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EXECUTIVE SUMMARY

The Highways Agency (the "Agency") is making an application (the "Application") for development consent to improve the M4 motorway ("M4") to a smart motorway between junction 3 (Hayes) in west London and junction 12 (Theale), which is near Reading, (the "Scheme"). This Engineering and Design Report ("EDR") accompanies the Application and its purpose is to explain the design principles and design rationale for the Scheme. It describes how the design has been influenced by the technical and operational requirements of creating all-lane running and smart motorway infrastructure. It is similar to a Design and Access Statement ("DAS"), but provides additional Scheme-specific information beyond that usually provided for within a DAS. It also supports the environmental impact assessment of the Scheme.

The Strategic Road Network ("SRN") in England comprises motorways and all-purpose trunk roads. The SRN is operated, maintained and improved in England by the Agency on behalf of the Secretary of State. The Agency is an executive agency of the Department for Transport ("DfT"). ~~Government.~~

The M4 is the main strategic route between London and the west of England, and on to South Wales. The M4 currently suffers from heavy congestion between junctions 3 (Hayes) and 12 (Theale), which leads to unpredictable journey times. Traffic flows are predicted to increase further, which, without road improvements, will result in more severe congestion. The strategic need for the Scheme was originally discussed in 2003 by the Thames Valley Multi Modal Study which recommended against widening in favour of using technology to manage traffic flow.

Improvement of the M4 to a smart motorway will help to relieve congestion by permanently converting the hard shoulder to a running lane and using technology to vary speed limits and manage traffic. Signs and signals will be used to inform drivers of conditions on the highway network, when and where variable speed limits are in place, and when lanes are closed.

The Scheme is a nationally significant infrastructure project ("NSIP") to which the Planning Act 2008 ("PA 2008") applies. Therefore, the Agency is required to make an application to the Secretary of State for a Development Consent Order ("DCO") to build and operate the Scheme.

The Scheme is some 51km (32 miles) in length, between junctions 3 and 12. Preliminary design is complete and the Scheme comprises the following principal elements:

- a) conversion of the hard shoulder to a permanent running lane and, where no ~~hard shoulder~~ ~~hard shoulder~~ is in place at present, the construction of a new lane. This will mainly take place between junction 4b and junction 8/9.
- b) replacement of overbridge structures where portals are too narrow to accommodate the improved motorway;
- c) extension of underbridges and other structures such as culverts and subways to accommodate the improved motorway;
- d) changes to junctions and slip roads needed to accommodate traffic joining and leaving the improved motorway, and to allow use of the hard shoulder as a

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- running lane, as well as at some locations allowing 'through junction running' ("TJR");
- e) provision of new gantries and signs to allow the motorway to function as a smart motorway with a variable speed limit, and to provide messages to road users; and
 - f) other infrastructure needed for the improved motorway, such as Emergency Refuge Areas ("ERAsEAs"), enhanced communication systems, closed circuit television ("CCTV") and electrical supplies, as well as works to accommodate statutory undertakers' apparatus and other parties who may be affected by the Scheme.

Detailed design will commence during the examination period. The Detailed Design will build on the Preliminary Design and also take into account the Government's Road Investment Strategy ("RIS") which was published in December 2014 and sets out the performance specification for Highways England – the public sector company, owned by the Government, which will replace the Agency in April 2015. The Infrastructure Bill received Royal Assent on 12th February 2015, and will become an Act of Parliament – the Infrastructure Act 2015.

~~Receipt of Royal Assent means that, amongst other things, Highways England can be appointed as a strategic highways company and the RIS will be a legal requirement.~~

If the Application is successful and the Scheme is granted development consent, it is anticipated that construction will commence in late 2016 and the Scheme will be operational by 2022.

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1 INTRODUCTION

1.1 Scheme Overview

1.1.1 The Highways Agency (the "Agency") is making an application (the "Application") for development consent to improve the M4 motorway ("M4") to a smart motorway between junction 3 (Hayes) ~~in west London~~ and junction 12 in west London and junction 12 (Theale), which is near Reading, (the "Scheme").

1.1.2 This Engineering and Design Report ("EDR") accompanies the Application. The EDR has been submitted pursuant to Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 ("APFP Regulations 2009") (Ref 1) as a document necessary to support the Application. Whilst it is not a requirement for an EDR to be produced for a linear scheme, it is considered that this EDR will assist in the examination and the determination of the Application.

~~1.1.3~~ The Strategic Road Network ("SRN") in England, comprising motorways and all-purpose trunk roads, is constructed and managed by the Agency, which is an

~~1.1.4.1.3~~ executive agency of the Department for Transport ("DfT"). The Agency ~~is responsible~~ is responsible for operating, maintaining and improving the SRN in England on behalf of the Secretary of State.

