

**High Speed Rail: Consultation on the route from the
West Midlands to Manchester, Leeds and beyond**

Sustainability Statement

**Appendix B - AoS Method, Alternatives and
Supporting Documents**

A report by Temple-ERM for HS2 Ltd



July 2013

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1. APPENDIX B.1: The Appraisal of Sustainability Method

1.1. The role of the AoS

1.1.1. The AoS process was devised by Temple Group, in conjunction with HS2 Ltd and in consultation with Government departments and agencies, as a way of appraising how HS2 would support or conflict with objectives for sustainable development. The AoS approach was first established in 2009 to assist the appraisal and development of the Phase One proposals. Its use has continued during the evolution of the Phase Two scheme. Throughout this time the AoS formed a key part of the sifting process, helping to:

- Advise engineers and HS2 Ltd during scheme design of particular sustainability constraints and opportunities;
- Inform the engineers in refining scheme proposals to avoid or lessen potential adverse effects;
- Advise HS2 Ltd at key decision stages of the relative sustainability advantages and disadvantages of different options, and the consequence of potential impacts; and
- Formally report the sustainability impacts of the options at each stage.

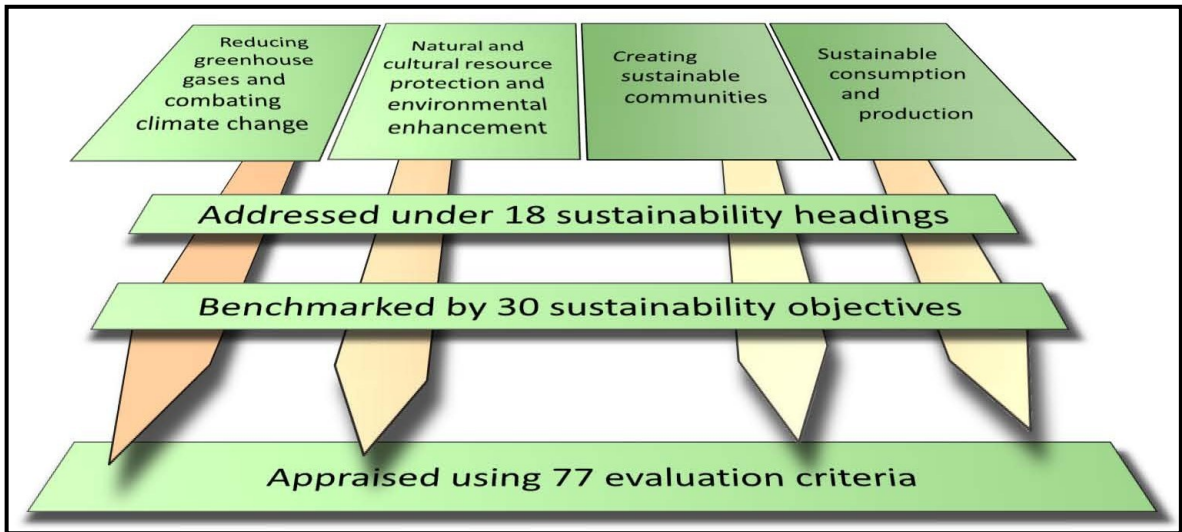
1.2. The AoS framework

1.2.1. The factors used by the AoS to appraise the impacts of the scheme options are captured within an AoS framework. Use of the AoS framework has helped to ensure a uniform and consistent approach to appraising each option at each successive sift.

1.2.2. The AoS is founded on four overarching sustainability priorities. These derive from government priorities that were set out within the 2005 UK Sustainable Development Strategy: *Securing the Future*¹. Beneath these priorities sit the 18 sustainability topics, covering matters such as noise and vibration, flood risk, greenhouse gases and resource use. Each topic is benchmarked by one or more of 30 sustainability objectives. Seventy seven evaluation criteria are then used to determine scheme performance against these objectives. This 'appraisal cascade' is illustrated in **Figure B1.1**.

¹ HM Government (2005) UK Sustainable Development Strategy: Securing the Future, TSO.

Figure B1.1 – The appraisal cascade

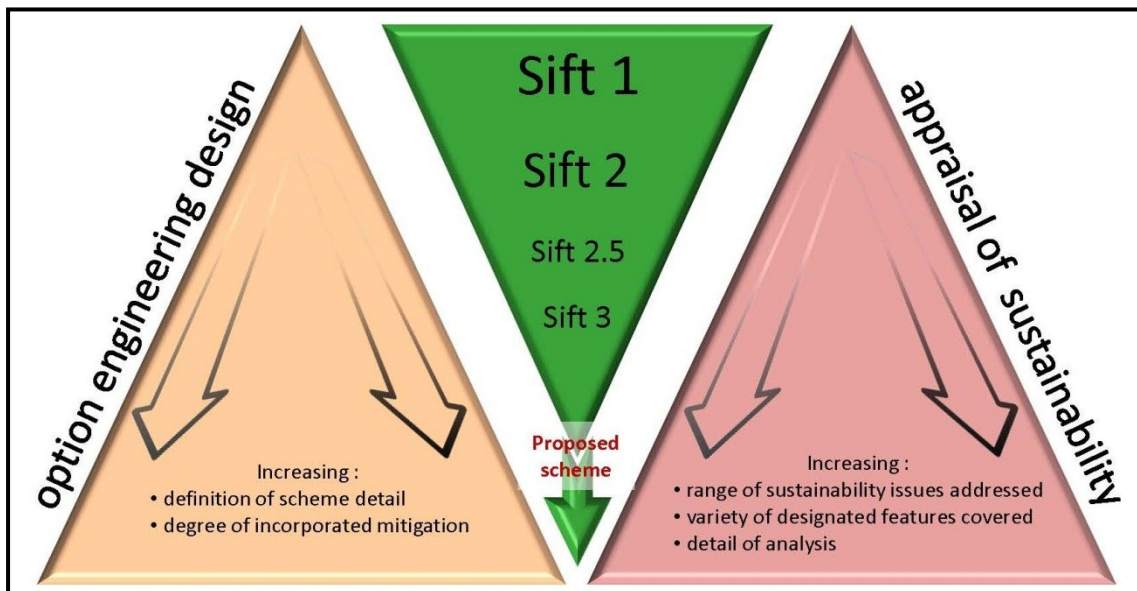


1.2.3. The AoS framework, containing all of the issues, objectives and evaluation criteria, is presented in **Table B1.1**.

1.3. Support to option sifting

1.3.1. Section 3 of the Sustainability Statement (Volume 1) explains how the number of scheme options reduced through each of the four sifting stages. This was accompanied by a corresponding increase in both the detail of option design and the depth of appraisal. For the AoS this meant a sequential increase in the range of sustainability issues and environmental designations that were considered, and an increase in the depth of analysis.

Figure B1.2 – As options reduce, engineering and appraisal detail increases



1.3.2. Up to the final list of options presented to Government in March 2012, the emphasis of the AoS was on those sustainability aspects most helpful in differentiating one option from another - those more concerned with the potential physical impacts of the proposals on, say, ecology or property. Once an initial preferred scheme had been announced, in January 2013, the AoS scope expanded to cover the route-wide

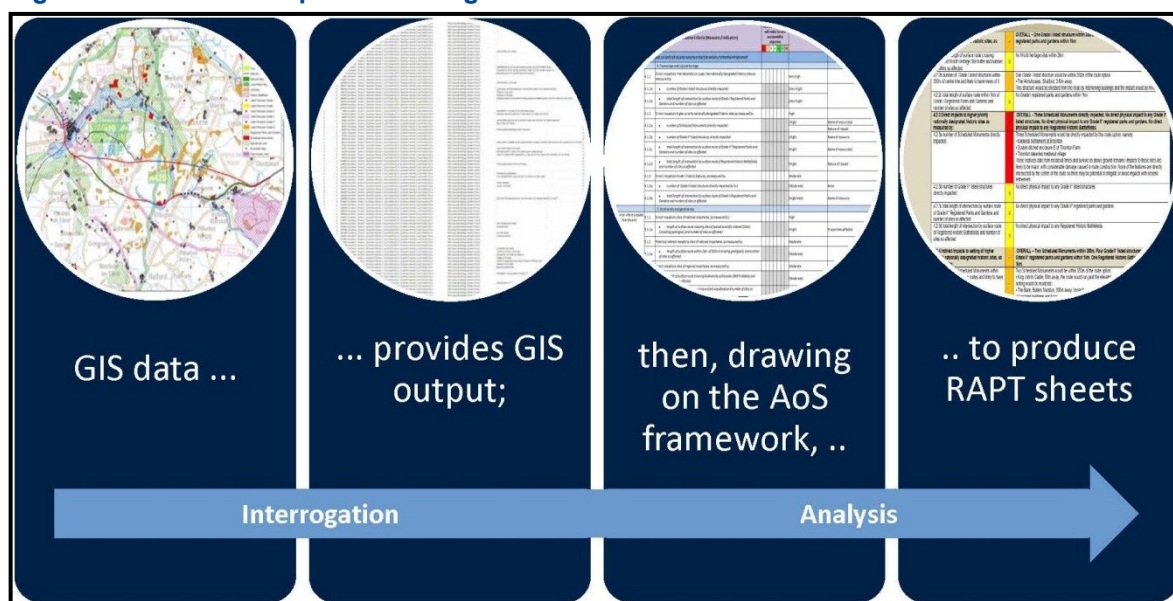
issues; for example, its carbon footprint and its safety considerations, as well as any potential cumulative effects, including those potentially arising from Phase One.

- 1.3.3. The changing level of scheme detail used for appraising the options at each sift, and the different types of sustainability information considered at each sift are described in **Figure B1.5**.

1.4. The route appraisal tool

- 1.4.1. The AoS framework provided the conceptual basis for the appraisal. However, the practical challenge of implementing a consistent and sufficiently detailed appraisal and comparison of several hundred options over a relatively short period necessitated a new approach. Drawing on the evaluation criteria within the AoS framework, the Route Appraisal Tool (RAPTool) was developed by Temple-ERM to combine data capture with a powerful route comparison function.
- 1.4.2. The RAPTool draws on mapping data to collate information on different sustainability features potentially affected by a route or station option within a given area. It then compiles and assimilates this data in a single place, allowing interrogation of key sustainability issues for a specific part or parts of the scheme.
- 1.4.3. The output of the RAPTool (the RAPT sheet) was devised to enable the AoS team to examine sustainability data in a number of different ways; for example, by focusing on impact severity or on certain sustainability topics.
- 1.4.4. The RAPTool provided efficiency and consistency to the AoS by:
 - Producing standardised outputs for each route section at each sift;
 - Minimising manual processing therefore reducing the margin for human error associated with data input and processing;
 - Enabling a tiered approach to appraisal at each sift, with the process and detail of outputs at each stage building on those from the previous one; and
 - Providing a transparent and traceable method of informing the decision-making process, clearly documenting the AoS process and outcomes in a way that allows easy comparison of options.

