffic impacts on local roads as a result of the temporary closure of Parkers Road during construction, which would cause traffic delays as a result of a 2.4km long diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • substantially greater air quality impacts on residential and non-residential properties along the B5076 North Street/Bradfield Road as a result of the temporary closure of Parkers Road during construction, requiring a 2.4km diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road; • greater community impacts on residential properties along Broughton Road and disruption to access to local facilities due to the Crewe tunnel north main compound being split to the north and south of Parkers Road requiring temporary closure during construction; • greater agricultural impact due to the removal of Bridge Farm; • greater historic environment impact due to the removal of Bridge Farm, an undesignated heritage asset; • similar ecological impacts as ponds in the area, known to support a rare species of beetle (lesser silver water beetle), may be impacted by the partial movement of the Crewe tunnel north main compound north of Parkers Road; • slightly greater visual impacts during construction on views from Bradfield Road as the construction compound moves partly north of Parkers Road; and • slightly shorter construction programme and lower construction costs overall.
Option 3 (the AP1 revised scheme)	Comparison of the AP1 revised scheme against the alternatives: • removal of significant ground-borne noise and vibration effects at scattered individual residential properties and fewer residential properties subject to a significant ground-borne noise and vibration community effect between the B5076 North Street and Parkers Road, when compared to the Baseline option, Option 1 and Option 2b. There would be new significant ground-borne noise and vibration effects at Bridge Farm as this property would be retained under this option; • substantially less traffic impacts as Parkers Road will not be closed during construction which will avoid traffic delays as a result of a 2.4km long diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road, when compared to the Baseline option, Option 1 and Option 2b; • substantially less air quality impacts on residential and non-residential properties along the B5076 North Street/Bradfield Road as Parkers Road will not be closed during construction which will avoid a 2.4km diversion, via Groby Road, Remer Street and the B5076 North Street/Bradfield Road, when compared to the Baseline option, Option 1 and Option 2b; • fewer community impacts on residential properties along Broughton Road and no disruption to access to local facilities as a result of Parkers Road remaining open during construction, when compared to the Baseline option, Option 1 and Option 2b; • less agricultural impact from loss of agricultural holdings as Bridge Farm will not need to be removed, in comparison to the Baseline option, Option 1 and Option 2b; • less historic environment impact as Bridge Farm, an undesignated heritage asset, will be retained, in comparison to the Baseline option, Option 1 and Option 2b; • slightly less visual impacts due to a reduction in the numbers of receptors impacted, as a result of the relocation of the tunnel portal and construction compound north of Parkers Road, when compared to the Baseline option, Option 1 and Option 2b; • greater ecological impacts as ponds in the area, known to support a rare species of beetle (lesser silver water beetle), may be impacted by the movement of the construction compound to the north of Parkers Road, when compared to the Baseline option and Option 1. Similar ecological impacts when compared to Option 2b; and

Option	Outcome of analysis
	• longer construction programme and higher construction costs, when compared to the Baseline option, Option 1 and Option 2b.

2.2.9 As a result of further design development following the detailed appraisal described above for the realignment and extension of Crewe tunnel, which includes the relocation of the north portal, further studies were completed. These studies were undertaken to assess the track location at Crewe tunnel south portal, aerodynamics to mitigate significant airborne noise effects at the Crewe north porous portal[6] and maintenance access points and safe walking routes. The following is a summary of the findings for these additional studies:

- a study was undertaken to review the track location at Crewe tunnel south portal. The study reviewed the proposed alignment change at the HS2 Phase 2a and Phase 2b Western Leg interface and the compatibility with the Phase 2b alignment and Phase 2b south portal structures. As a result, the Crewe tunnel alignment was moved by 1.6m to the east to tie into the Phase 2a alignment and this ensured the porous portal will fit into the retained cutting provided as part of Phase 2a. There will be no additional adverse environmental impacts as a result of this change;
- an aerodynamics study was undertaken and recommended that the Crewe north porous portal be extended by a further 25m, from 150m to 175m and that the Crewe south porous portal be extended in length by 100m, from 150m to 250m, to mitigate significant airborne noise effects at the Crewe north porous portal. The extension of the Crewe south portal will also be incorporated into the HS2 Phase 2a alignment at the south portal interface. There will be no additional adverse environmental impacts as a result of this change; and
- a study was undertaken to review access points and safe walking routes between the WCML and the southernmost access from the relocated Crewe tunnel north portal. The relocation of the Crewe tunnel north portal to the north of Parkers Road means that a new access arrangement will be required to the new location of the portal and laydown areas[7] on the WCML depot line. This required the extension of the tunnel by 34m to the north. There will be no additional adverse environmental impacts as a result of this change.

