



HIGH SPEED TWO PHASE ONE INFORMATION PAPER

E31: AIR QUALITY

This paper outlines how the potential air quality impacts of the scheme will be managed.

It will be of particular interest to those potentially affected by the Government's proposals for high speed rail.

This paper was prepared in relation to the promotion of the Bill for Phase One of the scheme which is now enacted. Although the contents were maintained and updated as considered appropriate during the passage of the Bill (including shortly prior to the enactment of the Bill in February 2017) the contents are now historic and are no longer maintained.

If you have any queries about this paper or about how it might apply to you, please contact the HS2 Helpdesk in the first instance.

The Helpdesk can be reached at:

**High Speed Two (HS2) Limited
Two Snowhill, Snow Hill Queensway
Birmingham, B4 6GA**

by email: HS2enquiries@hs2.org.uk

or by phone: 08081 434 434 (lines are open 24 hours)

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1. Introduction

- 1.1. High Speed Two (HS2) is the Government's proposal for a new, high speed north-south railway. The proposal is being taken forward in two phases: Phase One will connect London with Birmingham and the West Midlands and Phase Two will extend the route to Manchester, Leeds and beyond.
- 1.2. HS2 Ltd is the non-departmental public body responsible for developing and promoting these proposals. The company works to a Development Agreement made with the Secretary of State for Transport.
- 1.3. In November 2013, HS2 Ltd deposited a hybrid Bill¹ with Parliament to seek powers for the construction and operation of Phase One of HS2 (sometimes referred to as 'the Proposed Scheme'). The Bill is the culmination of nearly six years of work, including an Environmental Impact Assessment (EIA), the results of which were reported in an Environmental Statement (ES) submitted alongside the Bill. The Secretary of State has also published draft Environmental Minimum Requirements (EMRs), which set out the environmental and sustainability commitments that will be observed in the construction of the Proposed Scheme.
- 1.4. The Bill is being promoted through Parliament by the Secretary of State for Transport (the 'Promoter'). The Secretary of State will also appoint a body responsible for delivering the Proposed Scheme under the powers granted by the Bill.
- 1.5. This body is known as the 'nominated undertaker'. There may well be more than one nominated undertaker – for example, HS2 Ltd could become the nominated undertaker for the main railway works, while Network Rail could become the nominated undertaker for works to an existing station such as Euston. But whoever they are, all nominated undertakers will be bound by the obligations contained in the Bill and the policies established in the EMRs.
- 1.6. These information papers have been produced to explain the commitments made in the Bill and the EMRs and how they will be applied to the design and construction of the Proposed Scheme. They also provide information about the Proposed Scheme itself, the powers contained in the Bill and how particular decisions about the project have been reached.

2. Overview

- 2.1. This information paper outlines how the potential air quality impacts of the scheme will be managed.

¹The High Speed Rail (London – West Midlands) Bill, hereafter 'the Bill'.

- 2.2. The purpose of the scheme is to build a high speed railway network running trains powered by electric motors, supplied by electricity from the national distribution grid via overhead lines. The trains will have no significant emissions to air at the point of travel. Electric trains are 'cleaner' than the competing modes of car travel and domestic aviation which rely primarily on the combustion of fossil fuels. The railway can thus off-set the environmental impacts of the increase in travel associated with economic growth.
- 2.3. Further to this, HS2 Ltd has a sustainability policy which commits to reducing pollution and adverse effects where these cannot be prevented.