Figure B1.3 – The AoS process using the RAPTool

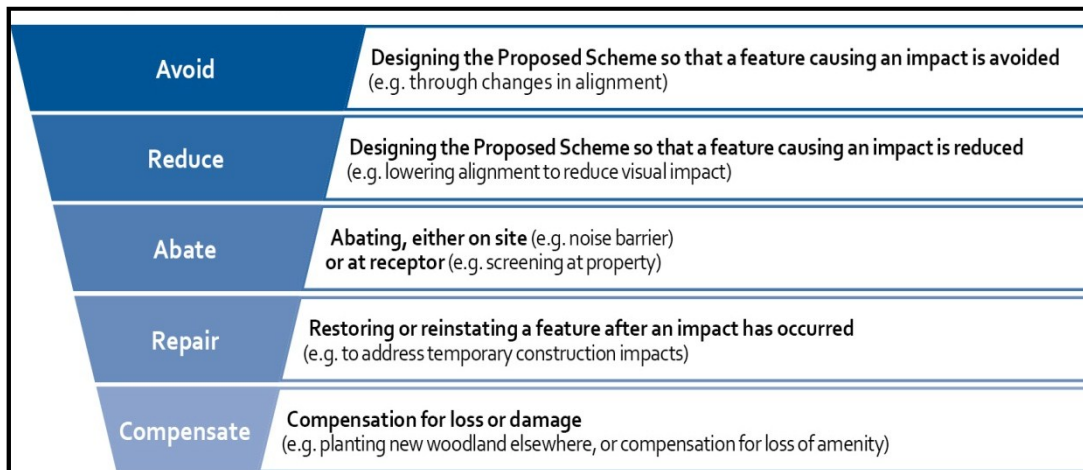


- 1.4.5. Having captured impact information on RAPT sheets, the appraisal team evaluated each relevant criterion of the AoS framework. Key impacts were summarised within a summary template, allowing a consolidated view on the overall sustainability performance of the option in question.

1.5. Managing adverse impacts

- 1.5.1. As well as establishing certain design principles and supporting the options sifting process, the AoS has enabled a number of potentially adverse effects to be avoided or reduced through mitigation. In the earliest sifts, this took place through rejection of potentially more adverse options. After Sift 2.5, mitigation focused on making changes to the alignments of the options that remained. As a prelude to Sift 3, all remaining options were reviewed to identify where there were opportunities to incorporate mitigation into route section design. This review was approached by developing a log of key impacts identified for Sift 2.5 options and holding mitigation workshops between AoS specialists and the engineering consultants.
- 1.5.2. In addition, 'hotspots' were identified where clusters of impacts were likely. These represented the regions of highest priority for mitigating impacts through changes to the vertical and horizontal alignment.
- 1.5.3. The route options that emerged from Sift 3, and which were presented to Government in March 2012, therefore incorporated a number of refinements to the Sifts 2.5 alignments.
- 1.5.4. As described in **Appendix B.2**, a number of further refinements were made, firstly during the summer of 2012 to what would become the initial preferred scheme, and subsequently during early 2013 to what would become the proposed scheme for consultation. The AoS assisted these refinements by providing a definitive view on their relative sustainability implications.
- 1.5.5. One particular focus of mitigation work affecting the proposed scheme was the introduction of preliminary noise mitigation. The noise appraisal team identified locations along the route where additional mitigation could be included to reduce the potential severity and number of noise impacts. These 'candidate areas for mitigation' took account of clusters of dwellings impacted in any one area and determined the likely effectiveness of potential mitigation measures, particularly trackside noise barriers. The noise impacts reported in the Sustainability Statement assume this mitigation is in place for these candidate areas.
- 1.5.6. The AoS will continue to support any further investigation of possible scheme variations and mitigation opportunities up to the point that Government confirms its proposed scheme, which would then be subject to an EIA.
- 1.5.7. The way that mitigation is introduced therefore follows a hierarchy. As scheme design develops in detail, the opportunity to change the alignment lessens and alternative mitigation strategies become appropriate. In the future, with a design largely fixed, mitigation might best be achieved by providing compensation for an adverse impact that is otherwise deemed unavoidable. This sequence of mitigation options is illustrated below.

Figure B1.4 – The mitigation hierarchy



1.5.8. HS2 Ltd will also consider opportunities for environmental enhancement. For example, the railway could present opportunities to reinforce and enhance biodiversity, providing a green corridor to be colonised by plants and animals, and linking with and forming connections between existing habitats. It could provide opportunities for urban regeneration and townscape improvement by enhancing or stimulating wider master planning initiatives. There may also be occasions where noise mitigation introduced as part of the railway design could bring about wider benefits by screening other existing sources of noise, such as major roads and motorways. These kinds of initiatives would be considered as part of the scheme design going forward.

Table B1.1 - The AoS framework

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
Reducing greenhouse gas emissions and combating climate change and its effects										
1. Climatic factors and adaptability										
1.1. Ensure resilience and adaptability of rail network against extreme weather events and other probable climate change impacts	1.1.1	Surface route crossing geology vulnerable to landslip (Determined by BGS Landslide Hazard Assessment areas), as measured by length of cutting crossing areas of significant landslip potential (m)								3
	1.1.2	Surface route exposed to greater risks from increasing rainfall as measured by length of surface route at risk of flooding in Flood Zone 2 and 3								3
2. Greenhouse gases										
2.1. Contribute to the reduction of greenhouse gas emissions	2.1.1	Change in CO2 equivalent (CO2e) emissions released as a result of modal shift from classic rail, road and air to high speed rail								PS
	2.1.2	Carbon emissions resulting from construction in terms of embedded carbon from surface route, tunnel boring, cutting and viaduct as measured by CO2e per metre and total footprint (tCO2)								2
Natural and cultural and resource protection and environmental enhancement										
3. Landscape										
3.1. Maintain or where possible enhance existing landscape character and qualities Reference is also made to Tranquillity, 12.1.3, which accommodates landscape considerations	3.1.1	Direct impacts to nationally designated landscape resources as measured by:								2
	3.1.1a	• Length of surface route crossing 3 National Parks								2
	3.1.1b	• Length of surface route crossing Areas of Outstanding National Beauty (AONB)								2
	3.1.2	Indirect impacts to nationally designated landscape resources, as measured by:								3

2 The sift number refers to stage at which the relevant information is first considered. Sift 3 information should be taken to include Sift 2.5 information as well. PS = Proposed scheme

3 Intersection or any direct impact is taken to occur where a relevant feature is within 50m of the centreline of the route.

Sustainability objective	Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective						Sift2		
		--	-	0	+	++	U		Na	
3.1.2a	<ul style="list-style-type: none"> Length of surface route within 2km of National Parks and number of areas so affected 								3	
3.1.2b	<ul style="list-style-type: none"> Length of surface route within 2km of AONB and number of areas so affected 								3	
3.1.3	Direct and indirect impacts on the landscape character and qualities of the wider countryside as measured by:								3	
3.1.3a	<ul style="list-style-type: none"> Degree of consistency with landscape quality objectives within relevant landscape character assessments 								PS	
3.1.3b	<ul style="list-style-type: none"> Approximate extent of visibility 								PS	
3.1.3c	<ul style="list-style-type: none"> Length of route crossing woodlands and/or traditional orchards and numbers so affected 								PS	
4. Townscape and cultural heritage										
4.1. Maintain or where possible enhance existing townscape character	4.1.1	Incursion into strategically designated views as measured by <i>number of strategically designated views impinged</i> .								2 & 3 ⁴
	4.1.2	Direct Impacts to conservation areas as measured by <i>number of conservation areas intersected and number of areas so affected</i>								2 & 3
	4.1.3	Indirect Impacts to conservation areas as measured by <i>total length of conservation areas within 500m likely to have a view of the route, and number of areas so affected</i> .								2 & PS
	4.1.4	Degree of fit with respect to existing townscape character ⁵								3
4.2. Preserve and protect historic assets	4.2.1	Direct impacts to internationally (or quasi internationally) designated historic sites as measured by:								2
	4.2.1a	<ul style="list-style-type: none"> Total length of intersection by surface route of World Heritage Sites and number of sites so affected 								2
	4.2.1b	<ul style="list-style-type: none"> Number of Grade I listed structures directly impacted 								2

4 All issues under 4.1 to be addressed at sift 2 for stations only

5 Issue to be addressed for stations and depots only

Sustainability objective	Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
		--	-	0	+	++	U	Na	
4.2.1c	<ul style="list-style-type: none"> Total length of intersection by surface route of Grade I Registered Parks and Gardens and number of sites so affected 								2
4.2.2	Indirect impacts to setting of internationally designated historic sites, as measured by:								2
4.2.2a	<ul style="list-style-type: none"> Total length of surface route crossing designated World Heritage Site buffer and number of buffers so affected 								2
4.2.2b	<ul style="list-style-type: none"> Number of Grade I listed structures within 350m of centre line and likely to have views of it 								2
4.2.2c	<ul style="list-style-type: none"> Total length of surface route within 1km of Grade I Registered Parks and Gardens and number of sites so affected 								2
4.2.3	Direct impacts to higher priority nationally designated historic sites as measured by:								2
4.2.3a	<ul style="list-style-type: none"> Number of Scheduled Monuments directly impacted 								2
4.2.3b	<ul style="list-style-type: none"> Number of Grade II* listed structures directly impacted 								2
4.2.3c	<ul style="list-style-type: none"> Total length of intersection by surface route of Grade II* Registered Parks and Gardens and number of sites so affected 								2
4.2.3d	<ul style="list-style-type: none"> Total length of intersection by surface route of Registered Historic Battlefields and number of sites so affected 								2
4.2.4	Indirect impacts to setting of higher priority nationally designated historic sites, as measured by:								2
4.2.4a	<ul style="list-style-type: none"> Number of Scheduled Monuments within 350m of centre of surface routes or from station footprint, and likely to have views of it 								2
4.2.4b	<ul style="list-style-type: none"> Number of Grade II* listed structures within 350m of centre of surface routes or from station footprint, and likely to have views of it 								2
4.2.4c	<ul style="list-style-type: none"> Total length of surface route within 1km of Grade II* Registered Parks and Gardens and number of sites so affected 								2
4.2.4d	<ul style="list-style-type: none"> Total length of surface route within 1km of Registered Historic Battlefields and number of sites so affected 								2
4.2.5	Direct impacts to Grade II historic features, as measured by:								2