2.2.10 These design updates do not change the outcome of the appraisal described above or the selection of the options taken forward into the AP1 revised scheme.

[6] Significant airborne noise can be generated at exit tunnel portals due to pressure waves created inside a tunnel as a train enters the tunnel.

[7] A laydown area is an area used for the receipt, temporary storage and sometimes for the assembly of construction equipment and other supplies.

Middlewich Street vent shaft – horizontal fan configuration (part of AP1-001-001)

2.2.11 Following the realignment and extension of Crewe tunnel being taken forward into the AP1 revised scheme as described above, further consideration was given to the configuration of ventilation fans for the Middlewich Street vent shaft. Opportunities to improve the vertical configuration of the Middlewich Street vent shaft were considered, which included the provision of horizontally orientated fans, the resulting potential for reducing the diameter and depth of the main vent shaft and a reduction from three fans to two, where feasible.

2.2.12 Three options were taken forward to a detailed appraisal where environmental impacts, engineering and construction feasibility and cost were considered for the Middlewich Street vent shaft:

- Baseline option – a circular vent shaft (24m internal diameter) and a circular vent shaft headhouse (internal diameter 32.6m, 7.3m high), with three ventilation fans orientated vertically within the vent shaft;
- Option A – a circular vent shaft (17m internal diameter), a rectangular vent shaft basement fan room (60.3m length, 33.4m width and 7m deep) and headhouse (33.4m length, 25m width and 4m high) both orientated parallel to the HS2 tunnels, with two horizontally orientated fans located in the shallow basement fan room; and
- Option B – a circular vent shaft (17m internal diameter), a rectangular vent shaft basement fan room (64.7m length, 33.4m width and 7m deep) and headhouse (33.4m length, 25m width and 4m high) both rotated 30 degrees to the HS2 tunnels to better align with the informal open space and adjacent urban context, with two horizontally orientated fans located in the shallow basement fan room.

2.2.13 Option A was taken forward to the AP1 revised scheme (see SES1 and AP1 ES Volume 2, MA01 Map Book: Map Series CT-06, maps CT-06-301 to CT-06-308a-R1) as this arrangement will provide greater operational efficiency and flexibility for maintenance. The horizontally arranged fans will simplify the ventilation flow by having the ventilation fans oriented parallel to the Crewe tunnel fan room structure with the vent shaft headhouse 3.3m lower in height than the Baseline option for Option A and Option B. Option A will have greater landscape and visual, and recreational impacts on the local community, Bentley Care Home and adjacent residential properties when compared to the Baseline option as the rectangular headhouse building will have a larger plan area, will be closer to the properties and will occupy a greater area of the informal open space. Option A will have slightly lower construction costs to the Baseline option but will be similar to Option B.

2.2.14 Table 2 provides a summary of the outcomes of the appraisal of the alternative options compared to the AP1 revised scheme, as described above.

Table 2: Consideration of local alternatives for Middlewich Street vent shaft – horizontal fan configuration

Option	Outcome of analysis
Baseline option	Comparison of the Baseline option against the AP1 revised scheme: • less operational efficiency and flexibility for maintenance of the ventilation fans; • lower recreational impacts on the local community and the Bentley Care Home as there would be less land required from the informal open space; • lower visual impacts on adjacent residential properties and the Bentley Care Home due to the smaller plan area of the circular headhouse; and • slightly higher construction costs.
Option A (the AP1 revised scheme)	Comparison of the AP1 revised scheme with the alternative options: • greater operational efficiency and flexibility for maintenance of the horizontally arranged ventilation fans within a vent shaft and rectangular headhouse positioned parallel to Crewe tunnel when compared to the Baseline option; slightly greater operational efficiency and flexibility compared to Option B due to the vent shaft fan room and headhouse being orientated parallel to the Crewe tunnel; • greater recreational impacts on the local community, Bentley Care Home and adjacent residential properties due to the larger plan area of the rectangular headhouse which will result in a greater loss of informal open space when compared to the Baseline option. Slightly lower recreational impacts when compared to Option B as the rectangular headhouse plan area is slightly smaller; • slightly greater visual impacts on adjacent residential properties and the Bentley Care Home when compared with the Baseline option associated with the larger plan area of the rectangular headhouse. Similar visual impacts on adjacent residential properties and the Bentley Care Home when compared to Option B; and • slightly lower construction costs than the Baseline option, but similar costs to Option B.
Option B	Comparison of Option B against the AP1 revised scheme: • slightly less operational efficiency and flexibility for maintenance of the horizontally arranged ventilation fans with the vent shaft and rectangular headhouse rotated 30 degrees to the Crewe tunnel; • slightly greater recreational impacts on the local community, adjacent residential properties and the Bentley Care Home due to the rectangular headhouse building being slightly bigger and requiring slightly more land which would have increased loss of informal open space; • similar visual impacts on adjacent residential properties and the Bentley Care Home associated with the larger plan area of the rectangular headhouse; and • similar construction costs.