3. Objectives

- 3.1. HS2 Ltd's Sustainability Policy identifies environmental issues as one of the key focuses for HS2's work². As part of promoting high speed rail and to balance community, environmental and economy issues, the HS2 Sustainability Policy sets out a commitment to 'protection of the environment through seeking to avoid significant adverse effects on communities, businesses and the natural, historic and built environment, including the prevention of pollution.'
- 3.2. This document sets out the approach HS2 Ltd will follow to try to avoid emissions to air causing significant adverse effects on communities and prevent air pollution. The measures set out are intended to maintain good air quality for those people living and working close to the scheme as far as reasonably practicable. For the most part, measures which reduce emissions which have harmful impacts on human health, will also reduce emissions which have an effect on climate change (carbon).
- 3.3. HS2 Ltd has the following objectives for air quality relating its construction and operation of HS2 Phase One. These are intended to be consistent with, and reinforcing of, HS2 Ltd's Carbon Minimisation Policy, which is published in Information Paper E10: Carbon. HS2 Ltd will, as far as reasonably practicable:
 - avoid pollutant emissions to air
 - avoid causing public and workforce exposure to air pollutants where emissions cannot be avoided
 - reduce pollutant emissions where emissions cannot be avoided
 - minimise public and workforce exposure to pollutant emissions where exposure cannot be avoided
 - work with the relevant authorities to maintain air quality, especially where construction or operations may have significant air quality effects in locations where

² <https://www.gov.uk/government/publications/hs2-sustainability-policy>

those authorities have management areas or zones with plans or measures directed at compliance with national air quality standards

- provide mitigation for dust soiling, where it cannot be prevented.
- 3.4. The railway itself is in keeping with these objectives as a mode of transport. Being powered by electricity, it avoids causing public and workforce exposure to air pollutants.

4. Potential Air Quality Effects

- 4.1. The quality of the air in the UK is regulated by law, to limit the concentration of air pollutants which cause adverse effects on human health and the environment.
- 4.2. The main pollutants of concern in the UK are nitrogen dioxide and fine particulate matter (PM₁₀). These are known to cause harm to humans.
- 4.3. The construction of the railway will have impacts on air quality through the use of on-road and off-road machines using conventional engines, and through the emissions of dust from demolition and construction.
- 4.4. The operation of the railway will have impacts on air quality through the change of location and nature of road traffic emissions. The passenger trains themselves are powered electrically and will have no significant emissions to air.
- 4.5. HS2 Ltd's environmental consultants have followed independently published guidance in order to determine where and to what extent the impacts on air quality cause significant effects.
- 4.6. This guidance published by the Institute of Air Quality Management sets out thresholds of change in air pollutant concentrations, which are compared against the existing situation. Where the existing air quality is poor (such as close to roads in London), a relatively smaller change in pollution concentration is considered to be a significant effect, than where existing air quality is good.
- 4.7. Where an effect on air quality is described as significant at a particular location, this is with respect to the air quality legislation, and does not denote a significant effect on human health. Much larger changes in air quality than are predicted as a consequence of the scheme would be needed to cause significant impacts on health at the level of an individual person.

Dust from Construction Sites

- 4.8. The conclusion of the assessment in the Environmental Statement, and the Supplementary Environmental Statements, is that there will be 'no significant effect' on any receptors (residential, property-based or ecological) along the route from dust-generating activities during construction, with the provisions of the Code of Construction Practice (CoCP) applied. The CoCP forms part of the Environmental Minimum Requirements ('EMRs'), so it is a requirement under

the EMRs that dust emissions during construction should be minimised as far as reasonably practicable and with the objective that there is no significant effect.

Highway Vehicle Emissions

- 4.9. Road vehicles with conventional engines burn diesel or petrol which emit the greenhouse gas carbon dioxide and water vapour with trace quantities of pollutants which include nitrogen oxides and PM₁₀ particulate matter (soot).
- 4.10. During construction, highway construction traffic and highway interventions will cause temporary significant effects for local air quality, but this is confined to a limited number of roads in the London metropolitan area. These effects are mostly from changes in nitrogen dioxide concentrations, and to a much less extent from changes in PM₁₀. This is largely due to the existing poor air quality in London.
- 4.11. In other areas, additional construction vehicle movements and highway interventions will cause traffic changes in Air Quality Management Areas, including South Ruislip to Ickenham, Colne Valley, Stoke Mandeville and Aylesbury, and in Birmingham and Coventry, although without being predicted to cause significant air quality effects.
- 4.12. The railway will change the location and nature of road traffic emissions. Changes in road traffic flows near to Euston and Old Oak Common stations will result in localised significant beneficial and adverse air quality effects.