Sustainability objective	Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective						Sift2			
		--	-	0	+	++	U		Na		
4.2.5a	<ul style="list-style-type: none"> Number of Grade II listed structures directly impacted by line 								2		
4.2.5b	<ul style="list-style-type: none"> Total length of intersection by surface route of Grade II Registered Parks and Gardens and number of sites so affected 								2		
4.2.6	Indirect impacts to Grade II historic features, as measured by:								3		
4.2.6a	<ul style="list-style-type: none"> Number of Grade II listed structures within 350m of centre of surface routes or 50m from station footprint and likely to have views of it 								3		
4.2.6b	<ul style="list-style-type: none"> Total length of surface route within 1km of Grade II Registered Parks and Gardens and number of sites so affected 								3		
5. Biodiversity and geodiversity											
5.1. Maintain or where possible enhance biodiversity and geodiversity	5.1.1	Direct impacts to sites of international importance as measured by:								2	
	5.1.1a	<ul style="list-style-type: none"> Length of intersection by surface routes of SACs/candidate SACs (cSAC) and SCIs and number of sites so affected 								2	
	5.1.1b	<ul style="list-style-type: none"> Length of intersection by surface routes of SPAs/potential SPAs (pSPA) and number of sites so affected 								2	
	5.1.1c	<ul style="list-style-type: none"> Length of intersection by surface routes of Ramsar sites and number of sites so affected 								2	
	5.1.1d	<ul style="list-style-type: none"> Length of intersection by surface routes of other internationally designated sites and number of sites so affected (biosphere reserves, national geoparks, Biogenetic reserves, EU diploma sites) 								2	
	5.1.2	Potential indirect impacts to sites of international importance as measured by:									2
	5.1.2a	<ul style="list-style-type: none"> Number of Natura 2000 sites within 10km subject to potentially indirect effects 									2
	5.1.2b	<ul style="list-style-type: none"> Number of other internationally designated sites (biosphere reserves, Biogenetic reserves, EU diploma areas) within 10km subject to potentially indirect effects 									3
	5.1.3	Direct impacts to sites of national importance, as measured by:									2

Sustainability objective	Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective						Sift2	
		--	-	0	+	++	U		Na
5.1.3a	<ul style="list-style-type: none"> Length of surface route crossing national nature reserves (NNR) and number of sites so affected 								2
5.1.3b	<ul style="list-style-type: none"> Length of surface route crossing sites of special scientific interest (SSSIs),(including geological, and number of sites so affected 								2
5.1.4	Potential indirect impacts to sites of national importance, as measured by:								3
5.1.4a	<ul style="list-style-type: none"> Length of surface route within 2km of NNRs, and number of sites so affected 								3
5.1.4b	<ul style="list-style-type: none"> Length of surface route within 2km of SSSIs (including geological) , and number of sites so affected 								3
5.1.5	Direct impacts to sites of regional importance, as measured by:								3
5.1.5a	<ul style="list-style-type: none"> Length of surface route crossing biodiversity action plan (BAP) habitats and number of sites so affected 								3
5.1.5b	<ul style="list-style-type: none"> Length of surface route crossing ancient woodland and number of sites so affected 								3
5.1.5c	<ul style="list-style-type: none"> Length of surface route crossing Local Nature Reserves and number of sites so affected 								PS
5.1.6	Area of potential new habitat creation in terms of:								PS
5.1.6a	<ul style="list-style-type: none"> BAP habitat 								PS
5.1.6b	<ul style="list-style-type: none"> Habitat for BAP species 								PS
5.1.6c	<ul style="list-style-type: none"> Habitats referred to in Natural England's Natural Area Profiles 								PS
5.1.7	Potential for increased connectivity of BAP habitats								PS
5.1.8	Potential to buffer nearby designated sites								PS

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
6. Water resources										
6.1. Protect watercourses and surface water bodies	6.1.1	Direct impacts to controlled waters, as measured by:								2
	6.1.1a	• Number and length of major river diversions								3
	6.1.1b	• Number and length of minor river diversions								3
	6.1.1c	• Number of major river crossings								2
	6.1.1d	• Number of minor river and navigable waterway crossings								3
	6.1.1e	• Area of catchment upstream of river crossing points								3
	6.1.1f	• Number of water bodies (lakes and reservoirs) intersected								3
6.2. Protect groundwater resources	6.2.1	Direct impacts to strategic aquifers, as measured by:								2
	6.2.1a	• Length of route in tunnel or cut located in aquifers of "good yield" and "good quality" under the WFD								3
	6.2.1b	• Length of route in tunnel or cut located in aquifers of "good yield" and "poor quality" under the WFD								3
	6.2.1c	• Length of route in tunnel or cut located in aquifers of "poor yield" and "good quality" under the WFD								3
	6.2.2	Direct impacts to vulnerable water supplies as measured by <i>length of cut or tunnel source protection zones (SPZ1 and SPZ2)</i>								3
7. Flood risk										
7.1. Minimise and where possible reduce the risk of flooding from water bodies and surface water	7.1.1	Direct impacts to floodplains, as measured by <i>length of surface route within 1 in 100 year flood zones (Flood Zone 3)</i>								2

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
Creating sustainable communities										
8. Air quality										
8.1. Maintain or where possible enhance local air quality	8.1.1	Impacts on air quality arising from increased road traffic at stations due to HS2 as measured by <i>impacts to Air Quality Management Areas (AQMA)</i>								3
9. Noise and vibration										
9.1. Maintain or where possible enhance the local noise environment ⁶ NB: criterion 12.1.2 to be used at Sift 2 as a rough indication of properties subject to potential noise (and visual impact) from the operational scheme Reference is also made to Tranquillity, 12.1.3, which accommodates noise considerations]	9.1.1	See 12.1.2								2
	9.1.2	Change in the population potentially annoyed by operational noise and Present Value of Benefits (PVB) for daytime operational-related residential noise.								3
	9.1.3	Number of dwellings potentially qualifying for noise insulation (based on the Noise Insulation Regulations 1996).								3
9.2. Maintain local vibration environment	9.2.1	Risk of vibration and reradiated noise as measured by <i>number of properties within 100m of tunnelled sections</i>								2
10. Community integrity										
10.1. Maintain or where possible enhance community integrity	10.1.1	Potential loss of community integrity, as measured by ⁷ :								2
	10.1.1a	• Number of dwellings likely to be demolished								2
	10.1.1b	• Number of community properties likely to be demolished								2
	10.1.1c	• Number of demolitions of commercial properties likely to be demolished								2
	10.1.1d	• Number of industrial properties likely to be demolished								2

⁶ See also criterion 12.1.2, which is to be used at Sift 2 as a rough indication of properties subject to potential noise (and visual impact) from the operational scheme

⁷ Zone of impact taken as corridor 50m each side of the centreline

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
	10.1.2	Residential dwellings and communities at risk of isolation, as measured by <i>number of dwellings enclosed by major barriers such as transport routes as a result of HS2</i>								3
	10.1.3	Residential dwellings and communities at risk of severance, as measured by <i>number of dwellings or communities divided by major barriers such as transport routes as a result of HS2</i>								3
	10.1.4	Risk of exacerbating deprivation, as measured by:								3
	10.1.4a	<ul style="list-style-type: none"> Number of dwellings in the 20% most deprived areas potentially demolished 								3
	10.1.4b	<ul style="list-style-type: none"> Number of dwellings in the 20% most deprived areas potentially at risk of isolation 								PS
	10.1.5	Loss of community amenity, as measured by <i>length of surface route crossing Country Parks and greens and number of sites so affected</i>								3
	10.1.6	Impacts on social capital as measured by cumulative impacts from demolitions, severance & access, community landtake and changes in transport access								PS
	10.1.7	Risk of disproportionate effects on equality groups, as measured by <i>number of properties with disproportionately high numbers of equality groups demolished or at high risk of isolation, where known</i>								PS
11. Accessibility										
11.1. Maintain or where possible enhance pedestrian and recreational access	11.1.1	Interruption to linear access as measured by:								3
	11.1.1a	<ul style="list-style-type: none"> Number of OS footpaths and trails severed and/or requiring diversion 								3
	11.1.1b	<ul style="list-style-type: none"> Number of National Cycle Paths severed and/or requiring diversion 								3
	11.1.2	Loss of recreational access as measured by <i>length of surface route crossing National Trust Land and Open Access land (including mountain, moor, heath, downland and registered common land)</i>								3
11.2. Maintain or where possible enhance public transport interchange	11.2.1	Potential to improve transport option choices								PS
	11.2.2	Population in the 20% most deprived areas with better access to public transport services								PS

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective						Sift2	
			--	-	0	+	++	U		Na
	11.2.3	Potential to improve public transport interchanges as a result of option, as measured by <i>number of interchange opportunities at stations</i>								3
12. Health and well-being										
12.1. Maintain or where possible improve health and well-being	12.1.1	Combined impacts on the key determinants of health and well-being ⁸								PS
	12.1.2	Number of people at risk of experiencing disturbance during construction, as measured by <i>number of dwellings within 100m of surface sections of line (between 50m and 150m of centre line)</i> ⁹								2
	12.1.3	Impacts on areas of relatively high tranquillity, as measured by <i>length of surface route through highest 20% of tranquillity quadrants</i> ¹⁰								3
12.2. Reduce health inequalities	12.2.1	Impacts on health inequalities as measured by <i>communities within 20% most health deprived areas subject to combined health impacts (as recorded under 12.1.1)</i>								PS
	12.2.2	Number of people with greatest susceptibility to health impacts at risk of experiencing nuisance during construction, as measured by <i>number of dwellings recorded at 12.1.2 within 20% most deprived areas</i>								PS
13. Security and safety										
13.1. Contribute to the reduction of road traffic accidents	13.1.1	Change in likelihood of road traffic accidents as a result of option (modal shift)								PS
13.2 Minimise the likelihood or consequences of accidents	13.1.2	Relative density of potential risk features such as road crossings, built up areas, switches and points								PS
13.3. Avoid major hazards	13.1.3	Risk of impacts to or from potentially hazardous industrial activity, as measured by <i>number of COMAH registered sites between 50m and 150m of centreline</i>								PS

⁸ Key determinants of health and well-being taken as physical environment (particularly issues 3, 8 and 9); access (particularly issues under 10 and 11); safety (issues under 13); physical activity; and socio-economics (issues under 15).