Provision of landscape earthworks and enhancement of landscape mitigation north of Crewe (AP1-001-006, AP1-001-007 and SES1-002-001)

2.2.15 Following the adoption of the realignment and extension of Crewe tunnel (AP1-001-001) into the AP1 revised scheme outlined above, consideration was given to the potential for the provision of landscape earthworks and enhancement of landscape mitigation within locations north of Crewe. Opportunities were considered to reduce landscape and visual impacts at specific locations and for the reuse of excavated material generated during

construction of the realigned and extended Crewe tunnel to provide new or reprofiled landscape earthworks in these locations.

2.2.16 The following two options were taken forward to a detailed appraisal where environmental impacts, engineering and construction feasibility and cost were considered:

- Modified baseline option: no enhanced or new landscape earthworks would be provided, and all excavated material generated from the Crewe tunnel realignment and extension, totalling around 362,000m^3, would be removed via rail from temporary construction sidings at the Crewe North rolling stock depot (RSD), for disposal at landfill;
- Option 4: around 347,000m^3 of excavated material generated from the Crewe tunnel realignment and extension would be used for enhanced landscape earthworks, with around 15,000m^3 of excavated material removed by road for disposal at landfill. The temporary construction sidings at the Crewe North RSD would not be required for this option. Landscape earthworks and enhanced landscape mitigation would be provided at eight separate locations, as follows:
  - within the Hough to Walley's Green area (MA01):
    - Location 3: landscape earthworks near Moss Farm, Coppenhall Moss; and
    - Location 6: landscape earthworks adjacent to Minshull Vernon 8/1 accommodation overbridge (AP1-001-006).
  - at Wimboldsley, within the Wimboldsley to Lostock Gralam area (MA02):
    - Location 8: enhancement of landscape mitigation near Manor Cottage;
    - Location 9: enhancement of landscape mitigation near Rose Cottage;
    - Location 10: enhancement of landscape mitigation at Walley's Green embankment (SES1-002-001);
    - Location 26: landscape earthworks adjacent to Coppenhall Moss north embankment (AP1-001-007);
    - Location 27a: landscape earthworks near Stanthorne Park Mews; and
    - Location27b: landscape earthworks near Leahead Cottages.
- Option 5: around 103,000m^3 of excavated material generated from the Crewe tunnel realignment and extension would be used to provide landscape earthworks and enhanced landscape mitigation, with around 259,000m^3 of excavated material removed via rail from the temporary construction sidings at the Crewe North RSD for disposal at landfill. Landscape earthworks and enhanced landscape mitigation would be provided at three separate locations, as follows:
  - within the Hough to Walley's Green area (MA01):
    - Location 6: landscape earthworks adjacent to Minshull Vernon 8/1 accommodation overbridge (AP1-001-006); and
    - Location 26: landscape earthworks adjacent to Coppenhall Moss north embankment (AP1-001-007).
  - within the Wimboldsley to Lostock Gralam area (MA02):

- Location 10: enhancement of landscape mitigation at Walley's Green embankment (SES1-002-001).

2.2.17 Option 5 was taken forward into the AP1 revised scheme (refer to SES1 and AP1 ES Volume 2, MA01 Map Book: Map Series CT-06, maps CT-06-301 to CT-06-308a-R1 and MA02 Map Book: Map Series CT-06, maps CT06-308b to CT06-316a). This is because on balance, it will have less landscape and visual impacts compared to the Modified baseline option and will provide landscape earthworks at three separate locations, but it will have slightly greater landscape and visual impacts compared to Option 4. Option 5 will have less traffic impacts associated with fewer construction traffic movements on the local highway network than Option 4 and will have less impact on the conventional rail network because it will require fewer possessions and blockades when compared to the Modified baseline option. Option 5 will also have less waste impacts when compared to the Modified baseline option as less excavated materials will be disposed to landfill but will have a greater impact than Option 4, which has the smallest volume of excavated material requiring disposal to landfill.

2.2.18 Option 5 will require a greater area of land compared to the Modified baseline option to accommodate the landscape earthworks but would require less land than Option 4. Option 5 will provide greater construction flexibility than Option 4 as a result of the retention of the Crewe North RSD temporary construction sidings. Option 5 will have a greater construction cost than Option 4 due to the retention of the Crewe North RSD temporary construction sidings and disposal of excavated materials to landfill but will have a lower construction cost when compared to the Modified baseline option.

2.2.19 Table 3 provides a summary of the outcomes of the appraisal of the alternative options compared to the AP1 revised scheme, as described above. A summary is also provided of the AP1 revised scheme compared to the reasonable alternative options considered.

