

North & East Melton Mowbray Distributor Road

Volume III: ES Appendices

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September 2018**

INTRODUCTION

Appendices

This document is Volume III of the North & East Melton Mowbray Distributor Road (the proposed scheme) Environmental Statement (ES). It presents the appendices that should be read in conjunction with the ES.

The following appendices are included:

- Appendix 3.1: River Eye Options Appraisal Report
- Appendix 4.1 North & East MMDR Record of Consultation
- Appendix 5.1: Air Quality Monitoring Technical Note
- Appendix 6.1: Known Heritage Assets
- Appendix 6.2: Melton Mowbray GI Watching Brief Report
- Appendix 6.3: Geophysical Survey Report
- Appendix 6.4: Written Scheme of Investigations for Archaeological Trenching
- Appendix 6.5: Heritage Plates
- Appendix 8.1: Preliminary Ecological Survey Report
- Appendix 8.2 Hedgerow/Botanical Survey Report
- Appendix 8.3 Terrestrial and Aquatic Invertebrate Survey Report
- Appendix 8.4: White Clawed Crayfish Survey Report
- Appendix 8.5: Great Crested Newt Survey Report
- Appendix 8.6: Reptile Survey Report
- Appendix 8.7: Breeding Bird Survey Report
- Appendix 8.8: Wintering Birds Survey Report
- Appendix 8.9: Barn Owl Survey Report
- Appendix 8.10: Bat Roost Potential Survey Report
- Appendix 8.11: Badger Survey Report
- Appendix 8.12: Otter and Water Vole Survey Report
- Appendix 9.1: Geotechnical Investigation Report
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- Appendix 16.1: Water Legislative and Policy Framework
- Appendix 16.2: Water Quality Monitoring
- Appendix 16.3: HAWRAT Method A & D, Data & Results
- Appendix 16.4: Flood Risk Assessment Report
- Appendix 16.5: Water Framework Directive Assessment Report
- Appendix 16.6: Surface Water Drainage Plan

APPENDIX 3.1: RIVER EYE OPTIONS APPRAISAL REPORT

River Eye Crossing Options Appraisal Report

Melton Mowbray Distributor Road

Leicestershire County Council

Project reference: Melton Mowbray Distributor Road
Project number: 60542201

6 March 2018

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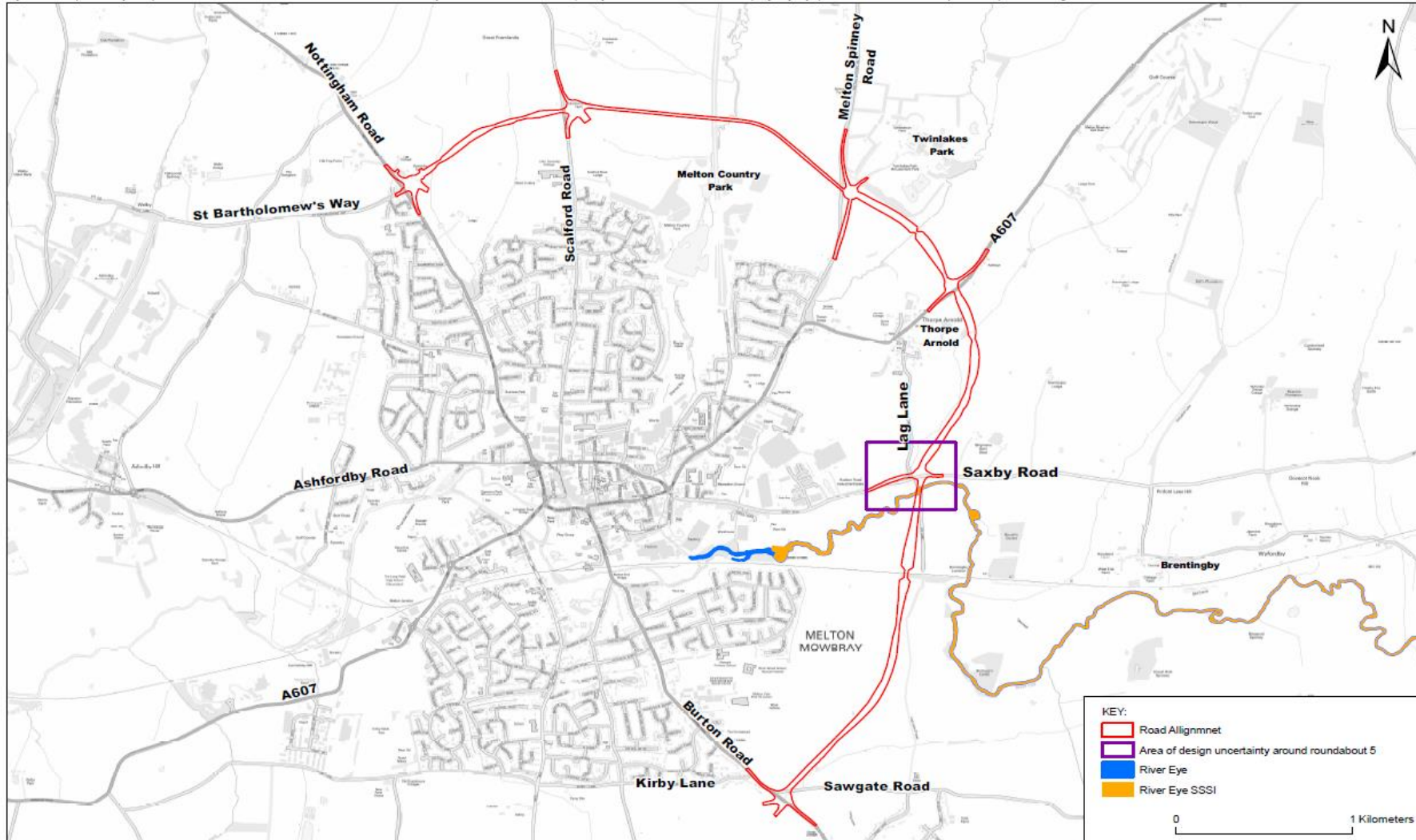
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1. Introduction

- 1.1 The Melton Mowbray Distributor Road (MMDR) is a major infrastructure scheme, proposed to help resolve traffic congestion on the local network and facilitate delivery of the objectives of the Melton Local Plan. The scheme comprises a new single carriageway road of approximately 7km in length, including six new roundabout junctions, a railway crossing and a river crossing. The new road will run from A606 Nottingham Road to the north of Melton Mowbray, around the outskirts of the town to the east, to the A606 Burton Road to the south of the town. Figure 1.1 shows the proposed MMDR route.

Figure 1.1 Proposed MMDR Alignment

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KEY:

- Road Allignmnet
- Area of design uncertainty around roundabout 5
- River Eye
- River Eye SSSI

0 1 Kilometers

Client:	LCC
Project:	MMDR

Title:	Figure 1.1: Proposed MMDR Alignment
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- 1.2 The MMDR would cross several watercourses, including the River Eye Site of Special Scientific Interest (SSSI). The River Eye SSSI is located south of B676 Saxby Road in the vicinity of the MMDR, running very close to B676 Saxby Road at the junction between B676 Saxby Road and Lag Lane. The River Eye SSSI then continues for approximately 200m to the east before heading south towards the railway line. Where the river meets the railway line to the east of Lag Lane is the Brentingby Dam, which is a major piece of infrastructure protecting Melton Mowbray from flooding. The Brentingby Dam is upstream of the section of the River Eye near the MMDR and affects the flow rates and function of the river.
- 1.3 A new roundabout junction (roundabout 5) is required between the new MMDR and B676 Saxby Road. Given that the MMDR would need to cross the River Eye SSSI, a number of design options have been explored to look at ways to minimise the impact of the scheme on the river.
- 1.4 Two sets of high voltage (132kV) overhead powerlines run to the north and south of the B676 Saxby Road broadly in parallel with the road. The current alignment of the MMDR requires a bridge to be constructed to cross the River Eye (see **Figure 1.1.**).
- 1.5 This report presents five options for the River Eye crossing and evaluates each option in terms of its technical feasibility, safety and environmental impacts. The report includes the findings of the options appraisal to enable further discussion with statutory consultees and to inform the detailed design of the proposed MMDR scheme.
- 1.6 An Environmental Impact Assessment (EIA) will be undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 to fully assess the effects of the proposed MMDR. Collaborative engagement with statutory consultees carried out throughout this process will influence the final detailed design of the proposed scheme. The EIA will be reported in an Environmental Statement and submitted with the planning application.
- 1.7 Given that this report has been prepared to inform finalisation of the MMDR design, the assessment herein is predominantly qualitative and in some sections quantitative (where information is available) and is in accordance with the Design Manual for Roads and Bridges (DMRB) as far as possible.
- 1.8 The Construction Design and Management Regulations 2015, also known as CDM Regulations or CDM 2015, were consulted for this assessment. The regulations govern the way construction projects of all sizes and types are planned. CDM 2015 regulations aim to improve the overall health, safety and welfare of those working in construction.
- 1.9 CDM 2015 place legal obligations on designers and contractors to eliminate reduce and control health and safety risks associated with the construction, maintenance and operation of highways.
- 1.10 The structure and content of the Report is as follows: :
 - Chapter two briefly describes the background of the proposed MMDR route alignment and describes in detail the proposed options for the River Eye Crossing. This section also evaluates each option against Construction Design Management Regulations (CDM) requirements.
 - Chapters three to eleven provide an assessment of the environmental effects of the proposed options for crossing the River Eye under each technical discipline namely: water resources, nature conservation, flood risk, cultural heritage, landscape and visual impact, air quality, noise and vibration, geology and soils and materials.

Each Chapter follows a similar structure where possible to include a description of the study area, methodology, baseline conditions, assessment of effects and conclusions.
 - Chapter twelve provides cost estimates for each option.
 - Chapter thirteen presents the summary, conclusion and next steps.

2. The Options

Developing the Proposed Scheme Alignment

- 2.1 Leicestershire County Council has been assessing highway options to accommodate future growth and address congestion issues within Melton Mowbray town centre. This section describes the options that have been considered in developing the scheme as currently presented.
- 2.2 The development of the MMDR has been an iterative process with the three previous key stages in the optioneering process involving:
 1. assessment of different options for enabling development in Melton Mowbray;
 2. assessment of broad MMDR route options around Melton Mowbray; and
 3. refinement of options for the section of the MMDR south of the A607 Melton Road.

The alternatives considered under each of these stages are explored below.

Stage 1: Assessment of different options to enable development in Melton Mowbray

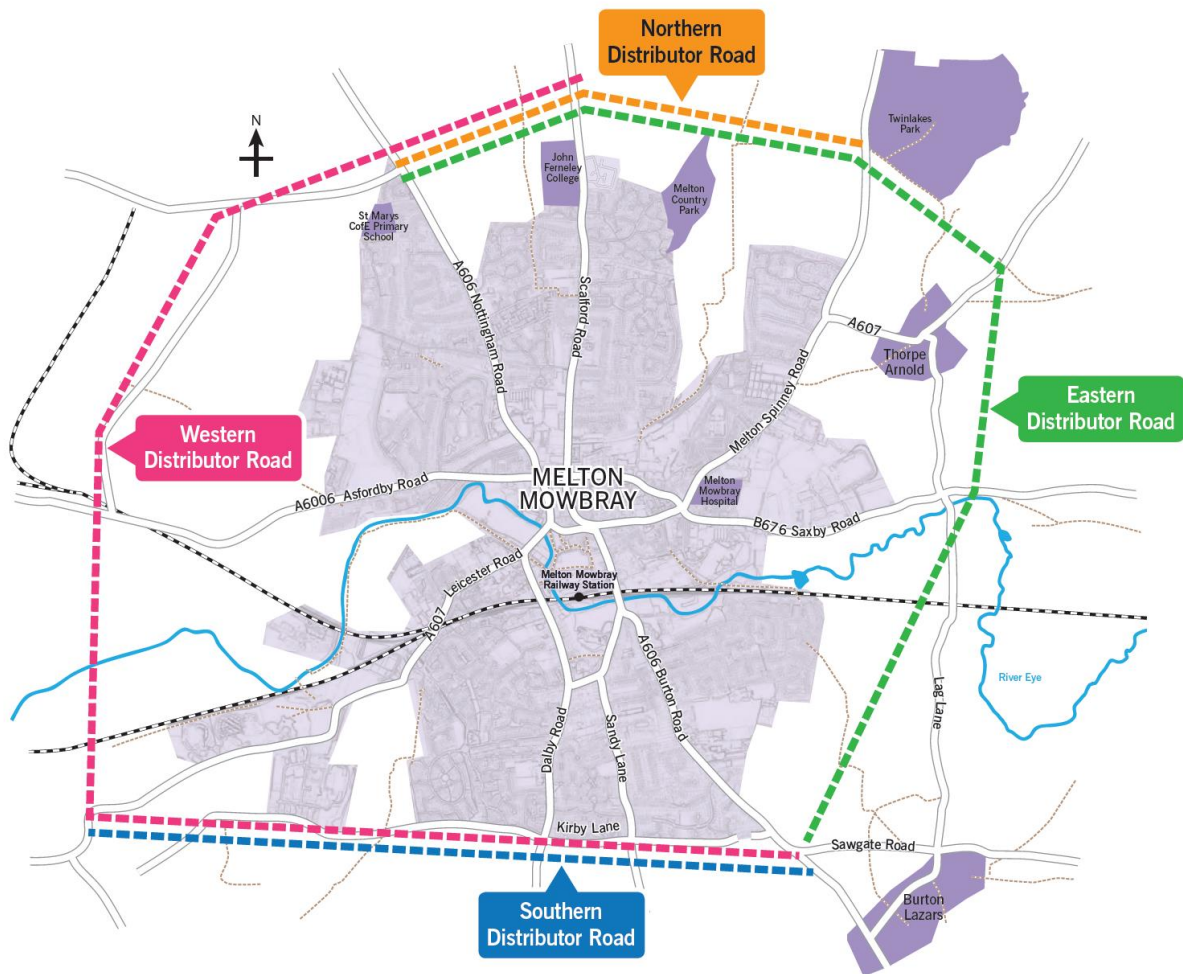
- 2.3 A study was conducted in 2014 to examine how future development within Melton Mowbray will affect traffic congestion in the town centre. The study showed that the road network in Melton Mowbray's town centre is close to its capacity and any future development will require significant improvement to the current road network. Workshops were held by Melton Borough Council (MBC) with stakeholders and residents to discuss potential solutions, resulting in development of 60 different options to address the issues. This 'long list' was then assessed in terms of deliverability, affordability and acceptability to narrow the options down to a 'short list' of 24 options.
- 2.4 The 'short list' of options were then assessed for performance against the seven objectives below:
 - improving access to Melton Mowbray town centre and the areas of potential development;
 - reducing congestion on the local network; in particular key pinch points in and around Melton Mowbray town centre;
 - addressing HGV impact in Melton Mowbray town centre;
 - improving connectivity to local and regional centres (e.g. Leicester and Nottingham);
 - increasing levels of walking and cycling within the study area;
 - improving effectiveness of public transport facilities within Melton Mowbray; and
 - improving highway safety for all road users within the study area.
- 2.5 In February 2015 workshops were held with representatives from MBC to further assess the options. The results showed that the highest performing options were all different types of distributor road. Using this information a traffic modelling assessment was carried out to compare the performance of an inner distributor road and an outer distributor road.
 - Inner distributor road: linking the A606/Mucky Lane junction to the A606 at the Cattle Market junction via the A607/ Dalby Road junction and onwards to the A6006/ Park Avenue junction.
 - Outer distributor road: linking the A606 Burton Road in the south to Scafford Road in the north via a westerly route which passes the B6047 Dalby Road, A607 Leicester Road and the A6006, before heading in a north westerly direction along Welby Road and Welby Lane to the A606 Nottingham Road.