⁹ This measure is also to be used at Sift 2 as a rough indication of properties subject to potential noise and visual impact from the operational scheme

¹⁰ Relevant also to noise and landscape

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
14. Economic prosperity										
14.1. Support economic competitiveness and make efficient use of public funds	14.1.1	Transport economic efficiency for business users & transport providers (i.e. excluding environmental and wider economic benefits and costs) as measured by "in work time" time savings, congestion relief on road and rail networks in £M								PS
14.2. Support wider economic growth and enhance employment opportunities	14.2.1	Wider economic impacts (agglomeration impacts as productivity improvements arising from changes in effective density of economic activity) as measured by <i>monetary figure for GDP or GVA in £M</i>								PS
15. Economic welfare										
15.1. Support wider economic welfare growth	15.1.1	Transport economic efficiency for consumers as measured by commuting and leisure time savings, congestion relief on road and rail networks in £M								PS
	15.1.2	<i>Number of jobs created directly and indirectly from construction</i>								PS
	15.1.3	<i>Number of jobs created directly and indirectly from operation</i>								PS
	15.1.4	<i>Number of jobs displaced due to demolition of commercial properties around stations and depots</i>								3
15.2. Support local economy	15.2.1	<i>Numbers of jobs supported through development around stations</i>								2
	15.2.2	<i>Number of housing units supported through development around stations</i>								2
15.3. Enhance regeneration	15.3.1	<i>Number of jobs supported in regeneration areas (20% most deprived areas according to the IMD) around stations</i>								2
	15.3.2	<i>Numbers of housing units supported in regeneration areas (20% most deprived areas according to the IMD) around stations</i>								2
15.4. Support regional and local growth	15.4.1	Degree of support for or conflict with strategic growth areas (as identified in regional strategies) and Enterprise Zones								3
	15.4.2	Degree of support for or conflict with local development policies or planning aspirations								2 or PS
	15.4.3	Degree of support for or conflict with local transport strategies or initiatives ¹¹								2 or PS

¹¹ Local transport plans are being re-written with revised LTP3 documents expected in April 2011

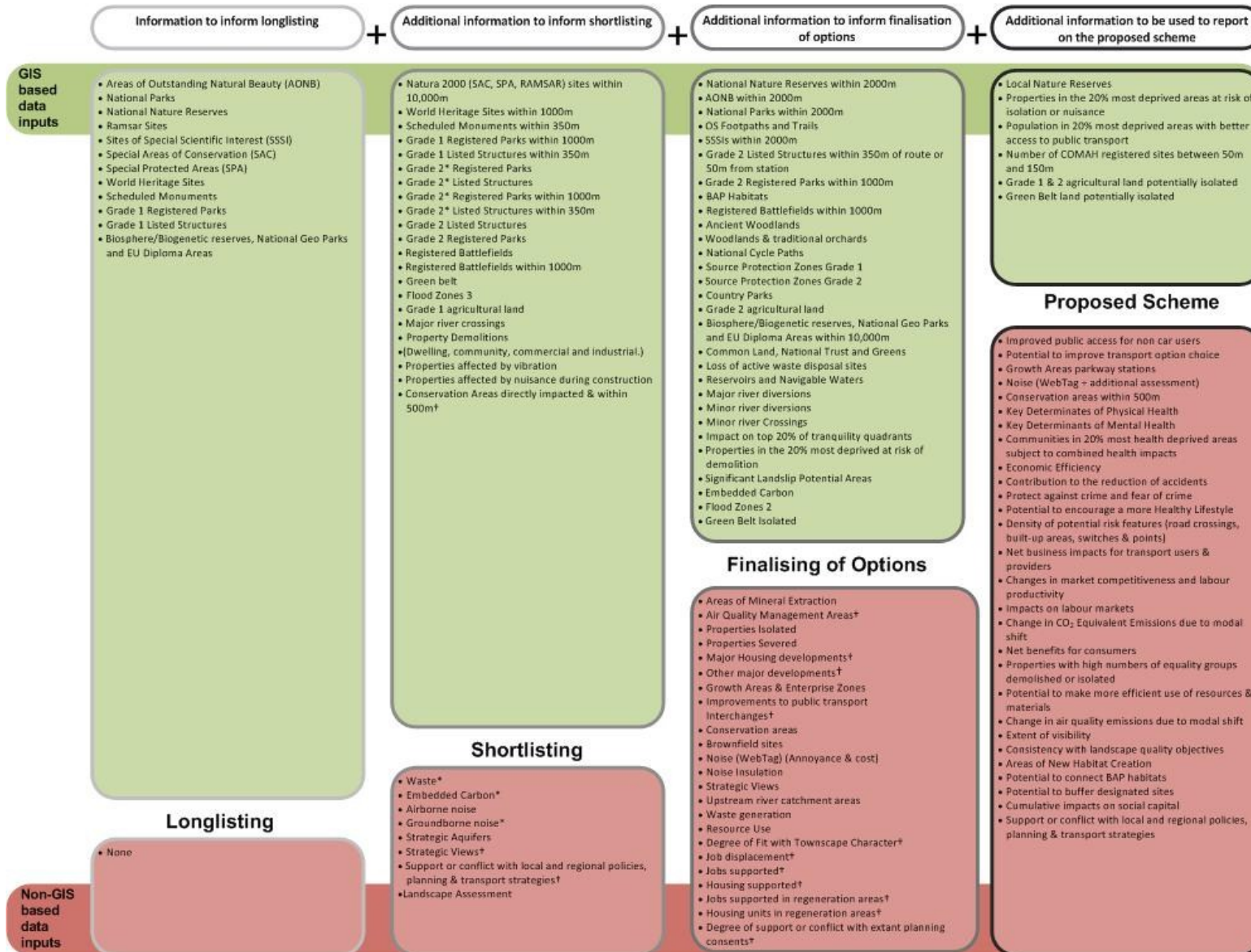
Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective							Sift2
			--	-	0	+	++	U	Na	
	15.4.4	Degree of support for or conflict with extant planning consent for commercial development >5000m2 or 100 housing units								2 or PS
Sustainable Consumption and Production										
16. Soil and land resources										
16.1. Maintain or where possible enhance land resources	16.1.1	Direct impacts on agricultural land, as measured by:								2
	16.1.1a	• Length of surface route crossing Grade 1 agricultural land and area of intersection								2
	16.1.1b	• Length of surface route crossing Grade 2 agricultural land and area of intersection								3
	16.1.2	Indirect impacts on agricultural land, as measured by:								PS
	16.1.2a	• Area of Grade 1 land potentially isolated								PS
	16.1.2b	• Area of Grade 2 land potentially isolated								PS
	16.1.3	Direct impacts to Green Belt as measured by:								2
	16.1.3a	• Length of surface route crossing designated Green Belt and area of intersection								2
	16.1.3b	• Area of Green Belt land potentially isolated.								PS
	16.1.4	Area of land designated for mineral extraction.								3
16.1.5	Loss of land designated for waste disposal, as measured by length of surface route crossing areas designated as active waste disposal								3	
16.2. Encourage the use of brownfield sites	16.2.1	Productive use of land, as measured by <i>number and total area of "high risk" brownfield sites (former landfill and gaswork sites) brought back into beneficial use, either wholly or partially</i>								3
17. Waste generation										
17.1. Prevent and minimise waste production	17.1.1	Volumes of inert and non-hazardous waste spoil potentially requiring off-line disposal as a result of option								3
	17.1.2	Volumes of hazardous waste spoil potentially requiring pre-treatment prior to off-site disposal as indicated by historic and active landfills								3

Sustainability objective		Evaluation criteria (measures and indicators)	Contribution option will make to core sustainability objective						Sift2
			--	-	0	+	++	U	
18. Resource use									
18.1. Conserve and protect primary material resources	18.1.1	Intensity of material resource use as measured by estimated required tonnage of steel and concrete							3

Table B1.2 – Showing how design and appraisal information used at each sift increased in detail

	Sift 1	Sift 2	Sift 2.5	Sift 3
Design detail used for AoS (routes)	Plans showing vertical and horizontal alignments, allowing differentiation of surface, viaduct or tunnel.		Plans showing vertical and horizontal alignments, allowing differentiation of surface, viaduct, tunnel, cutting, embankment and green tunnel (finalisation stage only). Additional vertical profile information defined the height of the route option relative to ground level	
Design detail used for AoS (stations)	Plans showing footprints for station and station throats for Manchester and Leeds termini and East Midlands and South Yorkshire station options. Manchester interchange station options considered at long listing stage only and shown only as a station box with no throat.		Plans showing the operational boundary for the station and station throats, but distinguishing platforms, concourse, station carpark and forecourt. Plans showing the extent of four tracking required for through-stations. Plans showing enabling and associated works. Design information on the possible future appearance of the station. A construction boundary was also identified that defined a provisional footprint needed to accommodate worksites and temporary and permanent works.	
Sustainability factors considered	See next diagram			
Appraisal criteria	See AoS framework above			
Appraisal team	Core team (including planning and socioeconomic specialists) interpreting available mapped information against AoS framework criteria.		Core team undertaking initial appraisal, with verification and additional appraisal by sustainability specialists (see below)	
On site appraisal	None	Stations only, to validate and refine predicted townscape and cultural heritage impacts and to undertake a land use survey of station footprints.	Stations and environmental 'hot spot locations' visited by relevant environmental specialists to augment appraisal by GIS. Stations land-use surveys conducted to validate demolition counts.	
Mitigation	During the sifting of options, mitigation has only been considered through the advice to HS2 Ltd in the context of the relative advantages and disadvantages of different options, thereby supporting decisions to progress certain options over others. This also resulted in new options being developed to resolve sustainability and engineering challenges.			Mitigation incorporated into options that emerged from the option refinement stage, to address specific impacts. Mitigation through adjustment to vertical and/or horizontal alignment, and introduction of tunnels and green tunnels.

Figure B1.5 – Increasing range of sustainability information at each sift





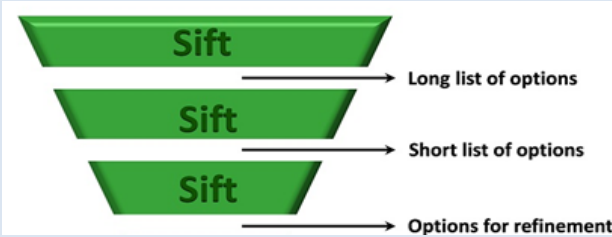

†For stations only * A preliminary appraisal for route comparison only

2. Appendix B.2: HS2 Phase Two Alternatives

2.1. Summary

- 2.1.1. This appendix outlines the alternatives considered in reaching the proposed scheme for consultation. It reflects on the decisions to promote the Y network, the development of Phase Two options between October 2010 and March 2012, the identification of an initial preferred scheme in January 2013, and the emergence of the proposed scheme for consultation that is the subject of the Sustainability Statement.
- 2.1.2. Strategic alternatives to high speed rail have been considered and included existing rail enhancement options and improving highways. Overall, Government considered that a new high speed railway line would provide the greatest capacity increase and connectivity benefits and that a Y-shaped network extending to Manchester and Leeds was preferred based on the economic and business case.
- 2.1.3. During development of the options for the Phase Two network several hundred route options (comprising well over 10,000 miles of route), over 160 station options and almost 90 depot options were proposed, appraised and sifted.
- 2.1.4. The approach to determining and appraising the many possible routes for Phase Two followed that used for Phase One, where a sequence of sifts reduced the number of options being considered. As a result of this process, and of additional scheme refinements, proposed single routes to Manchester and Leeds, connections to the existing rail network, and the selected stations and depots along each route have been identified for consultation.
- 2.1.5. The following table summarises the options considered and the decisions made at each stage. It provides an overview of the stages and alternatives considered. It does not provide detail on each alternative, but references (and provides links to) the core documents where this information is provided.