Table 3: Consideration of local alternatives for provision of landscape earthworks and enhanced landscape mitigation

Option	Outcome of analysis
Modified baseline option	Comparison of the Modified baseline option against the AP1 revised scheme: • greater landscape and visual impacts, with the engineered slopes and infrastructure appearing more prominent from several scattered residential receptors and recreational routes between the northern fringe of Crewe and the Crewe North RSD, as no enhanced landscape earthworks would be provided; • greater transport impacts as all excavated material would be removed by rail from the Crewe North RSD temporary construction sidings for disposal at landfill, with an impact on the conventional rail network from the need for a greater number of possessions and blockades; • similar impacts to the historic environment, with no additional landscape earthworks required within the vicinity of the non-designated heritage assets at Dairy House Farm and Leahead Cottages; • less noise impacts as there would be no construction of additional landscape earthworks at the three locations; • similar impacts on water resources and flood risk; • greater waste impact due to the disposal of a greater volume of excavated material to landfill;

Option	Outcome of analysis
	• less land use impact as this option would not require any additional land; • similar level of construction flexibility with the retention of the Crewe North RSD temporary construction sidings; • similar construction programme; and • greater construction costs to provide the Crewe North RSD temporary construction sidings and for disposal of all excavated materials to landfill.
Option 4	Comparison of Option 4 against the AP1 revised scheme: • less landscape and visual impacts, providing landscape enhancement at eight separate locations between the northern fringe of Crewe and the Crewe North RSD; • greater traffic impacts due to the excavated materials being removed for disposal from the site by heavy goods vehicles (HGV) using the public highway network, with no impacts on the conventional rail network as no train movements required; • greater historic environment impacts at Dairy House Farm and Leahead Cottages, as the landscape earthworks at Location 27a and 27b would increase the visual separation from and loss of these assets' agricultural setting; • greater noise impacts at Manor Cottage, Rose Cottage and in the vicinity of Stanthorne Park Mews associated with the construction of the earthworks; • greater water resource and flood risk impacts as Location 3 results in additional loss of 70m of Tributary of Fowler Brook 1; • less waste impacts as this option requires the smallest volume of excavated material to be disposed to landfill; • larger area of land required to accommodate Locations 26, 27a and 27b; • substantially less construction flexibility due to the removal of the Crewe North RSD construction sidings; • similar construction programme; and • lower construction costs, as this option does not require the Crewe North RSD temporary construction sidings and requires the disposal of the smallest volume of excavated material to landfill.
Option 5 (the AP1 revised scheme)	Comparison of the AP1 revised scheme with the alternative options: • less landscape and visual impacts compared to the Modified baseline option due to enhanced landscape earthworks at three separate locations, but slightly greater impacts compared to Option 4 as fewer locations provided with enhanced landscape earthworks will be provided; • less traffic impacts on the public highway network when compared with Option 4 as excavated materials for disposal will be removed via rail from the Crewe North RSD temporary construction sidings. Greater transport impacts on the conventional rail network than Option 4 due to the need to dispose of excavated materials by rail but less transport impacts on the conventional rail network when compared to the Modified baseline option as the number of possessions and blockades required to dispose of excavated material off-site would be lower; • less impacts to the historic environment when compared with Option 4 which would have impacts at Dairy House Farm and Leahead Cottages. Similar historic environment impacts when compared to the Modified baseline option; • less noise impacts when compared with Option 4, as there is no additional work proposed in proximity to Manor Cottage, Rose Cottage and in the vicinity of Stanthorne Park Mews. Similar noise impacts when compared to the Modified baseline option; • less impacts on water resources and flood risk when compared with Option 4 which would have impacts at Coppenhall and Park Hall but similar impacts to the Modified baseline option;

Option	Outcome of analysis
	• less waste impacts when compared to the Modified baseline option due to a reduced quantity of excavated materials for disposal. Greater waste impacts when compared to Option 4 due to a larger volume of excavated materials requiring disposal to landfill; • small increase in land required for construction compared to the Modified baseline option to accommodate Location 26 but requires a smaller amount of additional land when compared to Option 4; • greater construction flexibility due to the retention of the Crewe North RSD temporary construction sidings compared to Option 4 but similar construction flexibility to the Modified baseline option; • similar construction programme compared to the Modified baseline option and Option 4; and • greater construction cost due to the retention of the Crewe North RSD temporary construction sidings and a greater volume of excavated material requiring off-site disposal to landfill compared to Option 4. Less construction cost than the Modified baseline due to a smaller volume of excavated material being disposed off-site to landfill.

