

M54 to M6 Link Road

TR010054

Volume 6

6.3 Environmental Statement

Appendices

**Appendix 14.2 Climate Impacts and
Effects**

Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

January 2020

Infrastructure Planning

Planning Act 2008

**The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009**

**M54 to M6 Link Road
Development Consent Order 202[]**

**6.3 Environmental Statement Appendices
Appendix 14.2 Climate Impacts and Effects**

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Table of contents

Chapter	Pages
1 Summary of climate resilience assessment impacts.....	1
1.1 Overview	1
2 Assessment summary – climate change resilience.....	2
3 In-combination climate change impact (ICCI assessment)	7
4 References.....	9

List of Tables

Table 2.1: Summary of non-significant effects - Operation	2
Table 3.1: Summary of potential in-combination effects	7

1 Summary of climate resilience assessment impacts

1.1 Overview

- 1.1.1 This appendix provides a summary of an assessment of potential climate change impacts on the resilience of the Scheme. Climate change resilience impacts on the Scheme during the construction phase are not expected to be significant due to the duration and nature of the construction activities. Therefore, these impacts have not been assessed further.
- 1.1.2 The Scheme may, however, be vulnerable to a range of potentially significant impacts during the operational phase. These have been assessed in accordance with the methodology set out in Chapter 14: Climate, Section 14.3 of the Environmental Statement (ES) [TR010054/APP/6.3].
- 1.1.3 The assessment found that, based on the mitigation measures embedded in the Scheme design and assumed management practices, UKCP18 climate change projections (UK Met Office, 2018), and information from other environmental disciplines, that none of the potential impacts on climate resilience identified would be significant. These impacts are presented in Table 2.1 and include damage to assets, disruption to power supplies, increased incidence of pollution and increased risks to road users.