5. Control Measures

- 5.1. The objectives set out above will be considered appropriately in the design and construction of the civil infrastructure, and in the adoption of control measures to protect air quality
- 5.2. As stated above, in a limited number of locations the construction and operation of the railway is predicted to have significant adverse air quality effects.
- 5.3. HS2 Ltd is setting a new standard for construction projects in its management of air quality effects on the highways. In any area where they are predicted to occur, temporary significant air quality effects around highways will be managed through the Code of Construction Practice. The management process is based on the Local Air Quality Management provisions of Part IV of the Environment Act 1990, and requires measurements of air quality, periodic reviews of those measurements, and if necessary the development of action plans to address the significant effects, with the objective of removing them as soon as, and as far as practicable.
- 5.4. The management process described above will be undertaken working with the relevant Local Authorities. They will be consulted on the monitoring, reviews, assessments and action plans.
- 5.5. The main impacts from HS2 on air quality result from vehicles and machinery required for the construction of the Proposed Scheme.

- 5.6. Engine emissions are regulated in Europe by a series of standards ('Euro standards'), first introduced in 1992. These are limits on the emissions of NOx and particulate matter (amongst others) and they are different for light and heavy vehicles. The Euro standards legislation also dictated the use of specific technologies for use in the engines in order to reduce the emission of specific pollutants; for example, catalysts, absorbers and filters.
- 5.7. Since their introduction, each new standard has been set at a stricter level to the previous ones, therefore aiming to reduce the contribution of road transport to air pollution. The current and therefore the cleanest standard for heavy vehicles (trucks and buses) is EURO VI.
- 5.8. HS2 has set emission requirements and targets for the engines of contractor cars, vans and heavy road vehicles. These have been developed for the whole route and are categorised as follows; London Low Emission Zone, Clean Air Zones, and Rest of Route. Targets have also been set for the use of Ultra Low Emission Vehicles. Appendix A sets out these requirements and targets.
- 5.9. Certain exemptions to the construction vehicle emission standards are permitted for specialist vehicles, unforeseen circumstances and triviality. These, and the obligations of the construction vehicle emission standards are set out in the 'Euro VI' Assurance issued to the London Borough of Camden on 14 September 2016 (copied at Appendix B). The nominated undertaker shall comply with this assurance route wide so far as is relevant in each area to the requirements set out in Appendix A .
- 5.10. To clarify some of the terms included in the Euro VI Assurance (Appendix B): *relevant contractor* means contractor and sub-contractor of the nominated undertaker; *start of works* means start of works authorised under the Hybrid Bill; *principal contractors* means the same as lead contractors as defined in the Code of Construction Practice; and the standards apply following a 12 month transition period, which is from 14 September 2017.
- 5.11. Appendix C sets out HS2 Ltd's emissions requirements for the engines of Non-Road Mobile Machinery (e.g. large cranes and piling machines). These are more stringent (i.e. require cleaner engines, sooner) than the Mayor of London's requirements.

6. More information

- 6.1. More detail on the Bill and related documents can be found at: www.gov.uk/HS2

Appendix A

Construction Vehicle Emission Standards

Vehicle Class & minimum Vehicle Emission Standard	London Low Emission Zone	Clean Air Zone's	Rest of Route
HGVs – EURO VI	Target - 100% from start of works	Target - 100% from start of works	Target - 100% from start of works
	Requirement – 100% from start of works	Requirement – 100% from implementation	Requirement – as far as reasonably practicable; 100% from 2020
HGVs – from 2020 - %age 'cleaner' than EURO VI (e.g. lower PM emission through alternative fuel)	Target - 50%	Target - 25%	Target - 10%
	Requirement - None	Requirement - None	Requirement - None
LDVs – EURO 6 diesel, EURO 4 petrol	Target - 100% from start of works	Target - 100% from start of works	Target - 80% from start of works; 100% from 2020
	Requirement – 100% from 2020	Requirement – 100% from implementation	Requirement – 100% from 2020
ULEV* Cars	Target - 100%	Target – 100%	Target – 100%
	Requirement - produce a plan to work towards achieving target percentages	Requirement - produce a plan to work towards achieving target percentages	Requirement - produce a plan to work towards achieving target percentages
ULEV* Vans (Medium Vans, 2,000 to 2,600 kgs)	Target - 75%	Target - 75%	Target - 75%
	Requirement - produce a plan to work towards achieving target percentages	Requirement - produce a plan to work towards achieving target percentages	Requirement - produce a plan to work towards achieving target percentages