Additional land permanently required for the provision of a power supply to Crewe tunnel (AP1-001-002)

2.2.20 Consideration was given to the design of two permanent below ground 33kV power supply cables for the Crewe tunnel laid within the existing highway, footpath or verge, routed via Pyms Lane, a private road which forms part of the Bentley Motors site. Pyms Lane has recently been modified as part of the Bentley Motors site expansion works and the impacts of routing the power supply cables along this road have been considered. In addition, consideration was given to the impacts on the power supply cable route as a result of the revised location of the Crewe tunnel north portal.

2.2.21 Five options were taken forward to an appraisal where environmental impacts, engineering and construction feasibility, and cost were considered:

- Baseline option: two below ground 33kV power supply cables, 4.9km in length, routed via the A530 Middlewich Road, Pyms Lane and Badger Avenue. This option would require additional land for construction along Broughton Road. The cable would be routed via Pyms Lane, which has been recently modified as part of the Bentley Motors site expansion works;
- Option 2a: two below ground 33kV power supply cables, 4.2km in length, routed via the A530 Middlewich Road and Parkers Road, which would cross over the WCML via Parkers Road bridge. This option would require land for construction along the A530 Middlewich Road and Bradfield Road/Parkers Road and phased temporary road closures during construction. This option would avoid Pyms Lane and the Bentley Motors site expansion works;
- Option 2b: two below ground 33kV power supply cables, 5.4km in length, routed via the A530 Middlewich Road and Bradfield Road, which would cross over the WCML via Bradfield Road bridge. This option would require land for construction along the A530

Middlewich Road, Bradfield Road and Broughton Road and phased temporary road closures during construction. This option would avoid Pyms Lane and the Bentley Motors site expansion works;

- Option 3a: two below ground 33kV power supply cables, 5km in length, routed via a new access to Halton Drive, Sunnybank Road, West Street, Bowen Cooke Avenue, Badger Avenue, Underwood Lane, Bradfield Road and Broughton Road. Phased temporary road closures during construction would be required. This option would cross the existing Chester Line (railway) via the existing A532 road bridge and would require land for construction between Halton Drive and Badger Lane and along Broughton Road. This option would avoid Pyms Lane and the Bentley Motors site expansion works; and
- Option 3b: two below ground 33kV power supply cables, 4.9km in length, routed via a new access to Halton Drive, Sunnybank Lane, West Street, the A532 Middlewich Road and Underwood Lane. Phased temporary road closures during construction would be required. This option would cross the existing North Wales Coast Line via the existing A532 Middlewich Road bridge and would require land for construction between Halton Drive and Badger Lane and along Broughton Road. This option would avoid Pyms Lane, and the Bentley Motors site expansion works.

2.2.22 Option 3a was taken forward into the AP1 revised scheme (refer to Volume 2, MA01 Map Book: Map Series CT-06, maps CT-06-301 to CT-06-308a-R1) as it will avoid the socio-economic impacts associated with the use of Pyms Lane and possible disruption to the Bentley Motors site expansion works. Option 3a will also have less temporary traffic impacts during construction when compared to the Baseline option, Option 2a and Option 2b by avoiding the use of the A530 Middlewich Road and the blue light emergency services route to Leighton Hospital. Option 3a will also have less temporary traffic and socio-economic impacts than Option 3b as it avoids use of Underwood Lane and possible disruption to the Underwood West Academy. Option 3a will have greater impacts on ecology and greater landscape and visual impacts when compared to the Baseline option, Option 2a and Option 2b due to permanent tree and vegetation loss at Christleton Avenue, with similar impacts to Option 3b. Option 3a will require more land adjacent local highways, within the footpath or verge, for construction, compared to the Baseline option, with similar impacts to options 2a, 2b and 3b.

2.2.23 Table 4 provides a summary of the outcomes of the appraisal of the alternative options compared to the AP1 revised scheme.

Table 4: Consideration of local alternatives for provision of a power supply to Crewe tunnel

Option	Outcome of analysis
Baseline option	Comparison of Baseline option against the AP1 revised scheme: • greater socio-economic impacts associated with the use of Pyms Lane and possible disruption to the Bentley Works site expansion. There will be no temporary socio-economic impacts associated with possible disruption to Underwood West Academy through avoiding Underwood Lane; • greater temporary traffic impacts on A530 Middlewich Road and the blue light route to Leighton hospital and will require crossing of Leighton Brook and a public right of way (PRoW) (Crewe FP18/1);