2.6 The results indicated that both an inner and outer distributor road would reduce the levels of traffic in the town centre, however the outer distributor road would provide a greater reduction in congestion and also provide the additional road capacity to support Melton Mowbray’s growth aspirations. In September 2016 Leicestershire County Council’s Cabinet approved the development of a Transport Strategy for Melton Mowbray to examine options for an outer distributor road.

2. Assessment of broad MMDR route options around Melton Mowbray

2.7 Four options were explored for the route of an outer distributor road: a northern distributor road, an eastern distributor road, a southern distributor road and a western distributor road.

Figure 2.1: Options for an Outer Distributor Road

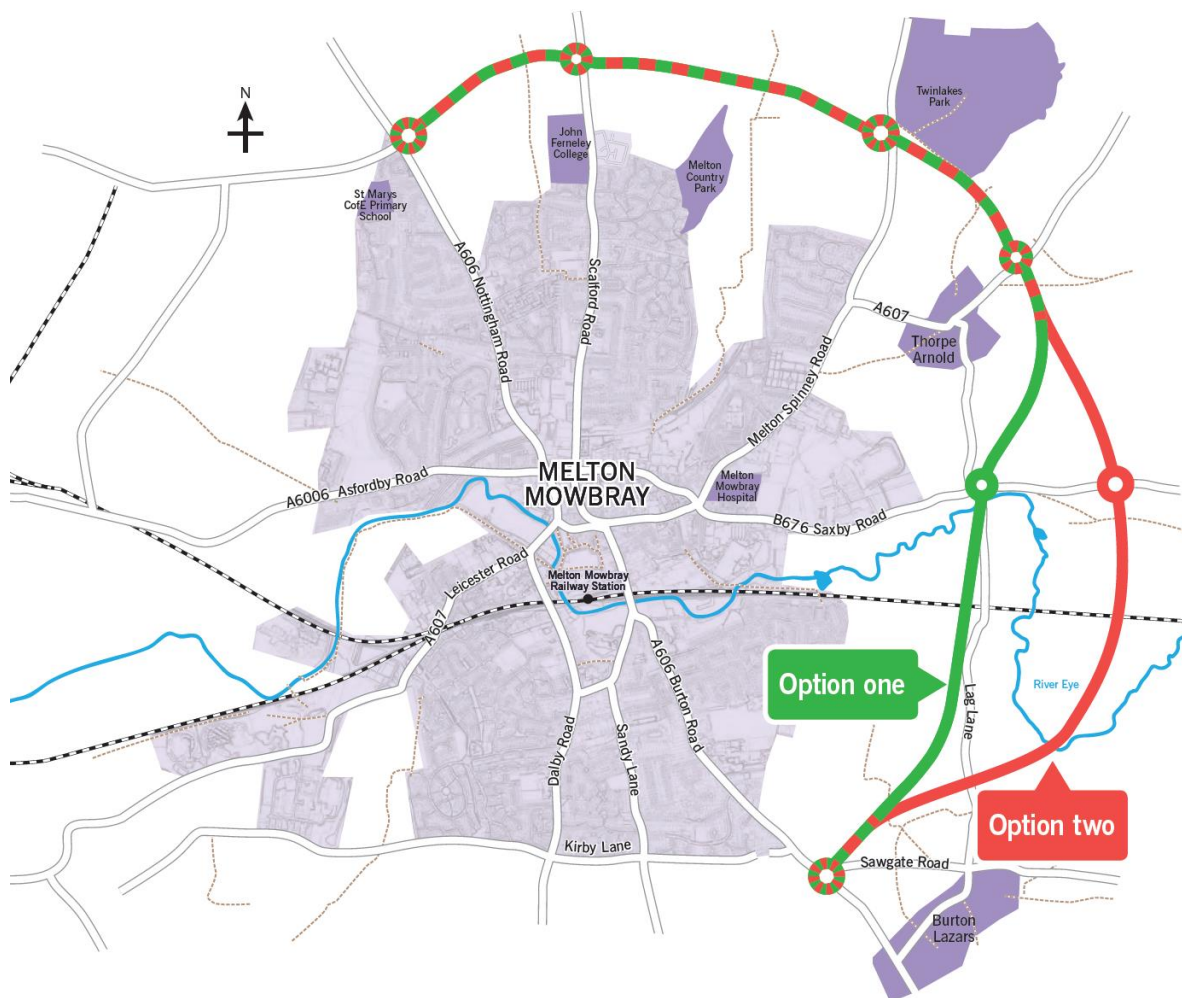


2.8 The four options were then appraised, with the results showing that the eastern and western distributor roads were the best options to improve congestion in Melton Mowbray. These two routes were then presented to a workshop group and the decision taken that the eastern option would provide the best cost/ benefit ratio for Melton Mowbray.

3. Refinement of options for the eastern outer distributor road section south of the A607 Melton Road

2.9 In July 2016 two potential routes were developed for the eastern outer distributor road. Figure 2.2 shows the two options.

Figure 2.2: Options for Eastern Distributor Road



Option 1

- 2.10 Option 1 comprises a new 7km standard 7.3m width single carriageway road to the east of Melton Mowbray. The route extends from the A606 Nottingham Road to the A606 Burton Road, crossing Scaford Road, Melton Spinney Road, A607 Thorpe Road and B676 Saxby Road.
- 2.11 Option 1 would be sited outside Melton Mowbray’s urban realm and surrounding towns/villages, creating new junctions with the radials along its route. The scheme would include one railway crossing and one river crossing. In contrast to Option 2, Option 1 would prevent severing access to the Environment Agency weirs and access over the railway between fields north and south of the railway line. The route passes under two sets of existing 132kV cables in close proximity to the River Eye.
- 2.12 Option 1 includes seven crossings of six watercourses. It also crosses the floodplain of the River Eye and the Leicester to Peterborough railway line. The scheme would require four culverts and four bridge structures, with bridges provided over Scaford Brook, Thorpe Brook, the River Eye and the railway line.
- 2.13 Six roundabout junctions will be required at the intersection with the following roads: A606 Nottingham Road, Scaford Road, Melton Spinney Road, A607 Melton Road, B676 Saxby Road and A606 Burton Road. Option 1 would provide gated access to Lag Lane and the existing private access to the weir of the River Eye will be retained. The Sawgate Road access to A606 Burton Road will be terminated and the traffic will be diverted through Cross Lane, as it would with Option 2.

Option 2

- 2.14 Option 2 would comprise a 7.4km long standard 7.3m width single carriageway road to the east of Melton Mowbray. The route runs north-east for 1km from A606 Nottingham Road, south of Sysonby Farm and meets Scalford Road, north of John Fernerley College. It continues east until the dismantled railway, north of Melton Country Park for another 0.8km and then runs south-east for 1.7km. From here the proposed route crosses Melton Spinney Road and the existing gas pipeline to the south of Twinlakes Park.
- 2.15 The route then intersects with the A607 Melton Road north-east of Thorpe Arnold. It spans the eastern side of Thorpe Arnold, crosses B676 Saxby Road east of Shipman's Barn Stud and continues south to the railway line. After crossing over the railway line, the route heads south-west for 2km to A606 Burton Road and ties-in to this existing road at the existing access of Sawgate Road.
- 2.16 Option 2 crosses seven watercourses (one crossing per watercourse), the floodplain of the River Eye and the Leicester to Peterborough railway line. Three culverts would be required in addition to four bridge structures, the latter crossing Scalford Brook, Thorpe Brook, the River Eye and the railway line. A multi span culvert structure would also be required to mitigate flood flow within the River Eye flood plain.
- 2.17 The option would also have six at-grade junctions, but with roundabout five located further to the east along B676 Saxby Road. An additional proposed at grade priority junction would be included at Lag Lane.

Option Comparison

- 2.18 Option 2 is approximately 0.5km longer than Option 1, would have a greater journey time for users of the route and would require a larger amount of land. The increased length of the road would have additional environmental impacts, including additional emissions to air.
- 2.19 Option 2 would take the road further from Melton Mowbray, extending the urban fringe of the town further into the surrounding rural area, although in doing so would take the road further from properties on the outskirts of the market town. Option 2 also passes through the Brentingby Flood Storage Area, with significant impacts on the flood storage capacity and environmental impacts on the area that may not be acceptable to the Environment Agency in the context of other options. Where the route of Option 2 crosses the Brentingby Flood Storage Area, a viaduct or multi-span structure would be required of approximately 700m in length. The scheme would pass through a larger amount of land in flood risk zones 2 and 3 than Option 1.
- 2.20 Option 2 would still require a crossing over the River Eye, although the crossing location would not be in close proximity to high voltage powerlines. The two routes diverge to the south east of Thorpe Arnold so the impact of the scheme on the village would be similar for the two options.
- 2.21 The assessment process suggested that Option 1 would more effectively deliver the aims of the distributor road and would do so with a lesser environmental impact than Option 2. Therefore, Option 1 is the recommended route for the MMDR and the option discussed in the remainder of this report. The alignment for Option 1 has been altered through the design process to minimise environmental impacts, leading to an alignment that differs slightly from that presented in Figure 2.2. In particular, the route of the road between roundabouts 2 and 3 has been relocated further north to increase the distance between the road and Melton Country Park and reduce the impact of the road on the housing allocations to the north of Melton Mowbray. The most up to date route for Option 1 is shown in **Figure 1.1** of this report.

Description of the Options for the River Eye Crossing

Description of the MMDR at Roundabout 5

- 2.22 The proposed MMDR alignment approaches the River Eye south of B676 Saxby Road and to the west of Lag Lane, with roundabout five proposed north of the river to provide a junction between B676 Saxby Road and the MMDR. There will be gated access to Lag Lane and the

existing private access to the weir of the River Eye will be retained. The proposed speed limit for this section of the MMDR would be 60 mph.

- 2.23 The River Eye crossing would be approximately at chainage 5000 (depending on the option taken forward) and a multi span culvert structure may be required to mitigate flood flow within the River Eye flood plain over approximately 300m between chainages 5000 and 5300.
- 2.24 The alignment to the west of the existing Lag Lane rail bridge would allow the existing structure to be retained and would avoid severing access to the Environment Agency weirs and over the railway between fields north and south of the railway line.
- 2.25 Two lines of 132 kV overhead power cables run east to west along the route of the River Eye to the north and south of B676 Saxby Road. The elevation of the cables to the south of the B676 Saxby Road and the need to construct a new bridge and embankments beneath them presents constraints to construction.
- 2.26 Due to the potential environmental constraints and safety issues associated with the crossing of the River Eye, five options (Options A-E) were proposed for further assessment. These options are described in the following sections. **Figure 2.23** shows the five options in the context of the River Eye SSSI and the existing powerlines.

Option A: Construction of a Bridge beneath the Powerlines

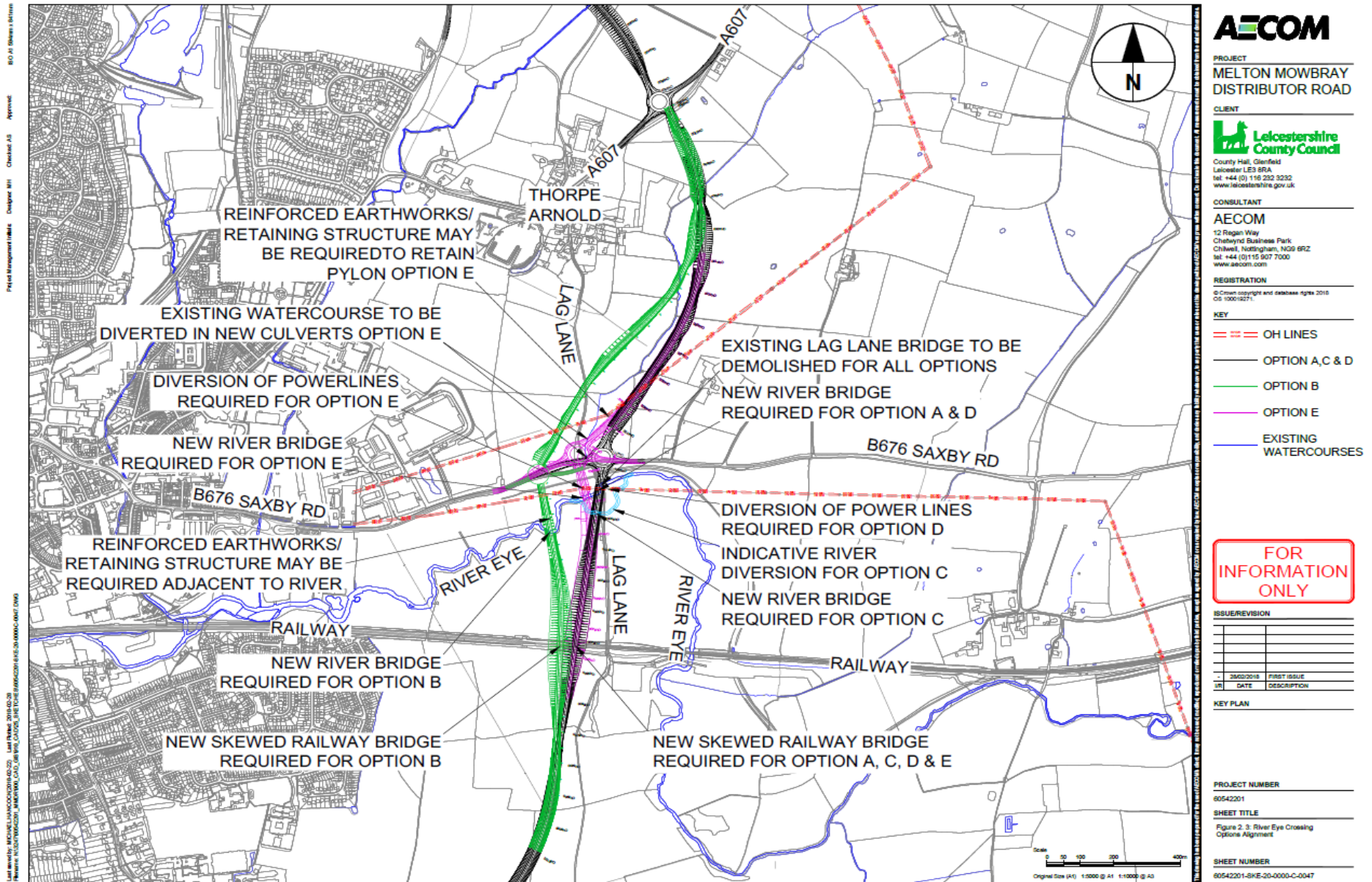
- 2.27 Option A would involve construction of a bridge beneath the existing 132kV powerlines. This was the originally proposed route for the MMDR as part of Option 1, with the road alignment for Option A following the same alignment as Options C and D.
- 2.28 The lowest sag in the cables where the cables overhang the road alignment in Option A is 86.3m¹ AOD². The height of the proposed alignment at this location would be 75.6m AOD. Therefore, the minimum permanent clearance between the highway and the existing power cables would be 10.7m. The height of the underside of the bridge cannot be reduced below 74.5m AOD³ because of flooding requirements.
- 2.29 A minimum 6.2m vertical and horizontal exclusion zone from the 132kV powerlines is required for construction. Based on the minimum level difference referred to above, this would only leave 4.5m working room (i.e. 10.7m – 6.2m). In order to construct the bridge, cranes will be required to enable materials to be lifted. Piling rigs may also be required to enable construction of the foundations. The crane jib and piling rigs need significantly more than 4.5m working room and would therefore conflict with the minimum exclusion zone for the overhead power lines. It is therefore not possible to safely construct the bridge beneath the 132kV power lines.
- 2.30 Since it is not possible to eliminate or reduce/control risk to an acceptable level for Option A, this option does not enable compliance with the CDM regulations.
- 2.31 Option A has therefore been scoped out of the assessment.