Vehicle Class & minimum Vehicle Emission Standard	London Low Emission Zone	Clean Air Zone's	Rest of Route
Fleet Average gCO ₂ /km Cars	Target - 75gCO ₂ /km from start of works, decreasing by 5gCO ₂ /km every 3 years		
Fleet Average gCO ₂ /km Vans	Target - 160gCO ₂ /km from start of works, decreasing by 20gCO ₂ /km every 3 years		

Table Notes

1. <https://www.gov.uk/government/publications/air-quality-plan-for-reducing-nitrogen-dioxide-no2-in-greater-london-urban-area-uk0001> and <https://www.gov.uk/government/publications/air-quality-plan-for-reducing-nitrogen-dioxide-no2-in-west-midlands-urban-area-uk0002>. Emissions assumptions are set out in the Evidence Annex. New Clean Air Zones will be set up and run by Boroughs/Local Authorities.
2. ULEV* 'Ultra Low Emission Vehicle' current definition for the purposes of obtaining an OLEV grant = 'emissions lower than 75gCO₂/km and zero-emission range greater than 10 miles or for an all-electric vehicle, range greater than 60 miles' – eligible for grant from April 2015. Previous definition from 2011 to 2015 was 'emissions lower than 75gCO₂/km'. The definition of ULEV cars and vans for the purposes of HS2 Ltd will be 'emissions lower than 75gCO₂/km and zero-emission range greater than 10 miles, or for an all-electric vehicle, range greater than 60 miles'. As of 1st March 2016, there will be three categories for plug-in car grants:

Category 1: CO₂ emissions of less than 50g/km and a zero emission range of at least 70 miles

Category 2: CO₂ emissions of less than 50g/km and a zero emission range of between 10 and 69 miles

Category 3: CO₂ emissions of between 50 and 75g/km and a zero emission range of at least 20 miles

3. Contractor performance will be assessed by using data from the vehicle monitoring system and matching it with data from the DVLA and VCA databases. Retrospective reports will be shared with contractors to assist them in managing their performance. In optimising the emissions reduction potential of plug-in hybrid electric vehicles, the duty cycle needs to include sufficient opportunity for vehicle to be charged and operate in electric mode, and fleet and site management should take this into account. Vehicle fuel use is required to be recorded by contractors as part of carbon management.
4. 'Requirements' in the table are a contractual requirement. 'Targets' in the table are HS2's aspiration but form part of the contract tendering process.

Appendix B

Construction Vehicle Emission Standards 'Assurance'

Issued to the London Borough of Camden on 14 September 2016, and signed by
London Borough of Camden on 15 September 2016

EURO VI engines

The Promoter working with Transport for London (TfL), Greater London Authority (GLA) and the London Borough of Camden has produced a study on the use of low emission vehicles in London during construction of HS2. As a result the Promoter is willing to give the following assurances. These supersede and replace assurances on Euro VI vehicles previously provided to the London Borough of Camden on 30 November 2015 and 23 February 2016 (Undertaking & Assurance ref 1943).

- 3.9 *The Promoter will require the Nominated Undertaker to include in their contracts with all relevant contractors the following requirements and to enforce those requirements and to require those relevant contractors to pass down and enforce these requirements in contracts with any relevant sub-contractors:*

Heavy vehicles (>3.5 tonnes)

- 3.9.1 *Require contractors to use HGVs (vehicles with a permissible maximum weight greater than 3.5 tonnes) within the London Low Emission Zone and relating to the construction of the HS2 works, to be powered by Euro VI (or lower emission) engines, unless it is an exempt vehicle.*
- 3.9.2 *Require contractors to determine which vehicles are exempt and to report to the Nominated Undertaker HGV numbers by Vehicle Registration Number and Euro standard (including their subcontractors) including any exemptions and non-compliances for all relevant HS2 related works within the London Low Emission Zone. The exemptions shall be determined in a way that seeks to maximise the use of Euro VI (or lower emission) vehicles. This information to be forwarded to the London Borough of Camden, within one month of receipt by the Nominated Undertaker.*
- 3.9.3 *Certain HGVs (vehicles with a permissible maximum weight greater than 3.5 tonnes) may be exempted on the grounds of:*
- a) **Specialism:** *being a specialist vehicle (not readily available as Euro VI compliant); and/or*