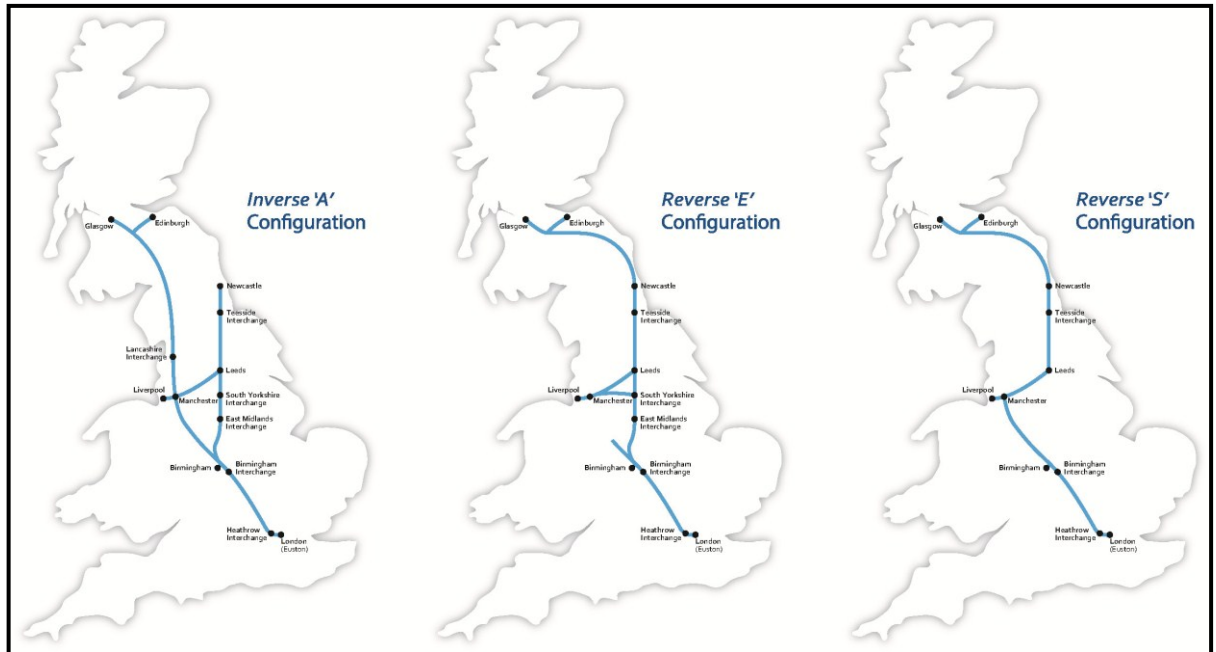
Table B2.1 – Descisions summary for each stage

Stages	Stage Overview	Stage Options	Links to Relevant reports
<p>HS2 Strategic Alternatives 2009-2010</p> 	<p>Alternatives to high speed rail were considered including road and conventional rail. In addition various configurations of a high speed network from London to Scotland were considered.</p>	<p>Modal alternatives. Achieved by upgrading non-rail modes of transport e.g. air travel, new motorways.</p> <p>Conventional rail-based alternatives. Achieved either by upgrading existing railways or by building a new line to non-high speed standards.</p> <p>High speed rail alternatives to the proposed Y shaped network. Three shapes were considered as alternatives to the 'Y' network:</p> <ul style="list-style-type: none"> • 'Inverse A' configuration • 'Reverse S' configuration • 'Reverse E' configuration <p>Y-network (Variation of 'Inverse A') selected by Government in 2010 (see 2.2)</p>	<p>Chapter 7 of the HS2 Phase One draft Environmental Statement (May 2013) summarises consideration of strategic alternatives.</p> <p>Further details are contained in High Speed 2 Strategic Alternatives Study- Strategic Outline Case (March 2010) and High Speed Rail London to the West Midlands and Beyond: A Report to Government by High Speed Two Limited (March 2010)</p> <p>The Strategic Alternatives Study is in the process of being updated.</p>
<p>October 2010- March 2012</p> 	<p>Route wide alternatives for Phase Two of the Y network. These comprised numerous options for route corridors from the West Midlands to Manchester and Leeds, stations, depots and connections to Heathrow.</p> <p>A sequence of sifts reduced the number of options considered.</p> <p>Following the sifting of options a number of line of route, station and depot options were presented to the Secretary of State for Transport, from which Phase Two of HS2 would be determined.</p>	<p>Sifting of Route Options, long list, short list and options for refinement covering:</p> <ul style="list-style-type: none"> • Manchester line of route, station and depots • Leeds line of route, station and depots • Heathrow connection routes and stations  <p>Series of options proposed then subject to refinement and mitigation by HS2 Ltd team (see 2.3)</p> <ul style="list-style-type: none"> • 42 Manchester route sections (including stations) grouped into geographical areas and depots • 32 Leeds route sections (including stations) grouped into geographical areas and depots • 3 Heathrow options (including one station) <p>HS2 Ltd presented these route section options, together with stations and depots, to Government in March 2012 (see 2.3)</p>	<p>The options addressed at each stage of sifting, together with an overview of decisions made, are summarised in an appendix to a the AoS Options Report Options for Phase Two of the high speed network- Appraisal of Sustainability (March 2012) - Appendix 3: Sifting History</p> <p>General considerations: Options for Phase Two of the High Speed Rail Network (overarching March report) – A Report to Government by HS2 Ltd (March 2012)</p> <p>Sustainability considerations: Options for Phase Two of the high speed network- Appraisal of Sustainability (March 2012)</p>
<p>March 2012- January 2013</p> 	<p>Minor refinements and one main new alternative that hybridised two western leg routes to reduce local impacts.</p>	<p>Government engaged with relevant local authorities and sought clarification and refinement in certain areas. A limited number of changes were made to the routes on the Manchester and Leeds routes.</p> <p>Government announce the initial preferred scheme (see 2.4)</p>	<p>Scheme refinements during this time are considered in Selecting an initial preferred scheme for phase two: refinement work since March 2012 (HS2 Ltd January 2013)</p> <p>Sustainability considerations for the Initial Preferred Scheme: HS2 Phase Two Initial Preferred Scheme Sustainability Summary (January 2013)</p>

2.2. HS2 Strategic Alternatives 2009-2010

2.2.1. Strategic alternatives to a new high speed railway included various enhancement options to the existing railway network and improvements to highways. Overall it was considered that a new railway line would provide the greatest capacity increase and connectivity benefits. The development of the core high speed network was considered in a number of configurations. As shown in the diagram below, this included options for the 'Inverse A', 'Reverse S' and 'Reverse E' shaped networks.

Figure B2.1 – Alternative Configurations



2.2.2. In comparison to other strategic options, a variation of the inverse A (called the Y network) was considered to offer shorter journey times to London from most key conurbations, strong interregional connectivity and enhanced access to key international gateways from across the country. It was concluded that the Y network would provide better value for money than the alternative options considered.

2.2.3. On that basis, Government announced in 2010 its decision to proceed with the Y shaped network and this initiated a programme of work, commencing in October 2010, to identify the best route, station and depot options for this Y-formation.

2.3. October 2010- March 2012

2.3.1. The diagrams below show the evolution of both the Manchester (western) and Leeds (eastern) legs through October 2010 to March 2012.

Figure B2.2 - Manchester Route Evolution

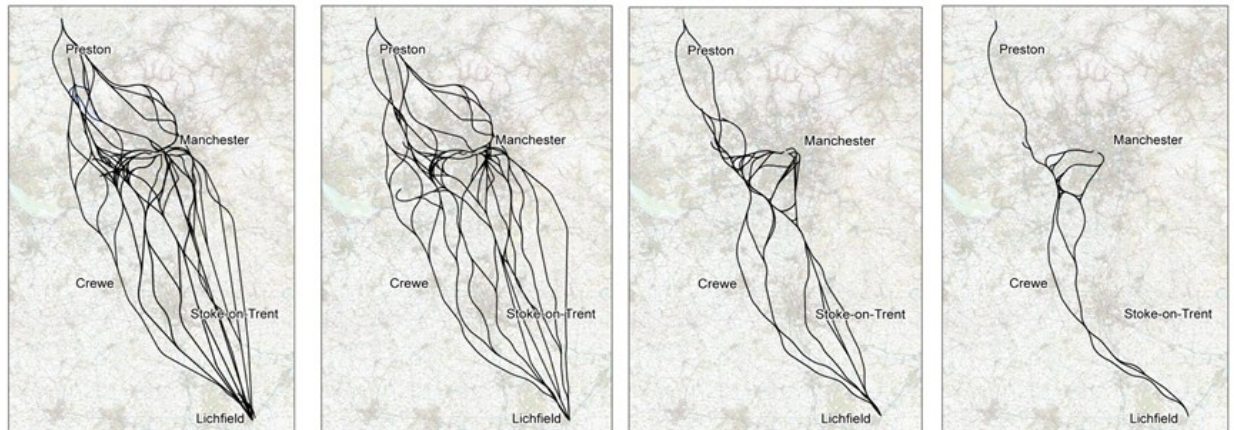
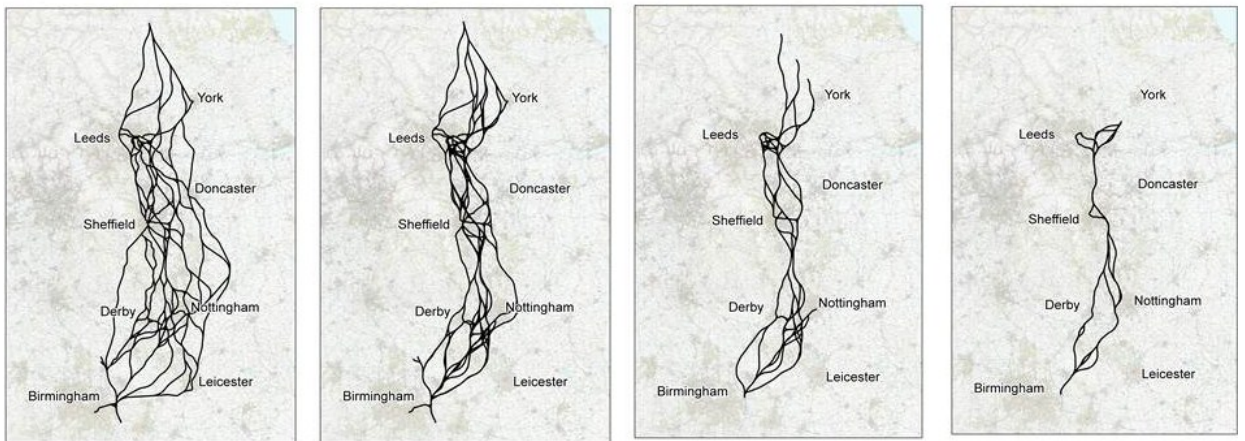


Figure B2.3 - Leeds Route Evolution



- 2.3.2. Between October 2010 and December 2011 hundreds of line of route, station and depot options were considered. The route options were reduced through a number of ‘sifts’.
- 2.3.3. By December 2011, HS2 Ltd had identified a number of options that were considered to best meet the HS2 Phase Two remit. A number of refinements were made to these in order to achieve engineering improvements or to mitigate particular potential impacts.
- 2.3.4. The route, station and depot options that remained after this work were presented to Government in March 2012. The options consisted of 42 possible route sections on the Manchester route (including stations) and 32 possible route sections on the Leeds route (including stations), eight different depot options, and three Heathrow options (two routes and one station).