~~1.1.5.1.4~~ The Agency is to become a government owned company known as 'Highways England', with the Secretary of State as sole shareholder on 1st April 2015. The new company will be set up as a highway authority for the SRN and will have conferred upon it the necessary powers and duties to operate, manage, maintain and enhance the strategic roads network. Regulatory powers will remain with the Secretary of State. The legislation establishing Highways England will make provision for all legal rights and obligations of the Agency, including those in respect of the Application, to be deemed rights and obligations of Highways England. In 2021 Highways England changed its name to National Highways. Where Highways Agency, Highways England or National Highways are stated in this Engineering Design report ("EDR") it should be considered that the same organisation (being the Applicant for the Scheme) is being referred to.

~~1.1.6.1.5~~ The M4 is the main strategic route between London and the west of England, and on to South Wales. Major towns and cities along the M4 include London, Reading, Swindon, Bristol, Newport, Cardiff and Swansea.

~~1.1.7.1.6~~ The M4 between junctions 3 and 12 carries over 130,000 vehicles per day, and more in places. At peak times, traffic flows on many links are close to or exceed the total flow that the link is designed to handle and traffic on the M4 therefore suffers from heavy congestion, which leads to unpredictable journey times. Although traffic volumes

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reduced in 2008 at the start of the global financial crisis, long-term traffic trends still show significant growth. Traffic flows are forecast to increase to an average of 160,000 vehicles per day over the next 20 years, which will result in more severe congestion without road improvements.

4.1.81.1.7 Improvement of the M4 to a smart motorway will help to relieve congestion by permanently converting the hard shoulder to a running lane and using technology to vary speed limits and manage traffic. Signs and signals will be used to inform drivers of conditions on the highway network, when and where variable speed limits are in place, and when lanes are closed.

4.1.91.1.8 The Scheme is a nationally significant infrastructure project ("NSIP") to which the Planning Act 2008 ("PA 2008") (Ref 2) applies. Therefore, the Agency is required to make an application to the Secretary of State for a Development Consent Order ("DCO") to build and operate the Scheme.

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1.2 Purpose and requirements of the EDR

- 1.2.1 The purpose of this EDR is to explain the design principles and design rationale for the Scheme. It describes how the design has been influenced by the technical and operational requirements of creating all-lane running, smart motorway infrastructure. It is similar to a Design and Access Statement ("DAS") but provides additional Scheme-specific information beyond that usually provided for within a DAS. It also supports the environmental impact assessment of the Scheme as described below. The EDR itself constitutes environmental information for the purpose of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (Ref 3).
- 1.2.2 As detailed design will commence during the examination period, this EDR addresses the preliminary design which has been completed. The aim of this EDR is to provide the Examining Authority, and the Secretary of State as decision-maker, with comfort as to how the design of the Scheme will be developed. The EDR is intended to allow the design to be understood and assessed, and to provide parameters for that assessment, which will also ensure that the Scheme is carried out within the limits that have been assessed. The DCO, if granted, will provide consent for the design, however, the Agency will retain an ability to bring forward amendments to the design within the parameters described in the EDR and the limits of deviation given in the DCO. The result is that the Agency should have reasonable flexibility within clear parameters to review the design products to ensure the most appropriate designs are incorporated into the Scheme as built.
- 1.2.3 The design approach included in this EDR takes account of comments received during pre-application consultation under sections 42, 47 and 48 PA 2008 (Ref 2), as well as the outputs of the environmental assessments of the Scheme.
- 1.2.4 The National Networks National Policy Statement ("NN NPS") (Ref 4) was designated in January 2015. It makes clear the requirements for good design in road schemes. At 4.32, the NN NPS states:

"Scheme design will be a material consideration in decision making. The Secretary of State needs to be satisfied that national networks infrastructure projects are sustainable and as aesthetically sensitive, durable, adaptable and resilient as they can reasonably be (having regard to regulatory and other constraints and including accounting for natural hazards such as flooding)."

1.2.5 At 4.35, the NN NPS states:

"Applicants should be able to demonstrate in their application documents how the design process was conducted and how the proposed design evolved. Where a number of different designs were considered, applicants should set out the reasons why the favoured choice has been selected."

1.2.6 The NN NPS suggests that the explanatory statement which accompanies the environmental statement ("ES") is a suitable place for providing the design evolution. However, an explanatory statement to an ES is not a document hitherto ordinarily produced; consequently this EDR communicates how the requirements for good design and access provision have been considered in the preparation of the Application. This EDR should be read in conjunction with the Application drawings/plans and ES, all of which are contained within the suite of Application documents.

1.3 Terminology

1.3.1 Some of the terminology used with the EDR may be unfamiliar to the Reader. Although the terminology is explained throughout the EDR, a tabulated glossary is included from page [148141](#) onwards.