- b) **Unforeseen circumstances:** for example breakdowns or mechanical failure requiring a replacement vehicle that is not readily available as Euro VI compliant; and/or
- c) **Triviality:** if it is expected that a particular vehicle is planned to and only makes no more than 12 visits in any 12-month rolling period to all HS2 works in the London Low Emission Zone, then the vehicle may be given a specific exemption.

All exemptions must be obtained from the contractor designated by the Nominated Undertaker for that purpose and the reasons for seeking the exemption shall be recorded. The totality of the exemptions listed in this clause shall account for no more than 8% of unique vehicles on an annual basis. There may be certain circumstances where an exemption cannot be granted in advance and in this case, a retrospective exemption can be granted provided that:

- (a) the relevant documentation is submitted for consideration within two working days of the vehicle arriving at site;
- (b) the vehicle falls within the grounds for an exemption; and
- (c) the reasons for the retrospective application are recorded.

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All principal contractors, shall set out in their Logistics Environment Sustainability and Safety Management Plans (ESSMPs), their exemptions management process and report vehicle numbers, exemptions and non-compliances to the Nominated Undertaker on a monthly basis for two years from start of works to be undertaken by those principal contractors. Following the end of the initial two year period the reporting period will be reduced in frequency by agreement as performance is established. Non-compliances are those HGVs (vehicles with a permissible maximum weight greater than 3.5 tonnes) which are not Euro VI compliant and have not been exempted under the agreed grounds for exemption (i.e. exempted vehicles are not considered to be non-compliances with the commitment). There shall be a transition period of 12 months from the signing of the assurance, during which the compliance regime will be established. Where Enabling Works Contractors do not produce ESSMPs, they shall make equivalent provisions to those set out in this paragraph, and agree them with the Nominated Undertaker. Such plans or provisions shall be consistent with the principle of avoiding pollutant emissions to air as far as reasonably practicable, as set out in Information Paper E31: Air Quality.3.3. The LB Camden will be provided with this information in accordance with the third assurance given by the Promoter in the Route-Wide Air Quality assurance dated 23 February 2016.

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For HGVs, contractors shall prepare and agree an Action Plan with the Nominated Undertaker:

- a) if there is less than 100% Euro VI compliance; or

or

b) if the number of exemptions increases on the previous three months.

Light vehicles (vehicles less than tonnes)

- 3.9.6 *Require all light vehicles used by contractors in relation to the construction of the HS2 works in the London Low Emission Zone (vehicles with a permissible maximum weight less than or equal to 3.5 tonnes) to be Euro 4 petrol and Euro 6 diesel compliant by 2020, (without an exemptions regime, with annual reporting).*
- 3.9.7 *Require contractors, as part of their Logistics Environment Sustainability and Safety Management Plans (ESSMPs), to produce a plan to work towards achieving target percentages of ULEVs to be used in the fleet of light vehicles relating to the construction of HS2 for the purposes of their contract, entering the London Low Emission Zone. An 'Ultra Low Emission Vehicle' (ULEV) is defined here based on advice from the Office for Low Emission Vehicles as: 'emissions lower than 75gCO₂/km and zero-emission range greater than 10 miles'. The target percentage of ULEVs shall be proportionate to the size and duration of the contract, and take into account the vehicle activity included in it. This plan should be agreed with the Nominated Undertaker and progress against the plan shall be measured and reported.*
- 3.9.8 *The use of cars (for the purposes of construction activities) by contractors is expected to be minimal during HS2 construction in inner urban areas within London. Contractors shall aim to adopt ULEV cars from the start of works under the act (and report actual usage measured as annual vehicle mileage, not unique vehicles), working towards a target of 100% ULEV use (or other percentage agreed with the Nominated Undertaker who shall have regard to what is proportionate given the size and duration of the contract) over the course of their contract, taking into account the contract size, duration and vehicle activity. For vans, contractors shall aim towards meeting a target of 75% ULEV use (or other percentage agreed with the Nominated Undertaker), measured as annual vehicle mileage). Benchmarks (defined here as numbers against which performance will be evaluated) are set for contractor fleet average CO₂ emissions as follows (and will be subject to review):*
- a) *fleet average for cars of 75gCO₂/km from start of works authorised under the Bill, decreasing by 5gCO₂/km every 3 years; and*
 - b) *fleet average for vans of 160gCO₂/km from start of works authorised under the Bill, decreasing by 20gCO₂/km every 3 years).*