These options are grouped as follows:

Manchester corridor	Leeds corridor
<ul style="list-style-type: none"> • West Midlands to Manchester outskirts 	<ul style="list-style-type: none"> • West Midlands to Leeds outskirts
<ul style="list-style-type: none"> • Manchester approaches and terminus 	<ul style="list-style-type: none"> • Leeds approaches and terminus
<ul style="list-style-type: none"> • Interchange stations 	<ul style="list-style-type: none"> • East Midland intermediate stations
<ul style="list-style-type: none"> • Intermediate stations 	<ul style="list-style-type: none"> • South Yorkshire intermediate stations

Manchester corridor	Leeds corridor
<ul style="list-style-type: none"> • West Coast Main Line connection 	<ul style="list-style-type: none"> • East Coast Main Line connection
<ul style="list-style-type: none"> • Depots 	<ul style="list-style-type: none"> • Depots
Heathrow options	
<ul style="list-style-type: none"> • Connections to mainline and station option 	

2.3.5. The route options identified could be combined in various ways, with certain sections interchangeable between common points (nodes) in order to create different whole route combinations. Each option was considered by HS2 Ltd in terms of passenger demand, cost, engineering complexity, journey time and sustainability.

2.4. March 2012- January 2013

2.4.1. During summer 2012, the Government held a series of meetings with political and economic leaders from the cities and regions that could be served by Phase Two to gauge their opinions of the proposals. Focussing on the station options rather than route options and undertaken in confidence to prevent the risk of widespread blight for residents and communities, these events helped the Government obtain an initial view on how HS2 could support development and regeneration aspirations.

2.4.2. In addition, the Secretary of State for Transport visited areas potentially affected by the proposals in order to both better understand the options and, where necessary, to request further work from HS2 Ltd to reconsider aspects of the route. Certain changes were made to the route options as a result of that work.

2.4.3. Another key decision taken by Government at this time was to pause work on the spur to Heathrow until after 2015 when the Airports Commission review is expected to be published.

2.5. January 2013- July 2013

2.5.1. A period of 'informal engagement' was launched following the announcement of the Initial Preferred Scheme. Ministers met with Members of Parliament affected by the Phase Two scheme, to reflect on any local priorities. In parallel, HS2 Ltd engaged with numerous stakeholders such as local authorities affected by the line of route, station city partners and key environment and heritage organisations.

2.5.2. Certain changes were made to the Initial Preferred Scheme partly as a result of this informal engagement.

2.5.3. These changes form part of the proposed scheme for consultation that is the subject of the Sustainability Statement.

3. APPENDIX B.3: GLOSSARY OF TERMS

This section defines all designations and sustainability features referred to in the Sustainability Statement, along with any other technical terms that might be encountered. Where appropriate, supporting methodological information outlining how impacts were appraised is also provided.

Agricultural land (Grade 1 and 2) The quality of agricultural land in England and Wales is assessed according to a system devised by MAFF/DEFRA, revised and published in 1989 and known as the Agricultural Land Classification (ALC). This is the nationally applicable system used for land use planning and development control. The two top grades are as follows:

- Grade 1: excellent quality agricultural land - land with no or very minor limitations to agricultural use;
- Grade 2: very good agricultural land - land with minor limitations which affect crop yield, cultivations or harvesting.

Local authorities should take account of Agricultural Land Classification in order to make informed choices about future land use within the planning system.

Ancient Woodlands Ancient Woodland is land continuously wooded since AD1600 in England and Wales and which has never been cleared or replanted. Many Ancient Woodlands are designated for their scientific and conservation importance. The Ancient Woodland inventory records such woods over two hectares in England. Ancient Woodlands do not enjoy their own statutory protection, although many are protected through designations such as SSSIs or other designations. See also BAP habitats.

AONB - Area of outstanding natural beauty AONBs have equivalent status to National Parks and are designated under the National Parks and Access to the Countryside Act 1949. The Countryside and Rights of Way Act 2000 added further regulation and protection.

The single purpose of AONB designation is to conserve and enhance the natural beauty of the area. Where there is a Conservation Board, the Board has an additional purpose of increasing the understanding and enjoyment by the public of the special qualities of the area. A Board must also seek to foster the economic and social well-being of their local communities. If it appears to a Board that there is ever a conflict between these two purposes, it must give greater weight to the conservation and enhancement purpose.

Aquifer	<p>An aquifer is a wet underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) from which groundwater can be usefully extracted. Areas underlain by aquifers are represented in plan by information obtained from the Environment Agency, the British Geological Society or mapping of the chemical and quantitative status of groundwater carried out in accordance with the Water Framework Directive. Possible impacts on aquifers have been assessed where they are traversed by cut or tunnel.</p> <p>It is an Environment Agency and Water Framework Directive requirement to mitigate by design the impacts of any works which may influence the groundwater resource to the point where they are insignificant. All aquifer crossings will be subject to detailed ground investigation, geo-hydraulic modelling, groundwater flow and quality monitoring before, during and after construction, and bespoke design incorporating groundwater barriers and bypass routes where required. All monitoring, works and design will be carried out in close collaboration with the Environment Agency in order to ensure that the groundwater resource is not polluted or impeded in any way. (See also SPZ).</p>
Bulk building materials	<p>The Sustainability Statement Volume 1 records tonnages of bulk building materials, namely steel and concrete, by way of indicating the potential principal material resource requirements of the project. This information was also the basis for embedded carbon figures which were used during sifting stages. The calculations do not take account of the high speed lines structural form and are purely a representation of potential bulk building materials.</p> <p>The tonnages have been calculated based on conversion factors taken from the Network Rail 2009 document, <i>Comparing environmental impact of conventional and high speed rail</i>. Calculations for concrete at stations have used a generic platform dimension (and assumed platform number), together with specific concourse dimensions. A concrete tonnage conversion has used the Bath University 2009 <i>Inventory of Carbon and Energy</i>. No steel volumes are determined for stations. No bulk materials have been calculated for depots.</p>
Conservation Area	<p>An area of special architectural or historic interest, designated under the Planning (Listed Buildings & Conservation Areas) Act 1990, whose character and appearance it is desirable to preserve and enhance. They do not have statutory protection, but local authorities will set rules on certain development in conservation areas.</p>
Code of Construction Practice (CoCP)	<p>A CoCP will be developed for Phase Two during the more detailed environmental assessment stage. It will contain strategic control measures and standards to be implemented throughout the construction phase.</p>

Country Parks	There are about 250 recognised Country Parks in England and Wales. Most were designated in the 1970s, under the Countryside Act 1968 with the support of the former Countryside Commission. In more recent times there has been no specific financial support for Country Parks directly, and fewer have been designated. Most are managed by local authorities, although other organisations and private individuals can also run them. There is nothing to stop anyone opening a site and calling it a Country Park, although they might not receive recognition from Natural England.
Demolitions	Using plans showing the proposed scheme footprint, counts have been made of the number of residential properties, community facilities, industrial properties and commercial properties that would potentially be demolished by the proposed scheme.
Depot	Two types of depots would be required for HS2. Rolling stock maintenance depots for used for stabling, inspection, repair, cleaning and light maintenance of trains. Infrastructure maintenance depots for stabling, preparing and maintaining the rolling stock. They would provide a central store and supply point for engineering material, as well as facilities for rail plant maintenance and rescue and recovery locomotives.
Disturbance	The AoS Options Report refers to dwellings being “at greater risk of disturbance from construction activity” in relation to health and wellbeing. This simple measure of dwellings within 100m of the route corridor is intended to indicate in very broad terms the number of people living close to the route who could be at greater risk of temporary impacts from noise, dust and light spillage during construction. These potential impacts would be determined far more accurately at later stages and as part of the EIA. In practice, strict control measures would be put in place to ensure that construction impacts are kept as low as possible.
ECML	East Coast Main Line. The main railway currently linking London and Scotland via Leeds, York and Newcastle.
Enterprise zones	A geographical area (agreed between the local enterprise partnership and Government) that has been designated for specific economic advantages. The aim is to attract investment, drive economic growth and employ local residents.

Environmental Impact Assessment (EIA)	<p>An EIA seeks to ensure that the environmental effects of major projects and development proposals are fully investigated, understood and taken into account before decisions are made on whether they should proceed. The framework for this is provided by European Directive (85/337/EEC) amended 1997, 2003 and 2009.</p> <p>The Sustainability Statement documents how sustainability has been integral to the development of the proposed scheme. Following public consultation and further route development a preferred scheme will be identified. This preferred scheme will be subject to an EIA, this is likely to take place during 2014-2015 for Phase Two.</p>
Excavated Material	<p>Excavated material refers to the earth and other materials that are produced during ground excavations. Excavated material would be produced principally from tunnelling and construction of cuttings. New embankments would require the <i>addition</i> of material. For each route section estimated excavated material volumes are reported as either a <i>surplus</i> or a <i>deficit</i> volume, depending respectively on whether more or less material would be produced than would be used within the scheme.</p> <p>Excavated material volumes have been provided by HS2 Ltd. They derive from calculations of the volumes of assumed structures (embankments, cuttings and tunnel) at this stage of design. They do not take account of bulking factors (the increase in volume following excavation). Nor do they take account of any mitigation earthworks, such as noise bunds or landscaping, which would be introduced into later designs. It would be a general intention of HS2 Ltd to balance excavated material surplus and deficit volumes as far as possible to reduce the need for offsite disposal.</p>
Exceptional Hardship Scheme	<p>Scheme introduced by the Government to protect the interests of mainly residential and small business owner-occupiers whose property values may be affected by the initial preferred route, station and depot options for HS2 Phase Two.</p>

Flood risk areas	<p>The Environment Agency maps highlight areas of flood risk alongside watercourses with a catchment size of 4km² or more and for smaller catchments with a history of flooding. These maps indicate areas which are high, medium or low risk of flooding. High to medium risk zones are as follows:</p> <ul style="list-style-type: none">• Zone 3b. Functional flood plain, which are areas subject to frequent flooding and play an important part in flow routes and storage.• Zone 3a. High risk of flooding; area designated as having a 1 in 100 or greater chance of river flooding (>1%).• Zone 2. Medium risk of flooding; area designated as having between 1 in 100 and 1 in 1000 chance of river flooding (1% - 0.1%). <p>The Sustainability Statement identifies all occasions of floodplain crossings over 100m in length. A more detailed examination of flood risk will be undertaken in due course.</p>
Green belt	<p>Green belt is designated in the UK for controlling urban growth and preventing the coalescence of main urban areas. A railway through green belt may create pockets of land that are susceptible to development infill and may conflict with the open and contiguous character for which a green belt is designated. Land included in the green belt must contribute to one or more of the five purposes of the green belt set out in Planning Policy Guidance Note 2 (PPG2 Green Belts): to check the unrestricted sprawl of built-up areas, safeguard the surrounding countryside from further encroachment, prevent neighbouring towns from merging into one another, preserve the special character of historic towns and to assist in urban regeneration. PPG2 states that there is a presumption against inappropriate development.</p>
Green tunnel	<p>A green tunnel provides an enclosure of the railway, where otherwise it would be in partial cutting or on the surface, with a box structure and a green (grassed or other vegetation) roof. Such an enclosure would normally be provided as mitigation for potential noise, visual or access impacts.</p>