¹ All distances in this report are provided to the nearest 0.1m.

² Based on topographical survey data

³ This clearance is required to cope with a 1:100 year + climate change flood event (based on 50% allowance for climate change and a 600 mm freeboard).

Figure 2.3: Proposed Options for River Eye Crossing



Option B: Realignment of the Proposed Highway to the West

- 2.32 Option B involves realigning the road to the west to increase the distance between the powerlines and the river. It does not involve diversion of the river. The movement of the proposed highway alignment to the west is limited by the need to retain a minimum distance of the alignment from the village of Thorpe Arnold. Therefore, this option was designed to maximise the distance between the powerlines and the river, whilst retaining separation from the village.
- 2.33 Option B would relocate roundabout 5 approximately 200m to the west of Option A (and the existing Lag Lane bridge over the River Eye) to enable the highway alignment to coincide with a U-shaped meander on the River Eye. The purpose of investigating this option was to determine if the U-shaped river meander would enable construction of the bridge sufficiently far south to avoid conflict with the powerlines. The lowest sag of the powerlines at this point is 83.9m and the proposed top of the kerb level under the powerlines would be 74.7m. This gives 9.2m minimum permanent clearance to the top of kerb. Since a 6.2m minimum safety zone is required for the overhead powerlines, this would leave only 3m working room. Even though the River Eye bridge would not be directly beneath the powerlines, there would still be insufficient working room for construction of the highway earthworks which would pass beneath the powerlines. Therefore, relocation of the powerlines would be required for Option B.
- 2.34 Option B would have a larger distance between the River Eye SSSI and roundabout 5 compared to options A, D and E. The proposed road would be positioned on embankments for greater lengths and would move 50m closer to Thorpe Arnold at its closest point compared to all other options. This means that the road would be less than 240m from the village. The road would also be 70m closer to the housing estate south of the railway line. However, Option B would be further from the two properties to the east of roundabout 5, including Shipman's Barn Stud.
- 2.35 The new bridge over the River Eye would be approximately half the length of that required for Option D and would not require supports in the river. However, Option B would require an additional crossing of the tributary of the River Eye and a significantly increased span for the railway bridge compared to options A, C, D and E due to the angle of the approach.
- 2.36 Although Option B would not succeed in finding an alignment that avoids relocation of the powerlines, it has nonetheless been evaluated as one of the options for crossing the River Eye as it may have other environmental benefits that would justify its consideration as an option.
- 2.37 In terms of CDM, it is not possible to eliminate or reduce/control safety risk to an acceptable level without diverting the powerlines.
- 2.38 If the powerlines were diverted the following key H&S risks cannot be eliminated and must therefore be reduced or controlled:
- Working at height, working with electricity, working over water associated with diversion of the powerlines, demolition of existing pylons and construction of new pylons.
 - Working over water, working at height, limited working room due to construction of bridge piers/abutments on northern side of river surrounded by water on 3-sides.
 - Working over water, working within water; working at height; due to the demolition of existing river bridge.
 - Working beneath live powerlines associated with the construction of the road.

Control measures can be implemented to reduce the above risks (e.g. Fall arrest systems; height restrictions and use of wagons with sliding floors in place of tipper wagons during construction). However, since there are alternative options which enable elimination of some of these risks it is necessary to demonstrate that the benefits associated with Option B outweigh the increased H&S risk associated with this option.

Option C: Realignment of River Eye without Powerlines Diversion

- 2.39 Option C involves diversion of the River Eye to the south of its current route, with the road alignment remaining as shown in Option A. The River Eye would be relocated further into the flood plain and further from the proposed Roundabout 5. No diversion of the powerlines would be required.
- 2.40 Option C would require extensive environmental mitigation measures associated with the diversion of the SSSI River Eye, including hydro-morphological design, flood risk management and species and habitat translocation due to the sensitivity of the SSSI watercourse. Based on LiDAR data there are indications that the River Eye may have been diverted historically in the vicinity of Lag Lane, so a new diversion could enable restoration to a form similar to the pre-modified condition. In addition, through site surveys it is evident that the existing river morphology along this reach is degraded by re-sectioning (i.e. widening, and possibly deepening as well), and is also impacted by the weirs downstream, flood storage area upstream, and channel siltation (upstream sources and local bank poaching by livestock).
- 2.41 The proposed Option C alignment would retain a similar separation distance between the road and Thorpe Arnold (and other properties) as Options A and D.
- 2.42 Option C would avoid the need for cranes and piling rigs to operate beneath the powerlines or in close proximity to them. It also enables construction of the new bridge in dry conditions, prior to diversion of the River Eye.
- 2.43 Option C would eliminate the following health and safety risks associated with working at height, working with electricity, limited working room and working over water:
- Diversion of powerlines including the demolition of existing pylons and construction of new pylons.
 - Demolition of existing River bridge.
 - Construction of bridge piers/abutments on north side of river surrounded by water on 3-sides

The following key H&S risk remains which cannot be eliminated and must therefore be reduced or controlled:

- Working beneath live powerlines due to the construction of the road.
- 2.44 Control measures can be implemented to reduce the above risk (eg. use of wagons with sliding floors in place of tipper wagons during construction). Option C enables elimination of a number of key H&S risks which are present within Options A, B, D & E without introducing significant further H&S risks. Option C is therefore the most favourable from a CDM compliance and H&S perspective.

Option D: Diversion of Powerlines to Enable Bridge Construction

- 2.45 The proposed highways alignment for Option D is the same as Option A and C. Option D would divert the powerlines sufficiently to enable construction of the proposed highways bridge and alignment without encroaching on the minimum safety zone required. It is unlikely that the powerlines could be raised sufficiently on the existing alignment to enable construction of a bridge beneath, so a diversion would be required.
- 2.46 The proposed alignment for Option D would coincide with a meander in the River Eye significantly increasing the span of bridge required over the River Eye in comparison to all other options. The span of the new bridge would be approximately 70m. The bridge is highly likely to require permanent intermediate piers to be positioned within the River Eye SSSI and would shade a significantly longer section of the river.
- 2.47 Option D would require construction of the new bridge and demolition of the old bridge in wet conditions without diversion of the watercourse. Option D would involve development of roundabout 5 in closer proximity to the River Eye SSSI than Options B, C and E.

- 2.48 Option D does not require diversion of the River Eye, an additional crossing of the tributary of the River Eye or relocation of the road closer to Thorpe Arnold.
- 2.49 With regard to CDM, the following key H&S risks cannot be eliminated and must therefore be reduced or controlled.
- Working at height, working with electricity, working over water associated with diversion of the powerlines, demolition of existing pylons and construction of new pylons.
 - River Bridge: working adjacent to water, working over water, working within water; working at height; due to the demolition of existing river bridge.
 - Working beneath live powerlines associated with the construction of the road.
- 2.50 Control measures can be implemented to reduce the above risks (eg. Fall arrest systems; height restrictions and use of wagons with sliding floors in place of tipper wagons during construction). However, since there are alternative options which enable elimination of some of these risks it is necessary to demonstrate that the benefits associated with Option D outweigh the increased H&S risk associated with this option.

Option E: Diversion of Powerlines and Realignment of Scheme to avoid the Meander in the River Eye

- 2.51 Option E involves the realignment of the proposed MMDR route in order to avoid the meander in the River Eye by relocating roundabout 5 approximately 50m west of Option A; immediately west of the existing Lag Lane bridge. Option E would require a powerline diversion as the new road would conflict directly with the location of an existing electricity pylon immediately west of Lag Lane. However, it would not require diversion of the River Eye and the location of the new bridge would minimise the span required.
- 2.52 Option E would retain the separation distance between the scheme, Thorpe Arnold and the housing estate south of the railway line; and would move slightly further away from Stud Farm and properties immediately east of the route. This Option does not require intermediate piers to be constructed in the watercourse due to the significant reduction in span required. Option E would require an increased length of the tributary of the River Eye to be diverted in new culverts under roundabout 5.
- 2.53 With Option E, the following key H&S risks cannot be eliminated and must therefore be reduced or controlled.
- Working at height, working with electricity, working over water associated with diversion of the powerlines, demolition of existing pylons and construction of new pylons.
 - River Bridge: working adjacent to water, working over water, working within water; working at height; due to the demolition of existing river bridge.
 - Working beneath live powerlines associated with the construction of the road.
- 2.54 Control measures can be implemented to reduce the above risks (eg. Fall arrest systems; height restrictions and use of wagons with sliding floors in place of tipper wagons during construction). However, since there are alternative options which enable elimination of some of these risks it is necessary to demonstrate that the benefits associated with Option E outweigh the increased H&S risk associated with this option.

3. Water Environment

Introduction and Methodology

- 3.1 This section considers the potential effects of Options B to E on water resources and Water Framework Directive (WFD) objectives, including surface water quality and hydro-morphology. For ease of presentation flood risk is considered separately in Section 5, ecology in Section 4 and groundwater in Section 10.
- 3.2 The core study area for the assessment provides a 500m buffer around the options. However, as there is also the potential for water quality impacts to propagate downstream, and in order to ensure that all relevant attributes of a water body have been taken into account when determining its importance, a wider 'secondary' study area of 2km is also been considered.
- 3.3 Potential impacts have been determined using the guidance and criteria set out in the Design Manual for Roads and Bridges (DMRB) HD45/09. Although not specific to roads, the method is applied to new road infrastructure and improvement projects throughout the UK. It represents a robust and suitable process for determining the potential effects of the proposed development on the water environment.
- 3.4 HD45/09 also includes specific water quality risk assessments to determine the potential effects on receiving watercourses of routine highway runoff and spillage risk. These quantitative assessments help to identify what level of treatment or spillage risk is required for each road outfall. The method also takes account of any cumulative effects depending on how close outfalls are positioned when discharging to the same watercourse. A water quality assessment of routine runoff and spillage risk has already been undertaken of the preliminary drainage design and is included in the appraisal below.
- 3.5 The level of assessment is proportional to the availability of scheme information and is considered adequate for the relative comparison of proposed options to cross the River Eye. This is an interim appraisal only and does not represent a full impact assessment, which will be undertaken for the preferred option and reported in the Environmental Statement.
- 3.6 At this stage detailed designs for the river diversion (Option C) have not yet been prepared or tested by appropriate hydraulic modelling. As discussed in previous meetings with Natural England and the Environment Agency it is assumed that for Option C:
 - The design of the diversion will follow best practice and be an exemplary design in keeping with natural form and function and seeking to restore the river to a more natural position and condition. This is to ensure that the diversion is WFD compliant (i.e. must not cause deterioration of any WFD parameter and must not prevent improvement) and contributes positively towards achieving favourable conservation status.
 - The diversion will deliver all relevant and appropriate river restoration measures along the diversion and un-diverted river reach within the planning boundary as described by Natural England's Restoration Plan 2011.
 - The diversion and river restoration proposals will be developed in partnership with Natural England and the Environment Agency and would be tested using best practice modelling techniques to confirm appropriate function taking into account future works to the MARS weirs and the operation of the Brentingby Dam.
 - The river state as described by Natural England's River Restoration Plan 2011 with all hydromorphological interventions implemented shall be the baseline against which the proposed diversion shall be evaluated (we note that the proposed improvements to the MARS weirs are currently only at trial stage and should this no longer be a viable option the future baseline will be amended).

Baseline Conditions

- 3.7 There are two water bodies within the study area; the River Eye and a tributary of the River Eye that flows in from the north and is culverted from where it meets the B676 Saxby Road. These two water bodies are described below.

The River Eye

- 3.8 The River Eye is a Main River and is listed in the Humber River Basin Management Plan (RBMP) as 'Eye/Wreake from Langham Brook to Soar' (GB104028047550). The waterbody extends from Stapleford to the east of Melton Mowbray, and flows in an approximately westerly direction through the middle of Melton Mowbray, and on to Asfordby and then southwest to its confluence with the River Soar at Rothley (NGR SK 59557 12729). The River Eye in the vicinity of the scheme is a SSSI for which Natural England published a strategic restoration plan in 2011. The SSSI is for the River Eye's characteristics as an exceptional example of a semi-natural lowland river, and covers 13.65ha and 7.5km between Stapleford and Melton Mowbray, which is approximately 40% of the total river length. There is also evidence of water vole and otter using the River Eye, but recent surveys did not identify any White Clawed-crayfish (but an abundance of non-native Signal Crayfish).
- 3.9 Flows are generally gentle and gliding with water quality impacted by elevated turbidity and nutrient levels. The natural river typology is a low energy, passively meandering system with a well-connected floodplain and associated water-dependant MG4 habitat. However, in the vicinity of the proposed scheme, we believe that evidence shows that the river is extensively modified and is degraded from its natural form and function. Weirs in Melton Mowbray attenuate baseflows as far as Lag Lane, while floodplain flows are entirely disconnected by Brentingby Dam. The channel appears to have been widened and deepened historically, and possibly realigned. These local factors, combined with intensive catchment agriculture have resulted in a high sediment load, with excess sediment delivered to the channel from the catchment surface, which is then trapped by weirs and ponding, and cannot be deposited back out of the enlarged channel on to the floodplain by spate events. Bed habitats are therefore depleted with excess fine sediment, while the channel structure is overly uniform with little remaining transitional flow structures between channel, marginal, riparian and floodplain conditions. Banks are comprised of silts and clays, and while numerous exposed bank faces are present and representative of natural conditions, many are also degraded by poaching by livestock.
- 3.10 The River Eye Restoration Plan (2011) is based on findings that there had not been any significant historic realignments, but it identified re-sectioning (i.e. widening and deepening without change in planform). However, based on the latest LiDAR, which appears not to have been available in 2011, there is considerable evidence for extensive channel diversion and realignment between Lag Lane and Brentingby village. The LiDAR evidence is presented in the preliminary Water Framework Directive report, and from LiDAR and morphological walkover surveys, we have identified:
- Channel straightening through Brentingby Dam and the railway crossing;
 - Distinct meander cut-offs upstream and downstream of Brentingby Dam;
 - The channel downstream of Lag Lane exhibits significantly different meander geometry to the channel upstream. Upstream it is relatively straight, while downstream, the wavelength, amplitude and curve radii are concurrent with the channel configuration near Stapleford, which appears natural and represents exemplar restoration template conditions;
 - The existing channel appears aligned to the edge of the floodplain and parallel to the abandoned canal at its northerly extent upstream of Lag Lane; and
 - Lidar reveals what may be an historic channel in the centre of the floodplain immediately upstream of Lag Lane and south of the present channel.
- 3.11 It seems logical that the majority of modifications would have been associated with engineering a water supply to the former canal in the late 1700s, although some may pre-date this and/or may be for other purposes.