Option	Outcome of analysis
	• fewer impacts on ecology and landscape as the route would be largely within the highway; • less areas of land within the footpath or verge adjacent highways required during construction; and • similar construction programme.
Option 2a	Comparison of Option 2a against AP1 revised scheme: • similar socio-economic impacts by the avoidance of Pyms Lane and possible disruption to Bentley Motors site expansion works. There will be no temporary socio-economic impacts associated with possible disruption to Underwood West Academy through avoiding Underwood Lane; • greater temporary traffic impacts on the A530 Middlewich Road and will require crossing of Leighton Brook and a PRoW (Leighton FP 8/1); • fewer impacts on ecology and landscape as the route would be largely within the highway; • less area of land within the footpath or verge required along A530 Middlewich Road and Bradfield Road/Parkers Road during construction; and • similar construction programme.
Option 2b	Comparison of Option 2b against the AP1 revised scheme: • similar socio-economic impacts by avoidance of Pyms Lane and possible disruption to Bentley Motors site expansion works. There will also be temporary socio-economic impacts associated with possible disruption to Underwood West Academy through avoiding Underwood Lane; • greater temporary traffic impacts on the A530 Middlewich Road; • fewer impacts on ecology and landscape as the route would be largely within the highway; • less area of land within the footpath or verge required along the A530 Middlewich Road and Bradfield Road/Parkers Road during construction; and • similar construction programme.
Option 3a (the AP1 revised scheme)	Comparison of the AP1 revised scheme against the alternative options: • fewer socio-economic impacts when compared to the Baseline option by avoidance of Pyms Lane and possible disruptioan to Bentley Motors site expansion works. Similar socio-economic impacts to options 2a, 2b and 3b. No temporary socio-economic impacts associated with possible disruption to Underwood West Academy by the avoidance of Underwood Lane; • less temporary traffic impacts when compared to the Baseline option, option 2a and 2b by avoiding use of the A530 Middlewich Road and the blue light emergency services route to Leighton Hospital and less temporary traffic impacts when compared to Option 3b by avoiding the use of Underwood Lane; • greater impacts on ecology and landscape when compared to the Baseline option, Option 2a and 2b due to permanent tree and vegetation loss at Christleton Avenue for maintenance and access to power cables. Similar ecology and landscape impacts when compared to Option 3b; • greater area of land within the footpath or verge required between Halton Drive and Badger Lane and along Broughton Road for construction compared to the Baseline option, but less area of land required when compared to Options 2a, 2b and 3b; and • similar construction programme to the Baseline option and Options 2a, 2b and 3b.
Option 3b	Comparison of Option 3b against the AP1 revised scheme: • similar socio-economic impacts by avoidance of Pyms Lane and possible disruption to Bentley Motors site expansion works. Greater temporary socio-economic impacts associated with possible disruption to Underwood West Academy through the use of Underwood Lane during construction;

Option	Outcome of analysis
	• greater temporary traffic impacts on Underwood Lane which provides primary access to the Underwood West Academy. Similar traffic impacts by avoiding use of the A530 Middlewich Road and the 'blue light' route to Leighton Hospital; • similar impacts on ecology and landscape due to permanent tree and vegetation loss at Christleton Avenue for maintenance and access to power cables; • less area of land within the footpath or verge required between Halton Drive and Badger Lane and along Broughton Road for construction; and • similar construction programme.

2.3 Pickmere to Agden and Hulseheath (MA03)

Removal of the HS2 West Coast Main Line (WCML) connection (SES1-004-001)

2.3.1 The HS2 WCML connection near Hoo Green junction on the HS2 network to the Lily Lane junction, near Golborne has been removed. As a result, modifications to the existing WCML for the HS2 WCML connection, as reported in the main ES, would no longer be required. Opportunities were considered to provide the necessary infrastructure to facilitate the future delivery of a northern connection to the WCML and the benefits that future connection would bring.

2.3.2 The following three options were taken forward to a detailed appraisal where environmental impacts, engineering and construction feasibility, and cost were considered:

- Option A: the connection would extend as far as Hoo Green junction, would require some re-profiling of the cutting slope to match existing ground levels at its end and a cable connection to the Peacock Lane auto-transformer feeder station (ATFS) located approximately 600m to the north. Peacock Lane would be realigned at existing ground level, north of the end point for Option A;
- Option B: the connection would extend approximately 600m from Hoo Green junction, be at existing ground level and would end adjacent to and require a short connection to the Peacock Lane ATFS. Peacock Lane would be realigned at existing ground level, immediately north of the end point for Option B; and
- Option C: the connection would extend approximately 1.7km from the Hoo Green cutting, ending on the southern side of the M56 and require a short connection to the Peacock ATFS as for Option B. Peacock Lane would be diverted and cross Option C on an overbridge. Millington Clough aqueduct and the substructures/abutments for the Northern Powerhouse Rail (NPR) Manchester to Liverpool junction overbridge would both be constructed and cross over Option C. Agden Lane would be permanently closed.