Additional Notes on Compliance monitoring and reporting

- 3.9.9 *For the metrics for all vehicles referred to above, contractors shall be required to establish a baseline of vehicle use, exemptions and compliance percentages within the first two months of starting their activities.*

- 3.9.10 *Data shall be reported to the Nominated Undertaker initially on a monthly basis; once continuous improvement is shown in each of three separate adjacent months, the frequency of reporting may be reduced (with the agreement of the Nominated Undertaker). Contractors shall also provide annual (calendar year) statistics to the Nominated Undertaker to enable aggregate reports to be compiled.*
- 3.9.11 *In keeping with HS2's principle of avoiding pollutant emissions to air as far as reasonably practicable, keep under review the potential for further updating this assurance to respond to potential future changes to vehicle emissions standards, technology and/or legislation. This could include, but is not restricted to, updating requirements to reflect future vehicle emission standards, and the introduction of automatic monitoring of vehicles relating to the construction of HS2 works.*

Appendix C

Non-Road Mobile Machinery Emissions Standards

The engine emissions of Non-Road Mobile Machinery (NRMM) are controlled by EU Regulation in a similar way to on-highway EURO standards. The Greater London Authority (GLA) Supplementary Planning Guidance (SPG) on the control of dust and emissions during construction and demolition³ sets requirements for NRMM emissions based upon the EU emission stages. Requirements for the scheme are based on those of the SPG, but are more stringent, requiring the earlier up-take of cleaner engines.

Table 1: NRMM Engine Emission Stage Requirements (of engine power between 37kW and 56kW)

Area	London SPG Stage Requirements		HS2 Requirements	
	From 2015	From 2020	From 2017	From 2020
Central Activity Zone (includes Euston)	IIIB	IV	IV ^(1, 2)	V
Rest of Greater London	IIIA	IIIB	IIIB ⁽²⁾	IV ^(1, 2)
Rest of country	Not applicable	Not applicable	IIIB ⁽²⁾	IV ^(1, 2)

Notes: (1) IIIB for $37 \leq P < 56$ kW, as there is no corresponding Stage IV at EU level
(2) IIIA for constant speed engines of any power, as there is no corresponding Stage IIIB or IV at EU level

The Greater London Authority exemptions policy set out in the SPG will apply route wide to HS2. It can be viewed at: <http://nrmm.london/nrmm/about/nrmm-exemption-policy>

In certain cases, retrofit emission control devices (REC) applied to the previous stage of engine may be permitted. In this case, the REC shall be approved to (United Nations Economic Commission for Europe) UNECE Regulation R132. HS2 Ltd shall set and periodically review best practice R132 class approvals for its contractors. When setting best practice class approvals, preference will be given to particulate matter retrofit REC with zero permitted absolute increase nitrogen dioxide emission classes.

HS2 contractors shall register compliant NRMM (including where necessary with HS2 Ltd approved REC) with the nominated undertaker prior to the machinery entering a HS2 construction site.

HS2 contractors shall submit, where necessary, applications for an NRMM exemption to the nominated undertaker for approval.

It is acknowledged that from 2020 not all NRMM equipment types will see a full set of Stage V products in the market place. In these cases contractor can apply for an exemption, in line with the GLA Exemptions Policy.

³ Greater London Authority (2014), The control of dust and emissions during construction and demolition Supplementary Planning Guidance