- 3.12 The Environment Agency's Catchment Explorer website indicates that the 'Eye/Wreake from Langham Brook to Soar' is not designated an artificial or heavily modified water body. It is 38.67 km in length and drains a catchment of 98.08 km². The water body is currently at Poor Ecological Status but is meeting Good Chemical Status. The reason for not meeting Good Ecological Status is macrophytes and phytobenthos, which is at Poor Status, although phosphate levels are also only at Moderate Status. Despite the hydrological assessment stating that it 'supports good status' the presence of the Brentingby Dam just upstream of Lag Lane has a significant impact on the high flow regime preventing out of bank flooding through the study area. Furthermore, the MARS weirs on the outskirts of Melton Mowbray just downstream of the study area are also known to affect flows that have been observed pooling as far upstream as Lag Lane under low flow conditions. These channel modifications will be having a significant impact on the morphological diversity and water quality, and thus ultimately the conservation status of SSSI Units 4, 5 and 6.
- 3.13 The River Eye is designated as a SSSI over a 7.5km reach between Ham Bridge (SK 80132 18637) and Swan's Nest weir (SK 76334 18814), which comprises the river channel, banks and riparian zone. Although outside of the SSSI boundary, it is also important to consider the interaction between the river and water dependent habitats in the floodplain, especially where these are important for a healthy functioning river ecosystem.
- 3.14 The River Eye SSSI is described within Natural England's citation as an exceptional example of a semi-natural lowland river, which is representative of clay streams in central and southern lowland England and rare in the UK. The habitats and species supported in the SSSI comprise diverse plant and animal communities, including rich marginal vegetation and invertebrate communities, with records of "white clawed crayfish (*Austropotamobius pallipes*), water boatman (*Corixa panzeri*) and white-legged damselfly (*Platycnemis pennipes*) at the northerly limit of its British range" (NE e-mail 30th August 2017 ref 222818). The citation also notes that natural structural features of the river, comprising riffles, pools, small cliffs and meanders, together with clean water, provide a range of conditions essential for the maintenance of rich and diverse plant and animal communities that are present within the SSSI. Although the SSSI designation is mapped for the river channel only, the channel should not be considered in any way separate from the floodplain and riparian margins that are critical for supporting the fluvial processes important for designated features.
- 3.15 The SSSI is divided into six units, and whilst the River Eye is recognised for its overall ecological value, each unit is currently assessed by Natural England as being in 'unfavourable no change' condition. The SSSI is not meeting targets for soluble reactive phosphorus (i.e. 0.05 mg/l) (primarily due to diffuse agricultural inputs), changes to river profile caused by previous dredging activities and impoundments, lack of a diverse bankside vegetation, and a lack of semi-natural habitats within the riparian zone. Suspended solids targets are reported to have been met, but site observations suggest that this could still be a significant improvement. The siltation problem is exacerbated by the lack of flow and structures, which impede the river's hydrological functioning. Water quality is being addressed, but the physical character of the river channel needs to be restored to secure good ecological and hydrological functioning. It is noted, however, that the river near to Lag Lane has achieved the target for supporting many characteristic aquatic plant species.
- 3.16 The River Eye Restoration Plan was published by Natural England in 2011 and involves a suite of measures to help restore the River Eye SSSI as a whole. These measures include the maintenance and enhancement of existing habitats, land management measures that improve the riparian zone, introduction of coarse woody material, bank enhancements, introduction of coarse bed material, increase channel sinuosity, remove or modify in-channel structures such as weirs, and review the operation of structures including sediment traps on the River Eye and Burton Brook and the automatic flood gates at Brentingby Junction, which form part of the Melton flood alleviation scheme.
- 3.17 Overall, by virtue of its scale, WFD, and SSSI designations, the River Eye is considered to be of Very High Importance.

Tributary of River Eye

- 3.18 This watercourse rises at Melton Mowbray golf club and flows generally in a southwest direction to pass Thorpe Arnold on its eastern side, before continuing south to meet the River Eye just south of B676 Saxby Road. Its total length is approximately 2km.
- 3.19 This watercourse drains an agricultural catchment and appears to have been significantly modified by realignment and straightening. At the sampling location in an arable field, the watercourse is essentially a small agricultural drainage ditch, varying between 0.5m and 1m in width, and straightened through the field. The watercourse is overgrown with grass and reeds (and suspected Himalayan balsam) with only un-functional low flows. Further up the catchment the watercourse is likely to be ephemeral.
- 3.20 The watercourse is not designated as a Main River and is not listed under the RBMP as an independent water body, although it would fall under the SSSI designation for the River Eye. There is also no evidence of water vole or otter being present, nor any licensed or unlicensed water abstractions.
- 3.21 Two water samples have been collected in summer and autumn 2017. Based on this limited data the watercourse is slightly alkaline with a high biochemical oxygen demand (BOD) indicative of water contaminated by organic pollutants. There is also evidence of nutrient enrichment with elevated orthophosphate concentrations. A recent sample indicated that several metals were present at concentrations in breach of WFD Environmental Quality Standards (EQS) including chromium, nickel and zinc.
- 3.22 Overall, from a water quality perspective this water body is considered to be of Medium Importance by virtue of the relatively short distance between where this watercourse would be impacted by the proposed development and the River Eye, which is considered to be of Very High Importance. However, due to its small scale and heavily modified character, from a morphology perspective it is currently considered to be of low importance.

Options Appraisal

Option B Appraisal

- 3.23 Option B relocates roundabout 5 approximately 200m west (downstream) of Options C and D and the existing Lag Lane bridge to enable the highway alignment to coincide with a U-shaped meander on the River Eye. The span of the river crossing for Option B would not need to be as wide as for Option D but is likely to be wider than the existing Lag Lane bridge in order to meet the Environment Agency's minimum set-back requirement of 3m – 5m for water vole habitat.
- 3.24 During construction site clearance, earthworks, foundation construction, piling, construction of a new bridge, and the demolition of the existing Lag Lane bridge would be required immediately adjacent to and over the River Eye, also affecting the floodplain. If not managed properly these activities may result in water pollution from uncontrolled discharges of contaminated site runoff or chemical spillages of oils, cementitious substances, and water containing high levels of suspended particulates. When working close to and over a water body there is also a risk that construction works cause erosion of the river bed and banks or that masonry, materials and other equipment fall into the channel.
- 3.25 Although such construction works would present a high risk to water quality and river morphological form, and would be challenging to manage, there are well developed mitigation strategies and measures that can be implemented to reduce these risks. It is expected, given the scale of the project, that all construction activities would be undertaken under a Construction Environmental Management Plan or similar and that this would include a specific Water Management Plan and Emergency Response Plan (or similar titled) describing precisely the mitigation measures that would be implemented by the Contractor to prevent pollution and how they would respond to a chemical spillage. The works would also require a Water Activity Permit from the Environment Agency and Assent to Work in the SSSI from Natural England, and the applications for both would require the submission of detailed Construction Method Statements and mitigation measures.

- 3.26 The new single span bridge would cross the River Eye at the base of a meander in a more constrained location and at a slightly oblique angle resulting in a longer length of river bank being affected than Options D and E. This is likely to require more reinforcement of embankments and potentially more extensive retaining structures than other options. It is also probable that the close proximity of the River Eye on three sides of the construction works north of the river would present greater challenges in terms of access and working safely, and would be expected to increase the risk of water pollution occurring as a greater proportion of the works would be close to the channel and there would be less space in which to manage the works and construction site runoff. As such, the potential construction impacts from Option B are predicted to be moderate adverse on the River Eye and its tributary (i.e. large/very large adverse significance and moderate adverse significance, respectively).
- 3.27 The new bridge would be open span with the abutments set back 3m to 5m from the water's edge, subject to agreement with regulators and hydraulic modelling. The new bridge is not expected to have any significant impact upon river hydro-morphology, and could be an improvement on the current Lag Lane Bridge, which may have caused constriction and local scour. As noted above, the natural cohesive clay banks could mean that an open span crossing could be designed across a stable channel geometry. This would mitigate the need for bank protection works, in terms of the extents of protection needed, and the higher feasibility of green engineering solutions, as opposed to hard, grey engineering. However, a new channel crossing with embankments within the natural floodplain would inevitably encroach onto riparian habitats and disconnect natural peak flow processes, which would be adverse for river morphology. Overall, assuming the existing Lag Lane bridge is removed and the river reach restored in keeping with Natural England's restoration proposals (as a minimum), a minor adverse impact is predicted (i.e. moderate/large adverse significance).
- 3.28 Although the location of the roundabout for Option B has moved further west than the course of the tributary of the River Eye, the change in alignment means that an additional crossing of this watercourse is required to the east of Thorpe Arnold. This crossing is at an oblique angle and given the size of the watercourse is expected to be a culvert. The design of this culvert would need to take into account any functional hydraulic and sediment transport process to minimise and reduce any adverse effects. Nevertheless, the installation of a new culvert would result in the loss of part of this waterbody and would result in a permanent moderate adverse impact (i.e. slight adverse significance).
- 3.29 A HAWRAT assessment for routine road runoff has been undertaken of the preliminary drainage proposals. Three outfalls (5+6+7) would discharge to the River Eye. This assessment shows that the risk from operational highway runoff in terms of routine 'day-day' runoff and a significant chemical spillage being caused by a major road traffic accident is low and that no treatment is required. However, as the River Eye is a SSSI, in the context of other catchment water quality impacts, the proposed development would provide treatment of runoff and measures to contain large chemical spillages. It is currently proposed to provide permanently wet treatment ponds on all three outfalls draining to the River Eye, together with penstocks that can be closed in the event of a significant chemical spillage on the carriageway. There is also an option to provide bypass oil interceptors upstream of each pond, although these may not be necessary subject to agreement with regulators, and have been known in some circumstances to actually add to the risk in the longer term. Although only a preliminary drainage design has been undertaken, each treatment pond has been optimised in order to provide the greatest level of treatment by including a sediment forebay, creating an appropriate bathymetry and water depth, providing vegetated shelves and bunds, and ensuring that inlets and outlets are well positioned to avoid runoff entering the pond 'short circuiting' treatment. Based on the level of risk and the treatment train that is being provided longer term, a permanent negligible impact is predicted (i.e. neutral significance).
- 3.30 In addition, during colder periods de-icing salts would likely be applied to the new road and which would runoff with snow melt and subsequent rainfall into the River Eye. In addition to containing sodium chloride (NaCl), de-icing salts may also contain quantities of clay, cyanide, sediment, and a number of metals. Rock salts can also be corrosive to metals and potentially increase the mobilisation of heavy metals in sediments (such as in highway treatment ponds). NaCl can cause damage to vegetation, and can potentially trigger the release of accumulated nutrients and heavy metals absorbed to suspended solids into solution. Generally it is

considered that because de-icing salts are used only infrequently in the colder months, over short periods and with frequent higher flows in between in which to dilute and disperse 'salty' water, and when flora tends to have died back and fauna less active and dormant, that significant long term adverse impacts are not likely to occur. The treatment ponds may provide some dilution of rock salt contaminated runoff, although are not generally considered to reduce concentrations of common salt to any significant extent. Overall, a short term, temporary and intermittent minor adverse impact is predicted, that is the same for all options (i.e. moderate/large adverse significance).

Option C Appraisal

- 3.31 This option would divert the River Eye sufficiently far south to enable construction of the proposed highway bridge away from the powerlines, without diverting the powerlines or revising the highway alignment. The proposed bridge that would cross the diverted section of the river is likely to be significantly larger than the existing Lag Lane bridge to meet the Environment Agency's minimum set-back requirement of 3m to 5m for water vole habitat.
- 3.32 Option C enables the construction of the diversion, new bridge, and the demolition of the existing Lag Lane bridge to be carried out offline from the River Eye. This would reduce the risk of adverse effects during construction works from contaminated runoff, chemical spillages, and from masonry, materials and equipment falling into the channel than other options by allowing a greater buffer zone between the construction works and the water body, other than when flows are diverted into the new channel. Construction works as described under Option B would still be required and in close proximity to the River Eye, although they are likely to be less constrained and more easily managed. As a consequence, a negligible impact is predicted for the River Eye (i.e. neutral significance), but a minor adverse impact on the tributary watercourse (i.e. slight adverse significance) assuming all appropriate mitigation is implemented as described earlier.
- 3.33 An approximate 50m to 60m length of the channel would be permanently lost due to the construction of the new road, but the river diversion would comprise a longer length of habitat, and could present an opportunity to deliver significant river restoration of the River Eye along what is known to be a degraded reach (e.g. poor flow conditions, lack of morphological diversity, excess bed sedimentation). The existing channel would be retained as a backwater and wetland, which would increase morphological diversity.
- 3.34 Extensive reviews of the natural channel typology have identified considerable evidence that the natural channel form and function throughout this area is passively meandering, and that the river has been realigned over a considerable distance. It is considered that the meander amplitude and wavelength that exists downstream of Lag Lane, and upstream around Brentingby village, would naturally be consistent all along the River Eye valley. As such, diverting (which could more appropriately be termed re-meandering) the river at the proposed crossing provides an opportunity to realign the river closer to what we believe was its original alignment and consistent with SSSI objectives to restore the natural river form.
- 3.35 Natural functions can be achieved without the channel being in its current location, and given the present and severe influences of Brentingby Dam and the weirs in Melton Mowbray, natural processes may be best achieved with river forms that mitigate the loss of flood flows to upstream storage, and the ponding of low flows due to the weirs. Although losing a short section of the channel is unavoidable, re-meandering presents an opportunity to deliver significant river restoration of the River Eye. Re-meandering the channel to a more natural position and improving channel morphology would result in greater potential to deliver the environmental enhancements needed to achieve favourable condition status, than if the channel was to be left in its current position. The majority of the existing channel location could be retained as backwater wetland habitat, which would help diversify an overly uniform channel that has been degraded by dredging and re-sectioning.
- 3.36 However, care must be exercised with this option, because the present day river form, and that which was used to define the SSSI status in the early 1980s, is based on a semi-natural channel form that has existed for some 250 years, and as such may comprise an adapted ecological baseline. The Melton Mowbray weirs and Brentingby Dam have also modified the