Habitats of Principal Importance	<p>The Natural Environment and Rural Communities (NERC) Act came into force on 1st October 2006. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with Natural England, as required by the Act.</p> <p>Fifty-six habitats of principal importance are included on the S.41 list. These are all the habitats in England that were identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and subtidal sands and gravels.</p>
Hazardous waste	<p>The full definition of hazardous waste is set out in the revised Waste Framework Directive (rWFD) (2008/98/EC). This provides a European-wide definition of hazardous waste and requires the correct management and regulation of such waste. Hazardous waste is defined as a waste possessing one or more of the 15 hazardous properties set out in Annex III of the rWFD, but which include being explosive, oxidizing, highly flammable, an irritant, carcinogenic, corrosive, infectious, toxic for reproduction, mutagenic, or ecotoxic. Further regulations are in place that set out how hazardous waste is to be managed in order to mitigate the potential risks it presents to human health and the environment.</p> <p>At this stage of the AoS it has not been feasible to determine the classification of the landfill facility (inert, non-hazardous or hazardous) or the nature of the constituent waste materials within the landfill site. More detailed design would seek to avoid or minimise the impacts on these sites.</p>
High noise levels	<p>A high noise level exposure is defined as a free field noise level from HS2 operational noise greater than or equal to 73 dB LAeq,18hr.</p>
Housing (support for)	<p>See <i>Jobs and houses</i>, below.</p>

HRA and HRA screening	<p>The Habitats Directive (enacted in the UK through the Conservation of Species and Habitats Regulations 2010) requires the 'competent authority' to assess the effects of development on Natura 2000 sites (see below). It requires an initial screening of impacts to determine if there would be a <i>likely significant adverse effect</i>, either alone or in-combination with other projects and plans. Where a likely significant effect is concluded, the competent authority must then undertake an Appropriate Assessment (AA) to determine whether the impacts will adversely affect the site.</p> <p>The process of screening and, if necessary AA, is termed Habitats Regulations Assessment (HRA). Although it is the responsibility of the competent authority to undertake the HRA, it is expected that the proponent of any development will provide sufficient information to enable such an assessment to be undertaken. HRA screening has been undertaken by Temple-ERM as a parallel and supportive process to the AoS and its conclusions are reported within the Sustainability Statement.</p>
Interchange station	<p>Interchange stations are located to provide interchange between HS2 and other modes of transport, including national rail, tram, highway and air. They provide onward access to distributed municipal centres, thereby serving a potentially larger catchment.</p>
Intermediate station	<p>Intermediate stations are stations located along the line of route intended to serve one or more major populations centres. They tend to be in or near to municipal centres, or at least are served by direct access from these municipal centres.</p>
Isolation	<p>Areas of isolation have been defined as areas which may be enclosed by the proposed route and existing major infrastructure, such as motorways or existing railway. The properties identified within these areas do not consider those likely to be demolished.</p>
Jobs (displacement of)	<p>Jobs displaced at stations were calculated by assigning a ratio of jobs per square metre of floor space to commercial demolitions. The affected premises were identified through an onsite comprehensive land use survey to identify the nature and size of each property. The method used at this stage has only considered potential job displacement as a result of commercial demolitions due to the station footprint, and has not yet considered impacts of the four-track sections.</p>

Jobs and houses (support for)	<p>The amount of development that could be stimulated by HS2 with the introduction of a new station is based on the anticipated net additional floorspace of commercial development and residential development within a catchment of the proposed station over the subsequent 25 years, estimated for scenarios both with and without HS2 to determine the difference.</p> <p>For this assessment, a 1km catchment area has been considered for high population and employment density areas (Manchester Piccadilly and Leeds) while a 2km catchment area has been analysed for areas with lower density (Manchester Airport, Sheffield Meadowhall and East Midlands Hub) to take into account that in a lower density area the station serves a wider catchment partially taking on a park and ride function. The catchment areas have been adjusted to correspond to the nearest ward or output area boundary for which socio-economic statistics are published by the Office for National Statistics (ONS).</p> <p>Information on the property market and potential future development has drawn on a variety of source material including published policy and guidance; relevant strategic planning documents; local planning information and assumptions; and existing property, retail and employment data and studies. In addition, the appraisal included discussions with local authorities and used the appraisal team's knowledge of local areas.</p>
Listed buildings (listed structures)	<p>A listed building is one that is 'of special architectural or historic interest' and has been included on a list kept by the Secretary of State. A listed building may not be demolished, extended or altered without special permission (listed building consent) from the local planning authority (who would typically consult English Heritage).</p> <p>Listed buildings are classified according to their importance and are given a grade depending on how important they are:</p> <ul style="list-style-type: none">• Grade I: of outstanding architectural or historic interest.• Grade II*: particularly significant of more than local interest.• Grade II: of special architectural or historic interest.
Local Nature Reserves	<p>Are places with wildlife or geological features that are of special interest locally. They offer people special opportunities to study or learn about nature or simply to enjoy it.</p>

Major, medium and minor river classifications (specific to the AoS)

Each watercourse has been assigned a value based on the size of the receiving catchment and level of flood risk, as follows:

- Major Watercourses: Major watercourses are defined as those watercourses that have a catchment area of 50km² or greater.
- Medium Watercourses: Medium watercourses are defined as those watercourses that have a catchment area of less than 50km², but are either identified as Environment Agency Main Rivers or are associated with an area of flood risk as shown on the Flood Zone Maps (usually any watercourse with a catchment area of 4km² or greater).
- Minor Watercourses and Cross Drainage: All remaining watercourses are defined as minor watercourses.

Major development sites

The study has reviewed major proposals for all types of development, including residential development of 100 or more dwellings or a site area of one hectare or more; other developments with floor space of 5000m² or more or a site area of one hectare or more; major infrastructure schemes, including highways schemes; and major minerals and waste management sites (including both new and extended sites).

The review considered local planning policy allocations within adopted and emerging development plan documents. It considered commercial proposals within masterplan documents, development briefs and consultation documents. It considered live (but as yet undetermined) planning applications registered by the local planning authority or Planning Inspectorate. And it considered extant planning consents, where the consent is granted but development is yet to have commenced or be completed.

The sites were identified from publically available documents that were current at the time of appraisal. Limited consultation was conducted by HS2 Ltd following the announcement of the initial preferred scheme in January 2013. .

The Sustainability Statement has identified only where there would be a potential conflict with these sites, and has not determined any specific potential impacts, on them and the planned proposed land uses within them.

National parks	<p>The national parks of England and Wales are areas of relatively undeveloped and scenic landscape that are designated under the National Parks and Access to the Countryside Act 1949. The two purposes of the National Park designation are to conserve and enhance the natural beauty, wildlife and cultural heritage of the area; and to promote public understanding and enjoyment of the areas special qualities by the public. In pursuing these purposes, a National Park authority shall seek to foster the economic and social well-being of their local communities. If there arises a conflict between the two purposes, relevant authorities shall give greater weight to the conservation and enhancement purpose. The Peak District is a national park.</p>
National Trust land	<p>The National Trust is the largest private society devoted to heritage preservation in the UK. The Trust's land holdings account for nearly 1.5% of the total land mass of England, Wales and Northern Ireland. A large proportion of this consists of the parks and agricultural estates attached to country houses, but there are also many countryside properties which were acquired specifically for their scenic or scientific value. This land is either owned or held in covenant by the Trust.</p> <p>The National Trust Acts grant the Trust the statutory power to declare land <i>inalienable</i>. This prevents the land from being sold or mortgaged against the Trust's wishes without special parliamentary procedure.</p>
Natura 2000 sites	<p>Natura 2000 site is the collective terms for special areas of conservation (both actual and candidate), special protection areas (both actual and potential), Ramsar sites and sites of community importance (not relevant here). See also HRA and HRA screening.</p>
NNR - National nature reserves	<p>NNRs contain examples of some of the most important natural and semi-natural terrestrial and coastal ecosystems in Great Britain. They are managed to conserve their habitats or to provide special opportunities for scientific study of the habitats communities and species represented within them. NNRs are declared by the statutory national conservation agencies (NE, SNH, CCW) under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981.</p>
Noticeable noise increase	<p>A Noticeable Noise Increase for HS2 AoS purposes is defined as having a total rail noise level of greater than or equal to 50 dB LAeq 06:00 – 24:00 with an increase in rail noise of at least 3 dB LAeq 06:00 – 24:00.</p> <p>In terms of a railway noise change, 3 dB LAeq or more is generally considered as a noticeable change. The World Health Organisation, in its 1999 Noise Guidelines report in 2000 on community noise states “to protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq”.</p>

Noise insulation regulations	<p>The Noise Insulation (Railways and Other Guided Transport) Regulations 1996 (NIRR) apply to works on new, altered or additional railway systems in England and Wales. They address changes in levels of railway noise only. The regulations set the daytime criteria where there is a duty on the relevant authority to carry out insulation work on residential buildings as follows:</p> <ul style="list-style-type: none"> • The total rail noise level is greater than or equal to 68 dB LAeq,18hr one metre from the building façade; • Noise from the [new] railway makes a contribution of at least 1 dB LAeq,18hr to the total railway noise; • Noise from the [new] railway results in at least a 1dB LAeq,18hr increase in total railway noise level; and • Only relevant to dwellings within 300m of the railway.
Open access land	<p>Under the Countryside and Rights of Way Act 2000 (CROW), the public can walk freely on mapped areas of mountain, moor, heath, downland and registered common land without having to stick to paths. The new rights came into effect across all of England on 31 October 2005.</p>
Promoted recreational routes	<p>Certain rights of way are given additional status, albeit informally so, by their designation as long distance paths or national trails. Long distance paths link individual footpath sections into a continuous recreational walking trail. They may not necessarily be very long, but they are actively publicised or promoted. For example, they may be ‘themed routes’ where they take inspiration from an historical or literary figure, or they may follow a feature of the landscape. There are in addition, 15 national trails in England and Wales, although none would be affected by the route sections.</p> <p>The Sustainability Statement records impacts only on these routes, rather than on all rights of way. However, HS2 Ltd would seek to maintain <i>all</i> existing rights of way (not just promoted recreational routes) through the on-going design of the scheme. This would involve working with local people, local authorities and relevant organisations to determine the best way of maintaining rights of way.</p>
Preliminary candidate area for mitigation	<p>These are areas where additional mitigation, such as noise barriers or earth bunds, would potentially have the greatest benefit to reducing the overall number of noise impacts. For the purposes of modelling the scheme ‘including additional indicative mitigation’ it has been assumed that mitigation at these locations would achieve a noise reduction equivalent to that achieved by use of 3m high noise barriers (or bund) or, at viaducts, by 2m high barriers with noise-absorbent materials used throughout.</p>