2 Assessment summary – climate change resilience

Table 2.1: Summary of non-significant effects - Operation

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design/ assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
<p>End-users (members of public, commercial operators etc.)</p> <p>The assets and their operation, maintenance and refurbishment (i.e. pavements, structures, earthworks & drainage, technology assets etc.).</p>	Severe weather events	Health and safety risks to road users, and disrupted and/ or inaccessible network.	<p>Identification of suitable network redundancies and diversion routes.</p> <p>Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2).</p> <p>Standard operating procedures in place for use in the event of necessary road closure and/ or traffic diversion.</p> <p>Regular maintenance of drainage systems and incorporation of increased maintenance capacity to allow for potential extended maintenance intervals.</p>	Low	Moderate adverse	Not significant
	Increased frequency of heavy precipitation events	Damage to roads, cuttings and drainage systems due to flooding.	<p>Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2).</p> <p>Incorporation of Sustainable Drainage Systems (SuDS) where appropriate.</p> <p>Road drainage design includes future climate change allowances to improve its resilience. Use of attenuation features to detain runoff from all events expected to occur with 1% annual probability or more frequently.</p> <p>Regular sweeping and cleaning to remove debris.</p> <p>Regular maintenance of assets to detect deterioration and damage.</p>	Medium	Minor adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design/ assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	Increased frequency of dry spells and heavy precipitation events	'Summer Ice' – Occurs after a prolonged period of no rain when dirt and oil residues build up on the road. When the first rain event occurs, this material becomes very slippery and dangerous (similar to ice on the road).	Regular maintenance of drainage systems.	Medium	Minor adverse	Not significant
	Increasing average temperatures and increasing frequency of hot days and heatwaves	Material and asset deterioration due to high temperatures.	Use of construction materials with superior properties (such as increased tolerance to fluctuating temperatures). Regular maintenance of assets to detect deterioration and damage. Deterioration models used identify appropriate maintenance regimes.	Medium	Minor adverse	Not significant
	Severe weather events	Increased slope instability leading to subsidence and landslides.	Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2). Requirement for regular slope stability/ geotechnical surveys, especially for clay embankments vulnerable to moisture fluctuations. Alterations to the locations of embankments, or localised reprofiling of land.	Medium	Minor adverse	Not significant
	Severe	Damage and	Emergency response and contingency plans in	Medium	Minor adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design/ assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	weather events	disruption to power supply and other linked infrastructure.	place in the form of a severe weather plan (Ref 2). Identification of suitable network redundancies and diversion routes.			
	Increasing average temperatures and increasing frequency of hot days and heatwaves	Overheating of electrical equipment, such as information and communication systems.	Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2). Installation of equipment capable of withstanding high temperatures.	Medium	Minor adverse	Not significant
	Gradual climate change Severe weather events	Traffic related rutting and migration of materials.	Use of construction materials with superior properties (such as increased tolerance to fluctuating temperatures). Regular maintenance of assets to detect deterioration and damage. Deterioration models used identify appropriate maintenance regimes	Low	Moderate adverse	Not significant
	Increasing average temperatures and increasing frequency of hot days and heatwaves	Thermal expansion and movement of bridge joints and paved surfaces.	Use of construction materials with superior properties (such as increased tolerance to high temperatures). Regular maintenance of assets to detect deterioration and damage. Deterioration models used to identify appropriate maintenance regimes.	Low	Moderate adverse	Not significant
	Increased frequency of	Increased pollution from road runoff.	Control surface water runoff at its source through the use of sustainable highways drainage	Low	Moderate adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design/ assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	dry spells and heavy precipitation events	Increased sediment transport.	techniques to manage road runoff.			
	Gradual climate change Severe weather events	Longer vegetation growing seasons leading to reduced soil moisture and/ or increased tree leaf coverage combined with an increased magnitude and frequency of storm events may result in tree fall and increased maintenance and management requirements.	Regular maintenance of assets to detect deterioration and damage. Regular sweeping and cleaning to remove debris. Regular maintenance of the soft estate. Emergency response and contingency plans in place.	Medium	Negligible	Not significant
	Severe weather events	Reduced safety and visibility as a result of standing water.	Regular maintenance and cleaning of drainage systems. Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2).	Low	Minor adverse	Not significant
	Gradual climate change	Safety risks due to snow and ice.	Ensure effective, essential winter maintenance. Emergency response and contingency plans in place in the form of a severe weather plan (Ref 2). Standard operating procedures in place for use in the event of necessary road closure and/ or traffic	Very low	Minor adverse	Not Significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design/ assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
			diversion.			
	Snow and ice Increased frequency of heavy precipitation events Increasing average temperatures and increasing frequency of hot days and heatwaves	Reduced pavement friction coefficient.	Use of construction materials with superior properties (such as increased tolerance to fluctuating temperatures). Regular maintenance of assets to detect deterioration and damage. Deterioration models used to identify appropriate maintenance regimes. Use of appropriate materials on pavement sections to maintain adequate friction coefficient. Regular sweeping and cleaning to remove debris.	Low	Minor adverse	Not significant
	Gradual climate change	Reduced pavement deterioration from less exposure to freezing, snow and ice.	Regularly reviewed and updated winter maintenance plans. Regular monitoring and maintenance of pavement condition.	Low	Negligible	Not significant
	Gradual climate change	Reduced need for snow clearing.	Regularly reviewed winter maintenance plans.	Low	Negligible	Not significant

3 In-combination climate change impact (ICCI assessment)

Table 3.1: Summary of potential in-combination effects

Receptor	Potential in-combination impact	Likelihood	Consequence	Significance	Additional recommended mitigation measures
Controlled Waters	Increased frequency and severity of short periods of high rainfall may adversely affect groundwater / surface water quality due to uncontrolled release of pollutants, lateral migration of contaminants through aquifers and leaching of contaminants to underlying aquifers.	Low	Low	Negligible	No mitigation measures required.
Soil Quality	Increased frequency and severity of drought and high temperatures may adversely affect soil quality.	Low	Low	Negligible	No mitigation measures required.

Receptor	Potential in-combination impact	Likelihood	Consequence	Significance	Additional recommended mitigation measures
Human health	Increased temperatures or precipitation may affect people's travel choices. Warmer temperatures may lead to more cycling/walking and more rain may lead to the opposite for short local trips.	Low	Very low	Negligible	No mitigation measures required.
	Increased frequency and severity of drought events may adversely affect magnitude and duration of dust generation, exposure to contaminants, dust and vapours, and migration through groundwater during construction.	Medium	Low	Minor adverse	No mitigation measures required.

4 References

- Ref 1 UK Met Office (2018) UK Climate Projections 2018 (UKCP18). Available from:
<https://www.metoffice.gov.uk/research/collaboration/ukcp/download-data>
- Ref 2 Highways England (2018) Asset Delivery East Midlands: Severe Weather Plan.