- river hydro-morphological functions to such an extent that re-meandering is not recommended as a standalone improvement measure.
- 3.37 Lengthening by re-meandering could be considered to result in an increased length of modified habitat and less than favourable SSSI. A pilot scheme is being implemented to modify sluice arrangements in Melton Mowbray and restore a more natural flow regime through the attenuated reaches that backup to Lag Lane. Lengthening the channel here would reduce its gradient, and may limit the benefits that would otherwise be realised by the sluice improvement scheme. The same length of channel would still benefit from weir modifications with or without re-meandering, but with re-meandering, the effects may not propagate as far upstream from Melton Mowbray. Channel designs would be incorporated into any new meandering and wider mitigation to work with the improved flow regime. However, weir removal would be necessary to fully restore meandering flows, but existing waterbody uses and previous studies have demonstrated that this is not presently attainable.
- 3.38 Without major alterations to flow controls at Brentingby Dam to reconnect ecological important spate and floodplain flows, which are also not feasible in the interests of sustainable flood risk management, restoring the natural channel typology form would be ineffective, because it would not restore the corresponding function. However, it would still serve to prime the channel physical structure for future functional flow improvements, if further studies demonstrate that flow restrictions at Brentingby Dam could be relaxed safely, or the weirs could be modified further or removed.
- 3.39 Overall, the effect of meandering, when considered in the context of the channel typology and history, is considered to be neutral. It would not necessarily benefit the river without significant restoration activities taking place, but it is unlikely to be significantly detrimental, and could be considered a step towards a full SSSI restoration. In this sense, Option C could be considered minor impact (i.e. moderate/large beneficial significant effect). However, a new channel crossing with embankments within the natural floodplain would inevitably encroach onto riparian habitats and disconnect natural peak flow processes, which would be minor adverse impact for river morphology (i.e. moderate/large adverse significant effect).
- 3.40 By re-meandering the channel and improving channel morphology (in light of new evidence such as LiDAR that was not available in 2011), we consider that there is opportunity to provide environmental mitigation to achieve favourable condition status, above that of leaving the channel in its current position. The majority of the existing channel beyond the footprint of the new road but between the start and end point of the diversion could be retained as backwater wetland habitat. This would help diversify an overly uniform channel that has been degraded by dredging and re-sectioning, and enhance floodplain biodiversity that has been heavily managed for livestock rearing in this locality. The potential long term benefits that could result from Option C are not possible from the other options.
- 3.41 Option C would require extensive environmental mitigation measures associated with the diversion of the River Eye, including hydro-morphological design, flood risk management and species relocation due to sensitivity of SSSI watercourse. We will work with the regulators along this reach to provide mitigation measures in conjunction with the existing River Eye restoration plan, to support environmental / habitat enhancement of the River Eye.
- 3.42 The potential operation effects from routine runoff, spillage risk and road de-icing are as described for Option B (i.e. minor adverse to negligible impact resulting in effects of moderate/large adverse to neutral significant effect).
- 3.43 Finally, Option C would also require the extension of the existing culvert at the lower end of the tributary of the River Eye by 20m to 30m, which would have a permanent moderate adverse impact on this water body (i.e. slight adverse significance).

Option D Appraisal

- 3.44 The highways alignment design for Option D is the same as for Option C. However, instead of diverting the river, Option D would divert the powerlines sufficiently to enable construction of the proposed highways bridge and alignment without encroaching on the minimum safety zone required.
- 3.45 For Option D the crossing would be slightly oblique to the channel, which at this location is sinuous, meaning that a greater channel length would be impacted than in Options B and E. It is assumed that the new bridge would require an intermediate support located in the channel of the River Eye bankside abutments placed 3m to 5m beyond the water's edge, subject to agreement with regulators and hydraulic modelling of flood risk.
- 3.46 Construction works would be similar to those described for Option B plus the potential need for construction of an in channel support. With the mitigation measures described earlier and in the context of other regulatory processes, it is predicted that short term and temporary moderate adverse impacts would occur during construction of this option on the River Eye (i.e. large/very large adverse significance) and minor adverse impacts to its tributary (i.e. slight adverse significance).
- 3.47 The channel in this area is developed in cohesive clay, making it naturally stable and unlikely for meanders or sinuous forms to migrate. However, an intermediate support would result in a permanent structure in the channel with direct loss of river bed, and increased risk of vertical and lateral channel scour. These combined effects would potentially result in long term permanent moderate adverse impacts. A new in-channel structure is also likely to trigger local erosive adjustments, so avoidance of scour risks to the bridge would probably require parallel hard bank protection works.
- 3.48 The natural cohesive clay banks could mean that for other options, an open span crossing, with or without channel diversion or re-meandering, could be designed with a stable channel geometry. This would mitigate the need for bank protection works, in terms of the extents of protection needed, and the higher feasibility of green engineering solutions, as opposed to hard, grey engineering.
- 3.49 The potential impacts of constructing the new bridge would be offset to some extent by the demolition of the existing Lag Lane structure, that has itself caused localised scouring of the river bed and banks, and river restoration in its place in keeping with Natural England's restoration proposals (as a minimum). However, overall a new channel crossing with embankments within the natural floodplain would inevitably encroach onto riparian habitats and disconnect natural peak flow processes, which would have an adverse impact on river morphology.
- 3.50 Overall, Option D is predicted to have a long term moderate adverse impact on the morphology of the River Eye (i.e. large/very large adverse effect).
- 3.51 Option D would also require the extension of the existing culvert at the lower end of the tributary of the River Eye by 20m to 30m, which would result in a moderate adverse impact (i.e. slight adverse effect).
- 3.52 The potential operation effects from routine runoff, spillage risk and road de-icing are as described for Option B (i.e. minor adverse to negligible impacts resulting in effects of moderate/large adverse to neutral significance).

Option E Appraisal

- 3.53 The proposed design for Option E avoids the kink in the River Eye by relocating roundabout 5 approximately. 50m west of Options C and D. Option E would require the powerlines to be diverted as it conflicts directly with the location of an existing electricity pylon immediately west of Lag Lane. This option also requires an increased length of Lag Lane watercourse to be diverted in new culverts under roundabout 5.
- 3.54 In terms of construction phase impacts, the construction of Option E would be similar to Option D, although critically Option E does not require intermediate piers to be constructed in the

watercourse due to the significant reduction in span required. Consequently, the risk of water pollution and adverse impacts on morphology during construction are lower and a minor adverse impact is predicted, assuming the mitigation measures as described earlier (see discussion for Option B) are implemented (i.e. on the River Eye and its tributary (i.e. moderate/large adverse significance and slight adverse significance, respectively).

- 3.55 Like Option B and C, a new single span bridge would be constructed with the span yet to be agreed with regulators but expected to be such that the abutments on either bank would be at least 3m to 5m from the water's edge, subject to agreement with regulators and hydraulic modelling of flood risk. The crossing would be perpendicular to the channel minimising the length of channel impacted, although more substantial earthworks would be required south of the River Eye when compared to other options. The new bridge would be of a superior design to the existing Lag Lane structure that is narrower and has caused localised scour. The new bridge design shall be modelled to ensure that no significant scour effects would occur.
- 3.56 The existing Lag Lane bridge would also become redundant and would be demolished, with the river restored in its place in keeping with Natural England's restoration proposals (as a minimum). However, a new channel crossing with embankments within the natural floodplain would inevitably encroach onto riparian habitats and disconnect natural peak flow processes, which would be adverse for river morphology. Overall, Option E is predicted to have a long term minor adverse impact on the River Eye (i.e. moderate/large adverse significance).
- 3.57 With regards to the tributary of the River Eye, the footprint of the new roundabout would result in the potential culverting of approximately 100m of the channel, which would result in a permanent moderate adverse impact (slight adverse significance). However, it may be possible to divert this watercourse around the western edge of the new roundabout and to restore a new open channel to its confluence with the River Eye. Two culverts would still be required to convey the watercourse beneath Lag Lane and Saxby Road, but overall this solution would reduce the length of culverting and, with good design of the new channel, could be an improvement on the existing baseline resulting in a moderate beneficial impact (slight beneficial significance).
- 3.58 The potential operation effects from routine runoff, spillage risk and road de-icing are as described for Option B (i.e. minor adverse to negligible impact resulting in effects of moderate/large adverse to neutral significance).

Summary and Conclusions

- 3.59 All options would involve construction of a new bridge over the River Eye channel and floodplain, construction works in close proximity to the SSSI, and the potential for seasonal minor adverse impacts from de-icing salts in highway run-off. All options would involve the removal of the Lag Lane bridge, which currently restricts flows in this area.
- 3.60 During construction, mitigation measures would be employed through a CEMP to protect the River Eye and its tributary as far as possible, but some adverse construction impacts are likely. Construction risks and impacts to water quality and river morphology are most significant for Options B and D. For Option B, the bridge construction would be in a constrained location with the River Eye present on three sides. Option D would require construction of interim supports in the river and construction of a larger bridge. Both options are predicted to have a moderate adverse impact with mitigation measures employed, resulting in a large/very large adverse effect on the River Eye. Option E would have a lesser impact because it does not require interim supports in the river, it would have a larger river span, and construction would be less confined allowing more space to manage risks, resulting in a minor adverse impact during construction with mitigation (i.e. moderate/large adverse significance). Option C performs best on this measure as construction works for a new river bridge and the road can largely be undertaken offline from the existing river, with a resulting negligible impact on the River Eye (neutral significance).
- 3.61 In terms of the permanent impacts of the options on the morphology of the River Eye, Option D is predicted to have the most significant adverse effect (large/very large), due to the requirement to have an intermediate support in the channel, and the resulting risk of scour and additional hard engineering works that may be required. All other options (B, C and E) are

predicted to have a permanent, long term adverse impact of moderate/larger significance by virtue of the new bridge encroaching on riparian habitat and natural floodplain, taking into account the wider span of the new bridge when compared to the existing Lag Lane Bridge, the removal of this existing structure and river restoration in its place.

- 3.62 The potential impacts of Option C are the most complex as there are both potential benefits and disbenefits of the river diversion on the water environment. The diversion could create a more natural channel and planform, and also presents an opportunity to deliver further river restoration along a degraded reach, priming the river for full restoration of flow functions should improvements be possible to the river's altered flow regime (as a consequence of the Brentingby Dam). Although part of the existing channel would be lost, this would be compensated in the longer term by the creation of the new channel, retention of the existing channel as a backwater, and creation of wetland habitat in the intermediate area, which would increase habitat biodiversity, and provide for natural flood management. Option C would also lengthen the stretch of the river, which could be considered an environmental gain in terms of increased river channel habitat. However, Option C could also create less than favourable habitat in terms of reducing flow gradients in an already depleted flow regime (due to Brentingby Dam), and possibly reducing the benefits of any works to modify the MARS sluices, and this would need to be carefully evaluated. Overall, the impact of the diversion is considered to be neutral.
- 3.63 All options also have the potential to have a slight adverse effect on the tributary of the River Eye, although this is not considered significant. In the case of Option E, there might be an option to divert this watercourse around the roundabout and to restore a new open channel to the River Eye, which would be a slight beneficial effect, but again, would not be considered significant.
- 3.64 During operation, all options are considered to have a neutral effect on the water environment from highway runoff (i.e. routine runoff and spillage risk) in part due to the relatively low risk to water quality and the treatment and spillage containment measures that are being proposed. However, on a seasonal and intermittent basis, there could be moderate/large adverse effects from the use of de-icing salts. This is only a preliminary assessment and further investigation is required as to the future proposed management regime and the sensitivity of aquatic fauna and flora in the River Eye to changes in salt concentrations during cold weather periods.
- 3.65 Overall, Options C and E perform the best with the lowest impact (minor adverse) resulting in moderate/large significant effect for the water environment. However, the construction of Option C would have less risk to the water environment due to being able to undertake more works away from the River Eye. In addition, Option C offers potential benefits in terms of wetland and backwater gains, and reinstating a more natural meandering channel form, which would increase the potential for full restoration of favourable conditions, if flows can also be improved past Brentingby Dam.

4. Nature Conservation

Introduction and Methodology

- 4.1 This section identifies relevant important ecological features (including nature conservation designations, priority habitats and protected/notable species) and considers the effects that the proposed river crossing options are likely to have on their conservation status, inter-relationships and contribution to local, regional and national biodiversity.
- 4.2 A suite of ecological surveys were undertaken in 2017 and further surveys will continue in 2018 to gather detailed baseline information. This data has been used to inform the appraisal of options considered in this chapter. The surveys carried out to date include:
- Habitat surveys, including surveys of hedgerows and invasive non-native plant species;
 - Surveys of aquatic environments, including those for invertebrates, such as White-clawed Crayfish (*Austropotamobius pallipes*);
 - Great Crested Newt (*Triturus cristatus*) surveys;
 - Reptile surveys;
 - Otter (*Lutra lutra*) and Water Vole (*Arvicola amphibious*) surveys;
 - Badger (*Meles meles*) surveys;
 - Surveys for roosting, foraging and commuting bats; and
 - Surveys for breeding and wintering birds.
- 4.3 The boundaries and zones for the nature conservation study area reflect standard best industry good practice and the distances that statutory consultees would typically expect to be considered for identification of features external to the proposed scheme boundary that could be affected. This is informed by published guidance and professional judgement.
- 4.4 The indicative extent of the proposed option footprints are presented in **Figure 2.3**. The assessment considers all important ecological features requiring assessment as well as ecological features that could be directly or indirectly affected by the proposed river crossing options. The study area varies according to the spatial characteristics of each species or habitat potentially impacted.
- 4.5 Impacts on potentially important ecological features (i.e. designated sites, habitats and species) within the zone of influence of the proposed scheme options have been considered. The approach taken is to make a qualitative appraisal of the options informed by appropriate baseline data gathered to date.
- 4.6 Where appropriate, within the context of the options appraisal, the principles set out in the following will be applied:
- DMRB Volume 11, Section 2 (General Principles and Guidance of Environmental Impact Assessment (HA 201/08));
 - DMRB Volume 11 Section 2 (Assessment and Management of Environmental Effects (HA 205/08));
 - IAN 125/15 (Environmental Assessment Update);
 - IAN 130/10 (Ecology and Nature Conservation: Criteria for Impact Assessment);
 - Guidelines of Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, Second Edition 2016); and
 - Professional judgement.
- 4.7 The final overall net impacts on nature conservation will be dependent upon the levels of mitigation, which can be delivered to reduce any significant effects. As a minimum this appraisal considers that mitigation measures following best practise guidance will be implemented and

that specific mitigation measures to reduce the significance of any likely significant effects on important ecological features would be agreed and delivered as part of the scheme.

