A38 Derby Junctions

TR010022

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

April 2019

Infrastructure Planning

Planning Act 2008

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

A38 Derby Junctions Development Consent Order 202[ ]

6.3 Environmental Statement Appendices
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Regulation Number	Regulation 5(2)(a)
Planning Inspectorate Scheme Reference	TR010022
Application Document Reference	6.3
Author	A38 Derby Junctions Project Team, Highways England

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Table of contents

Pages

List of Tables

Appendix 14.2 Climate Impacts and Effects

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 A38 Derby Junctions scheme (referred to as "the Scheme" herein). Climate 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) [**TR010022/APP/6.1**].

1.1.3 The assessment found that, based on the mitigation measures built into the Scheme design and assumed management practices, UK Climate Projections 2018 (UKCP18) (UK Met Office, 2018), and information from other environmental disciplines reported within the ES, that none of the potential impacts identified would be significant. These impacts are presented in Table 1 (refer to Section 2 herein) and include damage to assets, disruption to power supplies, increased incidence of pollution and increased risks to road users.

1.1.4 Table 2 in Section 3 provides a summary of the in-combination climate change impact (ICCI) assessment.

2 Assessment summary – climate change resilience

Table 1: Summary of non-significant effects – Scheme operation (2080s)

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
End-users (members of public, commercial operators etc.) The assets and their operation, maintenance and refurbishment (e.g. pavements, structures, earthworks and drainage, technology assets etc.).	Severe weather events	Health and safety risks to road users, and disrupted and/ or inaccessible network.	• Identification of suitable network redundancies and diversion routes. • Emergency response and contingency plans in place (some of which are detailed within the Asset Delivery East Midlands: Severe Weather Plan (Highways England, 2018)). • Standard operating procedures in place for use in the event of necessary road closure and/ or traffic diversion. • Regular maintenance of drainage systems and incorporation of increased maintenance capacity to allow for potential extended maintenance intervals.	Low	Moderate adverse	Not significant
	Increased frequency of heavy precipitation events	Damage to roads, cuttings and drainage systems due to flooding.	• Emergency response and contingency plans in place (some of which are detailed within the Asset Delivery East Midlands: Severe Weather Plan (Highways England, 2018)). • Regular sweeping and cleaning to remove debris. • Regular maintenance of assets to detect deterioration and damage. • Installation of pumping station at Markeaton junction to mitigate flooding of low-lying road section. • Incorporation of sustainable drainage systems (SuDS) into the highway drainage design where appropriate.	Medium	Minor adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
			• 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. • Scheme design includes flood storage areas at Kingsway junction and floodplain compensation area at Little Eaton junction which take appropriate account of climate change. • Design of Dam Brook diversion takes account of flooding and future climate change.			
	Increased frequency of dry spells and heavy precipitation events	'Summer Ice' – occurs after a prolonged period of no rain when dirt and oil residue builds 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	Medium	Minor adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
			maintenance regimes.			
	Severe weather events	Increased slope instability leading to subsidence and landslides.	• Emergency response and contingency plans in place. • Requirement for regular slope stability/ geotechnical surveys, especially for clay embankments vulnerable to moisture fluctuations. • Flood storage areas, alterations to the locations of embankments, or localised reprofiling of land.	Medium	Minor adverse	Not significant
	Severe weather events	Damage and disruption to power supply and other linked infrastructure.	• Emergency response and contingency plans in place. • Identification of suitable network redundancies and diversion routes. • Redundancies and power backup built into the pumping station at Markeaton junction.	Medium	Minor adverse	Not significant
	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. • 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

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	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 dry spells and heavy precipitation events	Increased pollution from road runoff. Increased sediment transport.	• Control surface water runoff at its source through the use of sustainable highways drainage techniques to manage road runoff.	Low	Moderate adverse	Not significant
	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

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	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.	Low	Minor adverse	Not significant
	Gradual climate change	Safety risks due to snow and ice.	• Ensure effective, essential winter maintenance (as outlined within the Asset Delivery East Midlands: Severe Weather Plan (Highways England, 2018)). • Emergency response and contingency plans in place (some of which are detailed within the Asset Delivery East Midlands: Severe Weather Plan (Highways England, 2018)). • Standard operating procedures in place for use in the event of necessary road closure and/ or traffic diversion.	Very low	Minor adverse	Not Significant
	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 (as outlined within the Asset Delivery East Midlands: Severe Weather Plan (Highways England, 2018) in response to snow and ice melt). • Regular sweeping and cleaning to remove debris.	Low	Minor adverse	Not significant

Receptor	Climate event	Impact (climate event and hazard occurring together)	Mitigation built into Scheme design and assumed management practices	Measure of likelihood	Measure of consequence	Effect significance (likelihood x consequence)
	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 Assessment summary – ICCI assessment

Table 2: Summary of potential in-combination effects

Receptor	Potential in-combination impact	Likelihood	Consequence	Significance	Additional recommended mitigation measures
Landscape	Increased frequency and severity of drought events may adversely affect flora, fauna, and water features affecting loss of environmental features and disruption of field pattern.	Low	Low	Negligible	No mitigation measures required.
	Increased temperature and frequency and severity of heat waves may lead to increased frequency of forest/ grass fires. This may result in loss of trees, biodiversity and aesthetic changes to landscape character.	Low	Medium	Minor adverse	No mitigation measures required.
	Areas of high elevation may experience land slippage, partly due to increased rainfall. This could result in changes impacting on the composition of views.	Low	Medium	Minor adverse	No mitigation measures required.
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 during construction.	Low	Medium	Minor adverse	No mitigation measures required.

4 References

Highways England (2018) Asset Delivery East Midlands: Severe Weather Plan (unpublished).

UK Met Office (2018) UK Climate Projections 2018 (UKCP18). Available from: https://www.metoffice.gov.uk/research/collaboration/ukcp/download-data+