2.3.3 Option B was taken forward into the SES1 scheme. This is because Option B will provide the best balance between costs and infrastructure provision at and around Hoo Green junction for any future connection to the WCML at this location. Option B will end near Peacock Lane ATFS and, like Option C, all infrastructure (trackwork, signalling, electrification) at Hoo Green

junction and the earthworks will be installed in full as far as Peacock Lane ATFS. This will reduce the need, as for Option A, to work around the Peacock Lane ATFS cable routing should a future connection to the WCML be constructed at this location. Option B will cost less to construct than Option C and will not require the construction of the route further north in cutting, the Peacock Lane overbridge, Millington Clough aqueduct and NPR Manchester to Liverpool junction overbridge substructures/abutments, all of which will require maintenance until a future connection to the WCML is constructed.

2.3.4 Option B, like Option C, will have greater impacts on ecology during construction compared to Option A as two ponds and an area of priority woodland habitat will be lost. Option B will have greater impacts on water resources compared to Option A. This is because two ponds will be lost and a watercourse culvert will be required, but there will be fewer impacts than Option C as Millington Clough will not be realigned into an aqueduct. Option B will have similar impacts on an agricultural holding compared to Option A as two agricultural buildings near Agden Lane will not require demolition as required for Option C. Option B will also have similar historic environment impacts to Option A, but fewer than Option C as it will avoid the loss of fields and the associated setting impacts on the Grade II listed Ovenback Cottage on Agden Lane. Like Option B, Option A, will have fewer visual impacts along Agden Lane compared to Option C. Option B will be more complex, take longer and cost more to construct than Option A, but will be less complex, take less time and cost less to construct than Option C.

2.3.5 Table 5 provides a summary of the outcomes of the appraisal of the alternative options compared to the SES1 scheme, as described above.

Table 5: Consideration of local alternatives for the removal of the HS2 WCML connection

Option	Outcome of analysis
Option A	Comparison of Option A against the SES1 scheme: • less impacts on ecology as two ponds and an area of priority woodland habitat would be avoided; • less impacts on water resources as two ponds would be avoided, and a watercourse culvert would not be required; • similar impact on an agricultural holding as two agricultural buildings near Agden Lane would not require demolition; • similar historic environment impacts as the loss of fields and the associated setting impacts on the Grade II listed Ovenback Cottage on Agden Lane would be avoided; • similar visual impacts along Agden Lane; • least complex to construct overall, but would require a 600m long cable connection to the Peacock Lane ATFS which would require ongoing maintenance and protection; and • shorter construction programme due to Option A being the shortest option.
Option B (the SES1 scheme)	Comparison of the SES1 scheme with the alternative options: • greater impacts on ecology during construction compared to Option A as two ponds and an area of priority woodland habitat will be lost. Similar impacts on ecology during construction compared to Option C; • greater impacts on water resources compared to Option A as two ponds will be lost and a watercourse culvert will be required, but fewer impacts than Option C as Millington Clough will not be realigned into an aqueduct;

Option	Outcome of analysis
	• similar impact on an agricultural holding compared to Option A as two agricultural buildings near Agden Lane will not require demolition, as they will be for Option C; • similar historic environment impacts to Option A, and fewer impacts than Option C as the loss of fields and the associated setting impacts on the Grade II listed Ovenback Cottage on Agden Lane will be avoided; • similar visual impacts along Agden Lane compared to Option A, but fewer impacts than Option C; • more complex to construct than Option A as a longer route, but less complex to construct and shorter than Option C. Will not require a 600m connection to Peacock Lane ATFS and associated maintenance as for Option A; and • longer construction programme than Option A, shorter construction programme than Option C.
Option C	Comparison of Option C against the SES1 revised scheme: • similar impacts on ecology during construction as two ponds and an area of priority woodland habitat would be lost; • greater impacts on water quality as the Millington Clough aqueduct would be required in addition to a watercourse culvert and the loss of two ponds; • greater impact on an agricultural holding as two agricultural buildings near Agden Lane would require demolition; • greater historic environment impacts as the loss of fields would adversely affect the setting of the Grade II listed Ovenback Cottage on Agden Lane; • greater visual impacts for residential properties in and around Agden Lane due to the presence of the route closer to residential properties; • greater construction complexity as Option C would be longer, have larger earthworks and would be crossed by the Peacock Lane overbridge, the NPR Manchester to Liverpool junction overbridge abutments and the Millington Clough aqueduct. Similar to Option B, Option C would not require a 600m connection to Peacock Lane ATFS and associated maintenance as for Option A; and • longer construction programme because Option C would be longer and require the installation of more infrastructure.