Baseline Conditions

Designated Sites

- 4.8 All options considered would require, as a minimum, a new road bridge crossing of the River Eye. The River Eye SSSI is a semi-natural lowland river, representative of clay streams within central and southern England. The citation notes records including white-clawed crayfish, the water bug (*Corixa panzeri*) and the white-legged damselfly (*Platycnemis pennipes*). The SSSI is currently assessed as being in 'unfavourable no change condition'. This classification means that the feature is not being conserved and will not reach favourable condition unless there are changes to site management or external pressures.

Protected / Notable Habitats

- 4.9 Beyond habitats associated with the SSSI and its floodplain, including areas of semi-improved neutral grassland, the options being considered will predominantly occur in areas of arable and pasture farmland. The options are likely to result in the loss and severance of a number of hedgerows, but none of these are considered to be species rich.

Protected / Notable Species

- 4.10 Both the River Eye and its tributary support populations of Otter, with identified holt sites having been located on the Thorpe Brook. Evidence to suggest that Water Vole also continue to persist in low densities on the River Eye has been found. The River Eye is also likely to provide an important feeding / commuting corridor for bat species.

Options Assessment

Potential Impacts and Effects

- 4.11 The following construction and operational impacts are relevant to all options being considered and have the potential to result in significant effects on important ecological features.
- 4.12 The following construction impacts may result in significant effects on important ecological features:
- Habitat loss: direct loss and severance of wildlife habitats through land take in various locations with potential to affect various species;
 - Spread of invasive species either from the site or onto the site; and
 - Indirect impacts: noise; watercourse pollution, sedimentation, dust, lighting, increased human disturbance; potential for invasive non-native species introductions from site works.
- 4.13 The following operational impacts may result in significant effects on important ecological features:
- Mortality of wildlife due to collision with traffic;
 - Severance of corridors of species movement;
 - Noise disturbance to wildlife from traffic;
 - Lighting impacts on nocturnal species;
 - Polluted surface water run-off; and
 - Disturbance from salt spray and changes in air quality (emissions).
- 4.14 All options include the requirement for a roundabout and new bridge crossing over the River Eye, therefore the following impacts may be present at some scale for all four options:

- The existing road bridge would be replaced by a larger road crossing, and depending on the design, would likely cause some level of shading to the channel of the river and result in a loss of bankside and aquatic vegetation. The road bridge would also likely result in a change in both in-channel and flood flow dynamics through this section and a loss to riparian habitat local to the new crossing, including grassland, wetland and scrub habitats.
- Bank protection measures such as rip rap stone may be required upstream and downstream of the new road bridge to prevent bank erosion and bed scour. This would likely result in further loss to bankside and aquatic vegetation.
- The roundabout would be located in the potential zone of impact to the SSSI and may result in a change to existing flood flow dynamics and a loss of riparian habitat including scrub and grassland. The roundabout would also increase the level of disturbance to wildlife in the area both from increased car numbers, pedestrians and lighting which if unmitigated may lead to habitat fragmentation and wildlife displacement. There is also an increased risk of mortality to wildlife, in particular Otter, from increased vehicle movements and infringement into riparian areas.
- The road bridge and roundabout would result in a significant increase in the amount of hardstanding in the area near to the SSSI with the potential to increase surface water runoff to the SSSI which also contains fine sediments and pollutants normally associated with road use such as dirt and dust, rubber, metal deposits from tyre wear, antifreeze and engine oil.

Option B Appraisal

- 4.15 The key elements of this option relevant to the consideration of potential impacts to important ecological features are:
- The requirement for a crossing of the tributary of the River Eye
 - No requirement for a diversion of the River Eye; and
 - Retaining and / or reinforced earth structures would be required to enable the Option B alignment to be constructed within the space available within the meander of the River Eye.
- 4.16 Whilst Option B would not require the realignment of the River Eye, it would require a crossing of the River Eye tributary as well as the new crossing over the River Eye. Although the tributary does not have any formal designations for its nature conservation value, it is hydrologically connected to the River Eye SSSI and supports protected species, notably Otter. The addition of a crossing over this watercourse would further increase the potential for significant effects on wildlife dispersal and ecological connectivity, as well as the potential for further pollutant and sediment runoff and deposition.
- 4.17 Conversely, the realignment of the highway and associated relocation of the roundabout would reduce the likelihood for significant effects on the River Eye from impacts arising from having the roundabout junctions within close proximity to the river corridor and riparian habitats.
- 4.18 In conclusion, whilst Option B avoids the requirement to realign the SSSI, the resulting requirement to realign the highway would make it necessary to have a second crossing over the tributary. The highway realignment would also result in the relocation of the roundabout approximately 200m to the west of that in Option A and importantly further away from the River Eye. The overall net impact on nature conservation is therefore considered to be medium in magnitude and adverse.

Option C Appraisal

- 4.19 The key elements of this option relevant to the consideration of potential impacts to important ecological features are:
- Diversion of existing River Eye channel required to construct bridge; and
 - No requirement for a crossing of the River Eye tributary.

- 4.20 Option C would require extensive environmental mitigation measures associated with the diversion of the River Eye, including hydro-morphological design, flood risk management and species relocation due to sensitivity of SSSI watercourse. However, through site surveys it is evident that the river morphology along this reach is degraded by re-sectioning (i.e. widening, and possibly deepening as well), and is also impacted by the weirs downstream, flood storage area upstream, and channel siltation (upstream sources and local bank poaching by livestock). We will work with the regulators along this reach to provide mitigation measures in conjunction with the existing River Eye restoration plan, to support environmental / habitat enhancement and achieve favourable condition status.
- 4.21 The realignment of the River Eye would result in the roundabout being situated further away from the river corridor and riparian habitats than Option D, which would reduce the risk of disturbance and degradation to species, habitats and wildlife mortality, in comparison with the other options.
- 4.22 In conclusion, whilst Option C requires the realignment of the River Eye SSSI, there is no need for a tributary crossing and the new realigned channel of the River Eye would relocate the river corridor and riparian habitats further away from the negative environmental influence of the roundabout and its lighting, traffic, litter etc. The extensive environmental mitigation measures associated with the diversion of the River Eye would look to complement and enhance the restored river environment as envisaged in the River Eye Restoration Plan. However, overall benefits to the river are not likely unless other flow restoration activities upstream and downstream take place. The overall net impact on nature conservation is considered to be high/medium in magnitude and adverse in the short term, but with the potential to be neutral or even minor beneficial in the longer term in line with potential opportunities arising from restoration and enhancement.

Option D Appraisal

- 4.23 The key elements of this option relevant to the consideration of potential impacts to important ecological features are:
- No requirement for a crossing of the River Eye tributary;
 - No requirement for the diversion of existing River Eye channel required to construct bridge; and
 - Larger span bridge, requiring intermediate piers within the River Eye.
- 4.24 Whilst this option avoids the requirement for a crossing over the tributary and realignment of the River Eye, the roundabout would be in close proximity to the river corridor and riparian habitats, with potential impacts from disturbance and an increased risk of wildlife mortality. Constructing the new bridge in this location is likely to require intermediate piers to be located within the river channel. This would likely result in significant changes to the watercourse, as well as impacts on biodiversity associated with the SSSI.
- 4.25 In conclusion, whilst Option D avoids the requirement for both a tributary crossing and the realignment of the River Eye, the location of the roundabout in close proximity to the river corridor and riparian habitats and the requirement for a larger span bridge, with intermediate piers within the watercourse, mean the net overall impact on nature conservation, even when best practice and specific mitigation measures have been applied, is considered likely to be major adverse effect.

Option E Appraisal

- 4.26 The key elements of this option relevant to the consideration of potential impacts to important ecological features are:
- No requirement for a crossing of the tributary;
 - No requirement for the diversion of existing River Eye channel required to construct bridge; and
 - The roundabout would be further away from the river corridor and riparian habitats than Option D.

- 4.27 This option avoids the requirement for both a tributary crossing and realignment of the River Eye. The roundabout can also be moved further away from the River Eye corridor and associated riparian habitats, which with the implementation of appropriate mitigation would reduce the impacts of disturbance and risk of wildlife mortality.
- 4.28 In conclusion, option E offers the opportunity to avoid both a tributary crossing and realignment of the River Eye, whilst relocating the roundabout slightly further away from the River Eye corridor and associated riparian habitats. The net overall impact on nature conservation, when best practice and specific mitigation measures have been applied, is considered likely to be of low/medium magnitude and adverse.

Summary and Conclusions

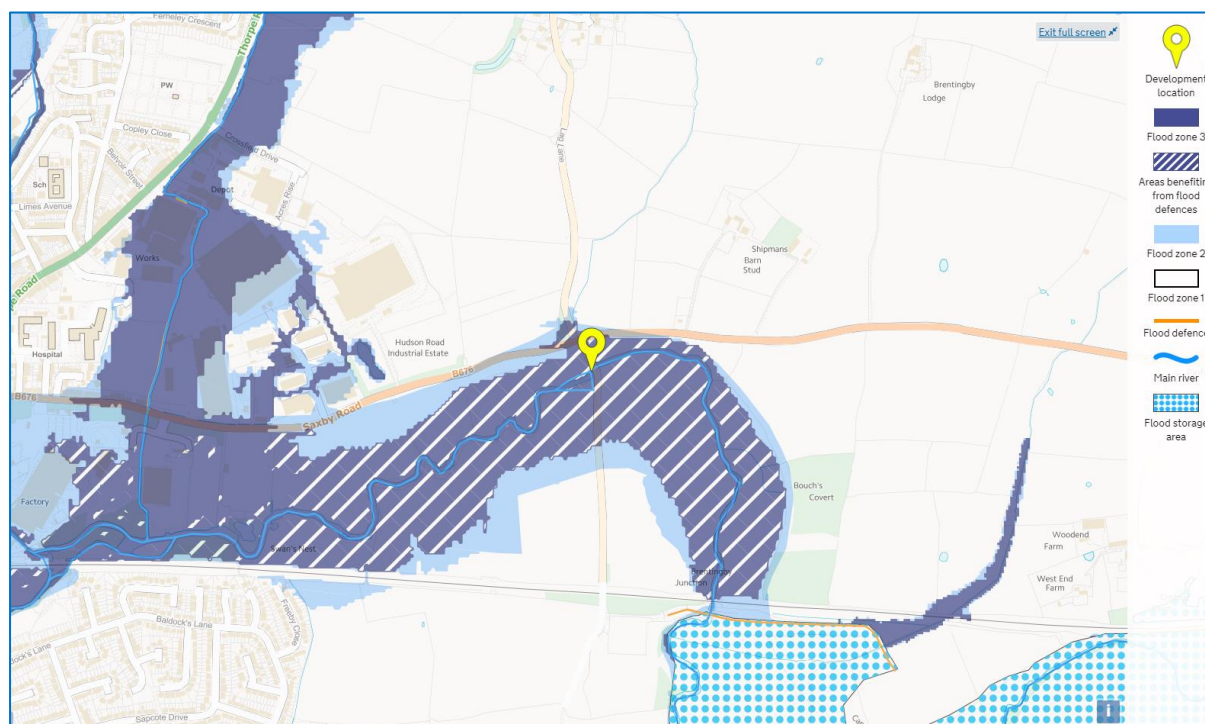
- 4.29 All options require a crossing of the River Eye SSSI and a roundabout to be located to the north of the SSSI. The key considerations in determining impacts of the scheme and likely significant effects on important ecological features are the proximity of the roundabout to the river corridor, the bridge span required for the new crossing, the implications of diverting the River Eye and the requirement for a crossing of the tributary, which is hydrologically connected to the River Eye and supports protected species.
- 4.30 The overall net impact of the four options on important ecological features are provided in Table 13.1 in the Summary and Conclusions section. In summary, Option D would have the largest adverse impact on ecology, with a high impact unlikely to be acceptable in the context of alternative options. In the short-term, Option C would have a high/medium adverse effect but provides the greatest opportunity for ecological enhancements of the options considered. Option B is predicted to have an overall medium adverse effect and Option E a medium/ low adverse effect. In the short-medium term, Option E is likely to present the best option in terms of nature conservation, but in the longer term Option C could deliver significant benefits.

5. Flood Risk

Introduction and Methodology

- 5.1 This section summarises the preliminary flood risk assessment of the proposed options for the crossing of the River Eye.
- 5.2 This appraisal does not include a detailed assessment of flood risk from the proposed development in comparison with the existing (baseline) conditions. This will be covered by a detailed Flood Risk Assessment that is being undertaken to support the planning application for the scheme and will assess the final design following a decision on the options at the River Eye.
- 5.3 The study area for review of the preliminary flood risk assessment was limited to the area around the proposed River Eye crossing. Figure 5.1 shows the Environment Agency's Flood Map for Planning⁴ in the area of the proposed MMDR River Eye crossing.

Figure 5.1 Environment Agency Flood Map for Planning (Flood Risk from Rivers and Sea)



- 5.4 In order to understand the impacts of the proposed River Eye crossing on flood risk to adjacent areas, hydraulic modelling of the proposed development is currently being undertaken. However, this work is still in progress and modelling results were not available to inform this appraisal. Thus, this preliminary assessment was based on the review of the available Environment Agency flood risk data.
- 5.5 At this stage, it is assumed that the likely crossing arrangement (irrespective of location) would be a bridge with abutments set-back from bank tops, and highway embankments with flood relief culverts across the floodplain.
- 5.6 It is assumed that the proposed River Eye crossing for all of the proposed options will be designed such that the soffit level of the bridge is 600mm higher than the peak flood level generated by a 1%AEP plus 50% Climate Change. The interim baseline results indicate that a minimum soffit level of 74.47 mAOD will be required at the proposed River Eye crossing.

⁴ Available at: <https://flood-map-for-planning.service.gov.uk/summary/477159/319211>

- 5.7 Modelling of the proposed options is required to determine the need for flood relief culverts through the highway embankment. This information is currently unavailable.
- 5.8 It is also assumed that the existing Lag Lane bridge over the River Eye will be demolished for all options.

Baseline Conditions

- 5.9 An extended flood risk baseline is presented in Annex 15.1 of the MMDR EIA Scoping Report and assesses the present risk of flooding from all sources including fluvial, tidal, surface water, artificial sources and sewers / drains. This shows that the majority of the former Option 1 alignment (Figure 2.2 of this report) is located within Flood Zone 1 (Environment Agency Flood Map for Planning, 2017) and is therefore considered to have a low risk of fluvial flooding (less than 1 in 1000 year, or <0.1% Annual Exceedance Probability (AEP) of fluvial or tidal flooding in any given year). Areas of higher risk are associated with the River Eye, Thorpe Brook and Scafford Brook (EA Main Rivers).
- 5.10 A review of the options (Figure 2.3) and the fluvial flood risk mapping provided in Figure 5.1 shows that all the proposed alignment options pass through Flood Zone 2 (risk of flooding between 0.1-1% annual probability of flood risk (medium risk of flooding)) and Flood Zone 3 (is more than 1% annual probability of flood risk (high risk of flooding)). This area benefits from existing flood defences which includes the Brentingby Dam located further upstream.
- 5.11 The existing Environment Agency baseline model results show no flood risk from the River Eye in a 1% AEP design event to Melton Mowbray because of the flood storage reservoir upstream at Brentingby. This has significantly reduced flood risk in Melton Mowbray and, as we understand, since it was constructed there's been no significant flooding downstream.
- 5.12 However, in the baseline scenario this area is shown to flood in the 1% AEP event plus 50% Climate Change allowance.