Protected characteristic groups	Protected characteristic groups are groups of people listed under the Equality Act 2010 according to their having defined “protected characteristics”. Those being considered at this stage within the Sustainability Statement are determined by, age (younger and older population), disability, race, faith, gender, sexual orientation and lone parent families..
Ramsar site	Ramsar sites are designated under the Convention on Wetlands of International Importance, agreed in Ramsar, Iran, in 1971. The Convention covers all aspects of wetland conservation and wise use, recognizing wetlands as ecosystems that are extremely important for biodiversity conservation in general and for the well-being of human communities.
Registered Battlefields	The English Heritage Register of Historic Battlefields offers protection for 43 English battlefields and promotes a better understanding of their significance. The inclusion of a site on the register does not give any statutory protection but it is a material consideration when a local planning authority determines a planning application.
Registered parks and gardens	<p>Parks and gardens are listed within the Register of Parks and Gardens of special historic interest in England, which was established and is maintained by English Heritage. There are currently close to 1,450 sites on the register split into three bands according to their significance. Inclusion on the Register brings no additional statutory protection, but local authorities are required by central government to make provision for the protection of the historic environment in their policies and their allocation of resources. Registration is a material consideration in planning terms so, following an application for development which would affect a registered park or garden, local planning authorities must, when determining whether or not to grant permission, take into account the historic interest of the site.</p> <ul style="list-style-type: none">• Grade I: of outstanding landscape and historic interest.• Grade II*: particularly significant landscape and historic interest.• Grade II: of special landscape and historic interest.
Scheduled monuments	Defined in the Ancient Monuments and Archaeological Areas Act 1979 and (in England only) through the National Heritage Act 1983 as a protected archaeological site or historic building of national importance. The Department of Culture, Media and Sport are responsible for identifying and scheduling (registering) new sites, as well as ensuring that scheduled sites are protected. Scheduled Monument Consent is required from the Secretary of State prior to any work affecting a monument taking place. English Heritage (EH) would advise in these matters.

SAC - special area of conservation	SACs are designated under Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the EU “Habitats Directive”) as areas identified as best representing the range and variety of habitats and (non-bird) species listed in Annexes I and II to the Directive within the European Union. SACs in terrestrial areas and marine waters within British Fishery limits (up to 200 nautical miles) are designated under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). With SPAs (see below) they form the Natura 2000 network.
Severance	Severance could occur when settlements are divided by the route, leaving some people separated from certain community facilities. The methodology for appraising severance in the Sustainability Statement involved looking for communities that will be severed such that one part of a town or settlement would be cut off from another. The counts of residential and community properties within the identified areas were derived from the latest available address point data.
SPA - special protection area	SPAs are classified by the UK Government under Directive 79/409/EEC on the conservation of wild birds (the EU “Birds Directive”). SPAs are areas of the most important habitat for rare (listed on Annex I in the Directive) and migratory birds within the European Union. SPAs in terrestrial areas and marine waters within British Fishery limits (up to 200 nautical miles) are designated under the Wildlife and Countryside Act 1981 but governed by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). With SACs (see above) they form the Natura 2000 network.
Spur	A track or tracks that diverge from the main line at one location, without onward reconnection, to provide access to other railway facilities at the end of the spur, often at some distance from the point of divergence.

SPZ - source protection zones	<p>Groundwater sources (or abstractions) such as wells, boreholes and springs used for public drinking water supply, are protected through mapping of groundwater Source Protection Zones (SPZ). These zones show the plan area of the underlying aquifer (see <i>aquifers</i>) which contributes to the supply of groundwater for drinking water. The zones help to identify the risk of contamination from any activities that might cause pollution in the area and the risk of affecting the supply from any activities which might impede or obstruct the flow of groundwater. The closer the activity to the point of abstraction, the greater the risk. For large public groundwater supplies, the areas of land from which water flows is also mapped, and activities that might cause pollution are carefully controlled. The EA has defined SPZs for 2,000 groundwater sources. SPZs are mapped showing different zones which indicate the increasing vulnerability of the groundwater source to contamination.</p> <ul style="list-style-type: none">• SPZ1 – inner zone, which defines an area with less than a 50-day travel time to the point of abstraction (minimum of 50m).• SPZ2 – outer zone, which defines an area with less than a 400-day travel time to the point of abstraction (minimum of 250m or 500m depending on the size of the abstraction).• SPZ3 – total catchment, which is defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge is > 0.75.
SSSI - sites of special scientific interest	<p>Identified by Natural England under section 28 of the Wildlife & Countryside Act 1981 as requiring protection from damaging development on account of its flora, fauna, geological and/or physiological features. Improved provisions for the protection and management of SSSIs were introduced by the Countryside and Rights of Way Act 2000.</p> <p>The SSSI series has developed since 1949 as the national suite of sites providing statutory protection for the best examples of the UK's flora, fauna, geological or physiographical features. These sites are also used to underpin other national and international nature conservation designations (see below). Most SSSIs are privately-owned or managed; others are owned or managed by public bodies or non-government organisations.</p>

Super output areas and indices of multiple deprivation	<p>The English Indices of Deprivation 2010 (ID 2010) are the Government's official measure of multiple deprivation at small area level. The Index of Multiple Deprivation 2010 (IMD 2010), which forms part of the ID 2010, is based on the small area geography known as Lower Super Output Areas (LSOAs). LSOAs are small areas of relatively even size (around 1,500 people). In most cases, these are smaller than wards, thus allowing the identification of small pockets of deprivation.</p> <p>There are 32,482 LSOAs in England. The LSOA ranked 1 by the IMD 2010 is the most deprived and that ranked 32,482 is the least deprived. The IMD brings together seven domains of deprivation to produce the overall Index of Multiple Deprivation: income, employment, health and disability, education, skills and training, barriers to housing and other services, crime and living environment. These are weighted and combined to create the overall IMD 2010.</p> <p>Identification of areas of high deprivation is a proxy for those areas considered relatively more sensitive to further adverse impacts associated with HS2. Equally, there are potential benefits where HS2 offers regeneration opportunity from which people in deprived areas might benefit.</p>
Tranquillity	<p>Tranquillity is a complex concept that can be summarised as 'getting away from it all'. Factors affecting tranquillity include closeness to roads and buildings, how noisy and crowded a place is, and whether it offers views of open countryside. The Campaign to Protect Rural England (CPRE) has produced regional tranquillity maps based on 44 such factors. The proposed route goes through none of these areas.</p>
UDP	<p>Unitary development plans are development plan prepared by a metropolitan district and some unitary local authorities that contain policies equivalent to those in both a structure plan and a local plan. By virtue of specific transitional provisions, these plans will continue to operate for a time after the commencement of the new development plan system.</p>
Vibration (and ground-borne noise)	<p>The appraisal records the number of dwellings located over tunnel sections as an indication of numbers at risk of vibration impacts. These are not recorded in the AoS Options report as experience from HS1 and other high speed railways shows that potentially significant effects from vibration and ground-borne noise in properties over tunnels can be avoided. HS2 Ltd is committed to ensuring that no significant effects occur over tunnels.</p> <p>Further information on the noise appraisal is given in Appendix E6 Noise and Vibration.</p>

Water Framework Directive	The Water Framework Directive is a European Union directive to establish a framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. It will ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015.
WCML	West Coast Main Line. The main railway currently linking London and Scotland via Birmingham, Manchester, Liverpool and Crewe.
World heritage sites	World Heritage Sites are designated to meet the UK's commitments under the 1972 World Heritage Convention concerning the Protection of the World Cultural and Natural Heritage. These sites are designated for their globally important cultural or natural interest and require appropriate management and protection measures. Sites are nominated and confirmed for inclusion on the list maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee, composed of 21 State Parties (countries) which are elected by the General Assembly of States Parties for a fixed term.

4. Appendix B.4: HS2 Ltd Sustainability Policy



Sustainability policy

HS2's purpose is to create a world class high speed rail network to support sustainable growth in the UK. It is a major opportunity to provide greater choice in the way we travel to help deliver a sustainable transport system for the UK.

Our vision is of a high speed railway network which changes the mode of choice for inter-city journeys, reinvigorates the rail network, supports the economy, creates jobs, reduces carbon emissions and provides reliable travel in a changing climate throughout the 21st century and beyond.

This policy sets out HS2 Ltd's commitment to be an exemplar project. Building this network will inevitably cause some local effects on communities, the natural and the built environment. We will strive to limit the negative impacts through design, mitigation and by challenging industry standards and we will look for environmental enhancements and benefits.

Through this policy we aim to support the following Government goals:

- Create a step change improvement in transport links between regional centres and from them to London.
- Enable more equal distribution of opportunity, connect communities and encourage regeneration.
- Stimulate sustainable economic growth through increased capacity and shorter journey times between key cities.
- Support British engineering, create job opportunities and develop skills in the UK.
- Deliver lower carbon long distance travel.
- Maximise integration of HS2 with existing UK and international transport networks.
- Encourage wellbeing and protect the environment.

What we will do

We will promote high speed rail and balance community, environmental and economic issues. We have identified key themes as a focus for our work to:

Growth and regeneration • Support sustainable economic development and the localism agenda for regeneration.

Environmental change • Seek to avoid significant adverse effects on communities, business and the natural, historic and built environment. Minimise impacts where they occur and deliver enhancements as far as practicable to ensure there is no net loss to the natural environment.

Skills and employment • Improve skills, jobs, education and the economy through our investment along the length of the route. Act as a driver for improvements in the sustainability of the engineering and construction sector. Promote diversity, openness and fairness.

Climate change • Minimise the carbon footprint of HS2 as far as practicable and deliver low carbon long distance journeys that are supported by low carbon energy.

Resilience • Build a network which is resilient for the long term and seek to minimise the combined effect of the project and climate change on the environment.

Resources and waste • Source and make efficient use of sustainable materials, maximise the proportion of material diverted from landfill and reduce waste.

Integrated transport • Engage with stakeholders to create seamless transport links with other modes and ensure accessibility for all.

How we will deliver this

To deliver our vision we will embed sustainability in our business at each phase of the project through:

A clear plan • Setting goals relevant to the stage of the project from design, through development, construction, operation, maintenance and renewal which stimulate innovation and ensure enhancements are protected for the long term. Our plan and this policy will be reviewed biennially.

Robust processes • Ensuring sustainability is integrated into our culture, procedures and processes. This will include the development of Sustainable Design and Delivery Principles as part of a process to enable us to balance the sometimes competing elements of sustainability and to understand whole life cost.

Procurement • Ensuring sustainability is integral in our procurement processes and is applied to our entire supply chain.

Innovation • Promoting sustainable construction practices, continually focussing ideas and technologies for improving sustainability.

Engagement and reporting • Engaging in dialogue about the project and working with local communities, key stakeholders and our supply chain. Openly reporting our progress in delivering the commitments we make on sustainability regularly and sharing what we learn.

HS2 is determined to ensure sustainability is embedded in the DNA of this project and that it is integrated into all of our work.



Alison Munro, Chief Executive, HS2 Ltd
April 2013

HS2/HS2/SU/POL/000/000002