Change to the diversion of a Scottish Power 132kV underground route, near Belt Wood (SES1-003-001)

2.3.6 Consideration was given to the design of a 4.1km long diversion of a Scottish Power 132kV power line, extending from Bucklow Hill Lane/Hulseheath Lane junction to the southern connection with the existing line within and in the vicinity of Belt Wood. The diversion would result in the permanent loss of 2.9ha (22%) of deciduous woodland from Belt Wood, a Local Wildlife Site (LWS) and a further loss of 400m^2 (0.7%) of Belt Wood Ancient Woodland Inventory (AWI) site that is not within the LWS. Opportunities were considered to reroute the diversion to avoid the impacts on the area of the Belt Wood AWI site that would be lost as a result of the diversion.

2.3.7 There will be no change in the area of deciduous woodland lost from the LWS reported in the main ES as these areas will be affected by other proposed utility diversions.

2.3.8 Two options were taken forward to a detailed appraisal where environmental impacts, engineering and construction feasibility and cost were considered:

- Baseline option: diversion of the overhead power cable route, 4.1km length, suspended between six new pylons that would cross directly over and impact 0.04 hectares of Belt Wood AWI site. The overhead power cable route crossing Belt Wood would require long term maintenance that would include management of the woodland to protect the overhead power cables from tree growth; and
- Option 1: below ground diversion of the overhead power cable route which would avoid Belt Wood AWI site. The diversion would be located to the west of Belt Wood LWS and would use twin below ground cables, 1.7km in length, laid within the existing Bucklow Hill Lane and Hoo Green Lane, before following the route of the proposed HS2 access road located to the east of the NPR London to Liverpool junction and triple deck cross-over. At the northern end of the diversion, the asset changes to overhead line (approximately 140m in length and consisting of one new pylon) and would cross over the high pressure gas pipeline and Zayo telecommunication cable diversion and join on to the existing overhead route to the south of Belt Wood.

2.3.9 Option 1 was taken forward into the SES1 scheme (refer to Volume 2, MA03 Map Book: Map Series CT-06, maps CT-06-316b to CT-06-321-L1) as it will avoid the loss of an area of Belt Wood AWI during construction when compared to the Baseline option. Option 1 will also avoid landscape and visual impacts associated with the overhead power cables and pylons and will allow the historic landscape character of the area to be maintained. Option 1 will avoid the long term woodland maintenance requirements that would be required for the Baseline option to protect the overhead power cables. Option 1 will have greater temporary traffic and noise impacts during construction but will be less complex to construct and maintain than the Baseline option. Option 1 will have a shorter construction programme but will cost more to construct than the Baseline option.

2.3.10 Table 6 provides a summary of the outcomes of the appraisal of the alternative options compared to the SES1 scheme, as described above.

Table 6: Consideration of local alternatives for a change to the diversion of a Scottish Power 132kV underground route, near Belt Wood

Option	Outcome of analysis
Baseline option	• Comparison of the Baseline option against the SES1 scheme: • greater ecology impacts from loss of an area of Belt Wood AWI site and loss of trees and hedgerows at the pylon locations; • greater landscape and visual impacts due to the presence of pylons that would be visible to residential properties at Bowden View Lane, Oakwood Road and the A50 Knutsford Road. Also, greater landscape impacts due to the loss of an area of woodland from Belt Wood LWS; • less impacts on traffic and transport as Hoo Green Lane and Bucklow Hill Lane would not require temporary closure during construction; • greater historic environment impacts due to the change to the historic landscape from the loss of Belt Wood AWI site; • less noise impacts as there are no residential properties located near the diversion route; • greater agricultural impacts on Knowlspit Farm during construction due to the larger area required for construction;

Option	Outcome of analysis
	• substantially greater maintenance requirements as the area of Belt Wood AWI site located beneath the overhead power cables would require regular trimming; • more complex to construct with a longer construction programme; and • higher construction cost.
Option 1 (the SES1 scheme)	Comparison of the SES1 scheme against the Baseline option: • removal of ecology impacts on Belt Wood AWI site and will prevent loss of trees and hedgerows at the pylon locations; • substantially less landscape and visual impacts due to the power cables being located below ground, which will avoid impacts on Belt Wood AWI and maintain the wooded landscape character of the area; • greater impacts on traffic and transport during construction due to installation of power cables within the highway on Hoo Green Lane and Bucklow Hill Lane; • less historic environment impacts on the historic landscape due to the avoidance of Belt Wood AWI site; • fewer agricultural impacts on Knowlspit Farm as the area of land required for construction would be reduced slightly; • greater noise impacts during construction due to power cable diversion route being closer to Hoo Green village and adjacent to local properties on Hoo Green Lane; • less maintenance requirements compared to the Baseline option as the power cables are located largely below ground; • less complex to construct than the Baseline option with a shorter construction programme; and • greater construction cost.

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