Options Appraisal

Option B Appraisal

- 5.13 Option B relocates roundabout 5 approximately 200m west (downstream) of Options C and D and the existing Lag Lane bridge. This option would also require an additional crossing of the tributary of the River Eye to the east of Thorpe Arnold.
- 5.14 The span of the river crossing for Option B would not need to be as wide as for options C and D but is likely to be wider than the existing Lag Lane bridge in order to meet the Environment Agency's minimum set-back requirement of 3m – 5m for water vole habitat. Thus, the larger span proposed bridge is likely to decrease flood levels upstream of the river crossing compared to existing conditions since the current Lag Lane bridge restricts flows in the river. The likely changes to flood levels and the need for flood alleviation culverts would need to be determined using hydraulic modelling.
- 5.15 The impact of raising land levels for the highway embankment in the flood plain is likely to be similar as the other options. The need for flood alleviation culverts would need to be determined using hydraulic modelling.
- 5.16 The impact on flood risk from this option in the vicinity of River Eye is assessed to be low as long as mitigation measures such as flood compensatory storage and flood alleviation culverts are constructed.
- 5.17 .

Option C Appraisal

- 5.18 This option would divert the River Eye sufficiently far south to enable construction of the proposed highway bridge away from the powerlines, without diverting the powerlines or revising the highway alignment.
- 5.19 The proposed bridge that would cross the diverted section of the river is likely to be significantly larger than the existing Lag Lane Bridge to meet the Environment Agency's minimum set-back requirement of 3m – 5m for water vole habitat. Similar to Option B the large span bridge crossing is likely to provide an improvement to flood levels upstream and downstream of the crossing point.
- 5.20 The proposed river diversion is unlikely to adversely impact flood risk to any built-up areas since there are none located close to the section of the river that is being proposed to be diverted. The impact of the river diversion on flood risk to the surrounding green field area would need to be tested using hydraulic modelling.
- 5.21 Compensatory flood storage would need to be provided to offset the raising of ground levels within the flood plain for the highway embankment.
- 5.22 Based on this preliminary assessment the overall net impact of this option on flood risk would be low as long as the river diversion is designed such that the flows are not restricted and appropriate compensatory storage is provided to mitigate raising of ground levels in the flood plain. However, this would need to be confirmed by undertaking detailed modelling of the proposed option.

Option D Appraisal

- 5.23 Option D does not require diversion of the River Eye and avoids an additional crossing of the Lag Lane watercourse. However, from a flood risk perspective since the highway alignment for Option D coincides with a kink in the River Eye, this alignment significantly increases the span of bridge required to approximately 70m.
- 5.24 An interim proposed model run (based on the 1% AEP event plus 50% Climate Change) of this option which represented a 70m wide opening across the kink in the River Eye to replace the existing Lag Lane bridge, showed a likely reduction in flood levels, both upstream and downstream of the crossing point. This model also showed that a proposed 70m crossing would not require flood alleviation culverts.
- 5.25 It should be noted that this modelling used a preliminary baseline model of the River Eye received from the Environment Agency without refinements. The proposed model also made the following assumptions:
- Rough estimates of the proposed embankment heights were used.
 - That the 70m structure would be free span, with a flat soffit set at an elevation of 74.47 mAOD (based on the 1% AEP event plus 50% Climate Change flood level).
- 5.26 A bridge of this length would require the construction of intermediate piers within the watercourse, which was not accounted for in the preliminary model. Even though the piers would permanently alter the watercourse, and may require scour protection works, it is likely that the water levels would decrease downstream and upstream of the bridge since the proposed bridge structure is significantly larger in span than the existing Lag Lane bridge, which currently restricts the flow in the river.
- 5.27 Compensatory flood storage would need to be provided to offset the raising of ground levels within the flood plain for the highway embankment.
- 5.28 Based on this preliminary assessment the overall net impact of this option on the flood risk would be low if appropriate compensatory storage is provided to mitigate the raising of ground levels in the flood plain.

Option E Appraisal

- 5.29 The proposed design of Option E avoids the kink in the River Eye by relocating roundabout 5 approximately 50m west of Options C and D, immediately west of the existing Lag Lane bridge. The principal benefits of this option are that it does not require diversion of the river and it minimises the span of the new river bridge required by avoiding the river meander.
- 5.30 Option E does not require intermediate piers to be constructed in the watercourse due to the significant reduction in span required compared to Option D. Option E does however require an increased length of Lag Lane watercourse to be diverted in new culverts under roundabout 5. However, the current culvert that joins the Lag Lane watercourse to the River Eye is reported to be undersized and flooding in this area has been reported. Option E allows for replacement of the existing culvert with a larger culvert which could provide an improvement to flood risk in the area affected by the tributary of the River Eye.
- 5.31 Based on this preliminary assessment the overall net impact of this option on the flood risk would be low if appropriate compensatory storage is provided to mitigate the raising of ground levels in the flood plain.

Summary and Conclusions

- 5.32 In summary the impact of the scheme on flood risk to built-up areas would not differ significantly between the four options. All the proposed options involve the raising of ground levels within flood zones 2 and 3, impacts of which would need to be mitigated by provision of compensatory flood storage and flood alleviation culverts.

6. Cultural Heritage

Introduction and Methodology

- 6.1 This section considers the heritage constraints for the potential options for the crossing of the River Eye.
- 6.2 This assessment examined an area of approximately 500m around the crossing point on the River Eye as presented in Option A (NGR SK 77053 19181). Information about the heritage assets within this study area was gathered from the following sources:
- Leicestershire Historic Environment Records (HER);
 - National Heritage List for England (NHLE), <https://www.historicengland.org.uk/listing/the-list/>;
 - National Library of Scotland Historic Map viewer, <https://maps.nls.uk/index.html>;
 - River Eye SSSI: Strategic Restoration Plan (2015) Natural England; and
 - Natural England LiDAR data.
- 6.3 The bracketed numbers in this chapter text refer to the individual record numbers, prefixed by the source.
- 6.4 This assessment is limited by the fact that only preliminary data sources were consulted. No site walkover survey was undertaken as part of this appraisal.

Baseline Conditions

- 6.5 The existing crossing point over the River Eye is located to the east of Melton Mowbray, on the south side of Saxby Road close to the junction with Lag Lane.
- 6.6 There are seven heritage assets recorded on the HER. There are no designated heritage assets recorded within the 500m study area. The closest designated heritage assets are listed buildings located in Thorpe Arnold, approximately 830m to the north of the existing crossing, and in Brentingby, approximately 1,330m to the southeast.
- 6.7 An archaeological evaluation was undertaken on land adjacent to Lag Lane to the south of the crossing point. The evaluation recovered several pieces of flint, including two cores, five flakes and one retouched flake, were found (HER MLE9253). The exact date of the flint artefacts is unknown but they are thought to date from the later prehistoric period. Some fragments of Iron Age pottery were also found on the site (HER – MLE9254).
- 6.8 A small scatter of Roman pottery, including some fragment of Samian, and five Roman brooch fragments (HER – MLE6026) were found in a field off Lag lane to the north of the crossing point.
- 6.9 There are no previously recorded heritage assets dating to the early medieval or medieval periods within 500m of the crossing. LiDAR data for the River Eye clearly shows extensive areas of ridge and furrow, a common farming practice from the medieval period, in the land adjacent to both banks of the river. It likely survives here as there has been little to no development in the area other than the adoption of more modern farming practices.
- 6.10 Two linear features cross through the area adjacent to the River Eye. The Oakham Canal (HER – MLE10600) was opened in 1802 to connect Melton Mowbray with Oakham. From analysis of the LiDAR data, it is considered that the river was re-aligned in places to accommodate the line of the canal. Historical evidence supports that the water flow to the canal was found to be unreliable and we believe that the alignment of the River Eye was modified to try and increase water flow to feed into the canal. The canal became financially unviable and was closed in 1847. By the time of the first edition Ordnance Survey map in 1884, sections of the canal are depicted as infilled or built over. The second linear feature is the Midland Railway (HER –

MLE16080) which passes to the south of the crossing point. The line was built between 1846 and 1848 to link Stamford and Peterborough, and remains in use.

- 6.11 The final two assets are modern in date and relate to the Second World War. The first is the site of a spigot mortar emplacement (HER – MLE10600) to the east of the existing crossing point and the second, the crash site of a Wellington Bomber (HER – MLE21369), which crashed on a training flight in 1944.

Options Assessment

- 6.12 An impact in this chapter is defined as a change resulting from the proposed development on the significance of a heritage asset. Impacts on heritage assets can relate to either physical impacts on the heritage assets or impacts to their significance relating to changes to their setting.
- 6.13 The following could have an impact upon heritage assets by the proposed development:
- Physical impacts upon archaeological features; and
 - Impacts on the setting of heritage assets.
- 6.14 This assessment has combined all options because the assessment is very similar for all options.
- 6.15 All of the options have the potential to physically impact the line of the former canal. Details of what, if any elements of the canal remain in situ are not known at this stage. Any excavation or construction works may result in the removal of or damage to, any surviving elements and an impact on its historic significance. With appropriate mitigation in place, this impact is unlikely to be more than slight adverse.
- 6.16 The River Eye itself is considered to be a heritage asset due to its association with the history of the canal, and the contribution it makes to the historic landscape. Any works to or adjacent to the river, or the diversion of the river considered as part of Option C, would have an impact on the historic significance of the river. However, due to the limited nature of the diversion, and with appropriate mitigation to ensure the current course is recorded, the impact is unlikely to be more than slight adverse.
- 6.17 There is potential for previously unrecorded archaeological deposits and heritage assets particularly from the prehistoric and Roman periods, to survive in this area. As a result, for all options, it is likely that further archaeological evaluation would be required to assess the potential for these to survive and to make appropriate recommendations for mitigation.

7. Landscape and Visual Impact

Introduction and Methodology

- 7.1 This section of the environmental options appraisal describes the landscape and visual baseline and sets out the anticipated effects of each of the options on receptors. For the purposes of the appraisal, a clear distinction is drawn between landscape and visual effects as follows:
- Landscape effects: effects on the landscape as a resource in its own right; and
 - Visual effects: effects on views and on the general visual amenity experienced by people.
- 7.2 The study area of the assessment is defined by a combination of the Zone of Theoretical Visibility (ZTV) of the scheme, professional judgement, and field survey verification. Guidance given in DMRB Volume 11 Section 3 Part 5 (Annex III) suggests a 1km study area corridor, broadening to capture areas within the ZTV sitting outside of the 1km with capacity to experience significant effects as a result of a proposed scheme. This approach is commonly adopted for highways projects and is adopted for this appraisal. The baseline study area for this assessment is within the context of the wider scheme study area, with detailed, localised assessments provided in the option assessment sections below.
- 7.3 The methodology for this appraisal is consistent with guidance provided in IAN 135/10 which supersedes DMRB Volume 11 Section 3 Part 5 and broadly follows GLVIA3 methodology. However, this is very high level and does not go into the full depth required for a Landscape and Visual Impact Assessment.
- 7.4 The appraisal combines judgements on the inherent sensitivity of the landscape character and visual amenity, as well as magnitude of impact that each of the options will exert on the landscape character and visual amenity, to arrive at a consideration of the importance of the effect.
- 7.5 As a general rule of thumb, landscape character which is considered highly sensitive tends to involve high scenic quality landscapes with numerous conservation and recreational interests and positive perceptual aspects, and is of a high susceptibility to change through the loss of key components or addition of new and incongruous components. Visual receptors of high sensitivity tend to be residential or recreational receptors, where the view is valued and attention is focused on the particular view – for example the rural outlook to a village.

Baseline Conditions

Landscape

- 7.6 Melton Mowbray is a small market town set within the Eye valley in rural Leicestershire. The valley runs in an east-west direction. The town itself sits in the floodplain and stretches up the northern and southern valley slopes.
- 7.7 The land cover away from the town is primarily arable farming, with some pastoral farming in the valley bottom. Away from the main town of Melton Mowbray, settlement is typically either concentrated in small villages such as Burton Lazars, or hamlets such as Brentingby or Wyfordby.
- 7.8 At a national scale the majority of the study area lies within National Character Area (NCA) 74: Leicestershire and Nottinghamshire Wolds⁵. The southern half of the study area sits within NCA 93: High Leicestershire⁶. The NCA has been defined on the Natural England website within a document uploaded on 2013/11/13. Both NCA 74 and NCA 93 are of a scale and nature such that the Scheme would not be likely to give rise to significant effects on their landscape character.

⁵ As defined on the Natural England website within a document uploaded on 06/11/2014.

⁶ The NCA has been defined on the Natural England website within a document uploaded on 13/11/2013.

- 7.9 At a more local level the study area is covered by the Melton Borough Council Landscape and Historic Urban Character Assessment (ADAS, 2006).
- 7.10 Melton Borough Council updated their Landscape Character Assessment in 2011 with the aim of reviewing and updating the descriptions of Melton's landscape character areas (LCA), as well as a review of the sensitivity assessment undertaken in the original 2006 assessment. The document provides a comprehensive assessment of Melton's landscape character, describing 21 LCA within the borough.
- 7.11 LCAs which occur within the study area either side of the highway boundary - as identified by the landscape assessment referred to above - are summarised within Table 7.1. These descriptions form the baseline against which the potential impacts of the proposed scheme on landscape character have been assessed.

Table 7.1: Melton Landscape Character Areas

Landscape Character Area	Key characteristics
LCA 6: Ridge and Valley	<p>A broadly homogenous gently rolling ridge and valley landscape with contrasting large scale arable fields along ridgelines and smaller scale pastures in the valleys, with managed hedges and scattered, mostly ash trees.</p> <p><u>Distinct Characteristics:</u> Rolling landscape, Large scale open arable fields along ridgelines, Small scale enclosed pastures on valley sides and floors, Few buildings.</p>
LCA 11: Pastoral Farmland	<p>A typical, pleasant, rural, gently rolling lowland pastoral farmland landscape. Generally well-managed, with diverse field shapes and sizes, good hedges and scattered trees.</p> <p><u>Distinct Characteristics:</u> Rolling topography, Well managed pastoral landscape, Scattered farmsteads, Thick stock proof hedges, Irregular shaped fields.</p>
LCA 13: Eye Valley	<p>A mixed, rather discordant, river valley landscape with traditional small scale pastoral land to the north and contrasting large scale intensive open arable land to the south, which suppresses the natural river valley landscape.</p> <p><u>Distinct Characteristics:</u> Small scale pastoral landscape to the north, Large scale intensive open arable fields to south, Sparse hedgerows and tree clumps.</p>
LCA 16: Farmland Patchwork	<p>A gently rolling lowland mixed farmland landscape with a distinct patchwork of small to medium scale regular shaped pastoral and arable fields with blocks of game cover and small woodlands.</p> <p><u>Distinct Characteristics:</u> Landscape influenced by game shooting, Blocks of trees, woodland, game cover crops, Patterned patchwork landscape.</p>
LCA 17: Open Arable	<p>A contemporary large scale blocky intensively farmed open arable landscape superimposed upon an older smaller scale and strongly irregular patterned landscape. The subtleties are subdued but evident.</p> <p><u>Distinct Characteristics:</u> Intensively farmed, large scale open landscape, Past field enlargement through hedge and woodland removal, Pattern of historic landscape still evident in places.</p>
LCA 20: Melton Fringe / LCA 21: Melton	<p>A mixed urban fringe ridge and valley and valley floor landscape, mostly pastoral farmland, Ministry of Defence (MOD) land and recreational land.</p> <p><u>Distinct Characteristics:</u> Rolling landscape of fields and hedges, Mixed pasture and arable land Clear distinction between urban edge and countryside, Housing estates remain unscreened Some industrial and other land uses (e.g. MOD).</p>

Visual Impact

- 7.12 The landscape surrounding the proposed highway options has an undulating landform, centred on the valley of the River Eye. The higher ground of the valley slopes afford long views in places where vegetation and built form allow.
- 7.13 There are several potential visual receptors in and around the study area. These include:
- Residential properties in Melton Mowbray (approx. 600m west);
 - Residential properties in Thorpe Arnold (approx. 200m west);
 - Other individual isolated residential properties;
 - Users of various local Public Rights of Way (PRoW);
 - Transitional receptors on the A607 (crosses the scheme);
 - Transitional receptors on the B676 (crosses the scheme);
 - Transitional receptors on the Leicester-Peterborough railway line (crosses the scheme);
 - Transitional receptors on minor roads; and
 - Workers on and users of the Saxby Road Industrial Estate (approx. 1km west).

Options Appraisal

Option B Appraisal

- 7.14 Option B runs closer to the edge of Melton Mowbray than Options C, D and E. There would be the same losses of agricultural land and hedgerows that are apparent within Option C and the landform modification is still present within the Eye valley. All these elements contribute to a low negative effect on the surrounding character.
- 7.15 Visually, the placement of Option B towards the edge of Melton Mowbray results in the scheme being located closer to the residential receptors in Thorpe Arnold. The shift in alignment closer to Thorpe Arnold than that of Option C involves a small section of embankment and therefore it is considered that the scheme would be somewhat more visible from the location of residential receptors within Thorpe Arnold. In addition the pylons crossing the River Eye will need to be diverted, resulting in an additional pylon being visible within the landscape. The effect on other residential and recreational receptors within the study area is considered to be much the same as those for Option D, with the overall visual effect for receptors considered to be medium negative.

Option C Appraisal

- 7.16 Option C would involve the introduction of a raised embankment within the floodplain of the River Eye; a landform modification which would be relatively incongruous within the otherwise flat floodplain. The scheme would also result in the direct loss of characteristic agricultural land and hedgerow field boundaries, the latter particularly to the north of the River Eye. Within the context of the wider Melton Mowbray, this option would introduce further noise and movement to the valley, which is crossed by a few existing roads.
- 7.17 Option C has the additional effect of adding meanders to an otherwise straight section of the River Eye, but this change is negligible in the wider context of the proposed development. The effect of Option C on landscape character is considered to be low adverse.
- 7.18 Visually, Option C would be visible to residential receptors in Thorpe Arnold and Melton Mowbray introducing highway infrastructure into views of the surrounding rural countryside. This effect would have the greatest impact for residential receptors in Thorpe Arnold due to their otherwise rural views across the Eye Valley. In addition, receptors on a number of PRoW within close proximity to the scheme would be affected by the introduction of highway infrastructure and movement into otherwise rural views. Overall a medium negative visual effect is considered to be felt by receptors as a result of the presence of Option C.

Option D Appraisal

- 7.19 Similar to Option C, Option D follows an alignment through the Eye valley, resulting in the loss of agricultural land and hedgerows, as well as the addition of landform modifications, noise and movement in the rural fringe of Melton Mowbray. These landscape effects are considered to be low negative overall.
- 7.20 Option D shares an alignment with Option C, and would result in similar visual effects. The only difference between this option and Option C is the diversion of powerlines required to facilitate a slightly different vertical alignment. This change is considered to be negligible in the wider context and therefore Option D is considered to result in a medium negative effect on the visual amenity of receptors within the study area.

Option E Appraisal

- 7.21 Option E follows a similar alignment to Options C and D, with the exception of the roundabout lying slightly closer to the urban fringe of Melton Mowbray. The alignment would result in similar losses of agricultural land and hedgerows that are apparent within Options C and D, as well as the landform modification present within the Eye valley. All of these effects are within the rural fringe context of Melton Mowbray, and therefore are considered to result in an overall low negative effect on the landscape character.
- 7.22 The difference in alignment of Option E in comparison to that of Options C and D are negligible within the overall proposed development. In addition, the pylons crossing the River Eye will need to be diverted, with at least one more pylon being visible within the landscape. Overall the views from receptors such as residents in Thorpe Arnold and Melton Mowbray, as well as from PRow in the surrounding area would remain much the same as described for the other options. Therefore, the effect on visual amenity arising from Option E is also considered to be medium negative.

Summary and Conclusions

- 7.23 Overall, there are very few differences in terms of landscape and visual impacts between the four options, owing to their relatively minor differences within the wider landscape context. Option B offers slightly greater visual effects, particularly for the residential receptors in Thorpe Arnold, due to its alignment lying slightly closer to the village and on embankment over a greater length than that of the other options. Option C presents the opportunity for landscape planting associated with the re-aligned River Eye. Overall, the options are considered to result in low negative effects on landscape character, and a medium negative effect on visual amenity, with few discernible differences in effect between each option.

8. Air Quality

Introduction and Methodology

- 8.1 This section outlines the findings of a qualitative review of the potential effect of the four options (B-E inclusive) for the River Eye crossing on air quality at sensitive receptors within a defined study area.
- 8.2 The assessment considers potentially sensitive receptors within a study area of 200m around the road section and routes likely to be affected by the four options. This is due to the effect of pollutants from road traffic reducing with distance from the point of release. Beyond 200m, pollutant concentrations are likely to have reduced and total pollutant concentrations would be equivalent to background concentrations. This 200m study area applies both to construction dust and emissions during the construction phase as well as road traffic emissions during the operational phase.
- 8.3 For this appraisal, a qualitative assessment has been undertaken to identify potential construction and operational air quality impacts of the four options associated with the crossing of the River Eye compared to the previously assessed Do Minimum scenario for 2021. This appraisal has taken into account the baseline conditions, location of sensitive receptors and information from the quantitative assessment undertaken for the Business case.
- 8.4 Each option has been provided with a rating in terms of overall net impact: positive (+) Very High, High, Medium, Low, Negligible or negative (-) Very High, High, Medium, Low or Negligible.
- 8.5 This assessment is a qualitative appraisal only and is not based on modelled traffic data or detailed mapping as these are not available for the different options. Based on the findings, an informed professional judgement has been made when determining potential air quality impacts for each option.
- 8.6 Details regarding construction activities, construction duration, construction traffic flows and construction phase traffic management proposals are not fully available at this time to inform the assessment therefore assumptions have been made on potential sources of emissions to air based on similar construction works.

Baseline Conditions

- 8.7 The study area is wholly within Melton Borough Council's (MBC) administrative area and does not pass through any Air Quality Management Areas (AQMAs). The nearest AQMAs are 14km from Melton Mowbray town centre. Annual average background pollutant concentrations of nitrogen dioxide (NO₂) and PM₁₀ for 2015 are below the relevant objective values. MBC conducts NO₂ diffusion tube monitoring at 16 sites in the borough. Annual mean NO₂ concentrations at long term sites have been relatively stable over the last few years and are generally well within the objective value. In 2015, the Council installed three new roadside monitoring sites (DT11, DT12 and DT13) within the town centre. Concentrations at DT12 were above the objective value for annual mean NO₂ in 2015 (MBC, 2016).
- 8.8 A quantitative air quality modelling assessment has previously been conducted for the Proposed Scheme in line with Highways England Design Manual for Roads and Bridges (DMRB) at around 200 sensitive receptors as part of the MMDR Environmental Impact Assessment. These receptors are predominately residential buildings with some schools and hospitals. This assessment predicted that in 2021, annual mean concentrations of PM₁₀ would be below the annual and 24 hourly mean objective value at all sensitive receptors within the study area. Annual mean concentrations of NO₂ were predicted to be below the annual mean objective value at most receptors, with two sensitive receptors above the annual mean objective value within the centre of Melton Mowbray. The local air quality assessment predicted that there would be both improvements and deteriorations in air quality at sensitive receptors due to the proposed MMDR compared to the future baseline (Do Minimum) scenarios, but overall there would be a net reduction in concentrations.

Options Appraisal

Option B Appraisal

- 8.9 Option B is the most western option and requires a second crossing of the tributary to the east of Thorpe Arnold. This results in increased lengths of the alignment being on embankment rather than in cutting. An additional 50,000m³ of material would be required for this option. This may result in additional risks to residents during the construction phase from associated dust and emissions. However, this risk is considered to be negligible as these receptors are located at a distance of more than 200m.
- 8.10 In terms of operational impacts, this option would move Roundabout 5 approximately 200m west of Options C and D, taking it further away from two sensitive residential receptors including Shipman's Barn Stud on B676 Saxby Road. This option brings the proposed highway alignment 50m closer to Thorpe Arnold (to within 240m) compared to Options C and D. However, as this distance is more than 200m away and there are no sensitive receptors at the edge of the village, there are unlikely to be any impacts due to traffic emissions from this road. The overall net impact on air quality due to this option is predicted to be negligible due to the distance from sensitive residential receptors and the River Eye SSSI.
- 8.11 Option B would require a section of the highway near Thorpe Arnold to be on embankment rather than cutting, requiring materials for construction rather than generating materials for reuse on the wider MMDR scheme. There will be additional heavy duty vehicle movements associated with transporting material to construct the additional tributary culvert and import 50,000m³ of additional earthworks material.

Option C Appraisal

- 8.12 Option C involves the realignment of the River Eye to enable the construction of the river bridge without diverting powerlines. It is predicted that air quality impacts during construction on sensitive receptors would be negligible and limited to the two individual properties on the B676 Saxby Road. There would be a slight increase in air quality impacts during operation at these properties and the River Eye SSSI. Overall the net impact on air quality of this option is considered to be negative low/negligible.

Option D Appraisal

- 8.13 Option D requires the diversion of the powerlines to enable construction of a bridge without diversion of the River Eye. The bridge would need to be longer than for the other options so the impacts from dust and emissions during the construction phase at two sensitive receptors on the B676 Saxby Road and on the River Eye SSSI may be greater than other options. The impact on air quality during operation at the nearest sensitive residential receptors such as Shipman's Barn Stud and the River Eye SSSI would be similar to Option C. The overall net impact on air quality due to this option is considered to be negative low/negligible.

Option E Appraisal

- 8.14 This option requires the powerlines and highway to be realigned to enable the construction of a bridge without diverting the River Eye. The likely construction impacts would be due to dust and emissions from the demolition of the bridge. The realignment of the highway would mean that roundabout 5 would move approximately 50m west of Option A. This would bring the crossing more than 200m from the sensitive receptors on B676 Saxby Road including Shipman's Barn Stud Farm, which means that the impacts due to the operation of the scheme would be negligible at this location. The overall net impact on air quality for this option is predicted to be negative low/negligible due to the distance of sensitive receptors from the proposed Option E.

Summary and Conclusions

- 8.15 In summary, the impact on air quality of the options at sensitive receptors is likely to be very similar and is predicted to be either negative low or negligible. Based on this qualitative appraisal, it is expected that Options B would have a negligible impact on air quality due to the low baseline pollutant concentrations in the area and the new highway being located more than

200m from sensitive residential receptors and the River Eye SSSI. Options C, D and E may have a greater impact on air quality during construction activities and operation although this impact is anticipated to be small and is therefore low negative/negligible. The main source of pollution would be from vehicle emissions from the new highway causing a small increase in concentrations at nearby sensitive residential receptors on the B676 Saxby Road and the River Eye SSSI.

9. Noise and Vibration

Introduction and Methodology

- 9.1 This chapter outlines the findings of a qualitative review of the potential effects of the four options on noise and vibration at sensitive receptors within a defined study area.
- 9.2 The assessment considers potentially sensitive receptors within a study area for noise of up to 1km around each of the four options, in accordance with Highways England Design Manual for Roads and Bridges (DMRB).
- 9.3 The study area is wholly within Melton Borough Council's (MBC) administrative area. None of the options pass through any Noise Important Areas (NIAs). The nearest NIAs are in Melton Mowbray town centre.
- 9.4 A quantitative noise modelling appraisal of the operational impacts of the whole scheme was previously conducted in line with WebTAG as part of the business case; this was based on a highways alignment corresponding to Options C and D. The noise appraisal indicated that significant increases in traffic noise are likely along the alignment of the proposed scheme including the eastern and northern edges of Melton Mowbray, Thorpe Arnold and individual properties off Saxby Road. Conversely decreases in traffic noise were predicted through the centre of Melton Mowbray as through-traffic transfers to the proposed scheme. The WebTAG appraisal included mitigation in the form of low noise surfacing on the scheme; no additional mitigation, such as noise barriers, were included.
- 9.5 For this appraisal, a qualitative assessment has been undertaken to identify the relative potential construction and operational noise and/or vibration impacts of the four options associated with the crossing of the River Eye. This appraisal has taken into account the existing baseline, location of sensitive receptors and results from the previous quantitative assessment.
- 9.6 This assessment is qualitative and is not based on modelled traffic data or detailed mapping as these are not available for all the different options. Based on the findings, an informed professional judgement has been made when determining potential impacts for each option.
- 9.7 Details regarding construction activities, construction duration, construction traffic flows and construction phase traffic management proposals are not available at this time to inform the assessment. Therefore assumptions have been made on potential sources of construction noise and vibration based on similar construction works.

Baseline Conditions

- 9.8 Baseline noise levels in the area around the scheme options are generally dominated by road traffic from the A607 Thorpe Road, B676 Saxby Road, and from local roads, as well as contributions from the railway line to the south and light aircraft from Melton Airfield.

Options Appraisal

Option B Appraisal

- 9.9 The alignment of Option B is the closest to Thorpe Arnold but the furthest from the two individual properties off B676 Saxby Road. It brings the scheme slightly closer to the eastern edge of Melton Mowbray. Based on the business case noise appraisal of Option C and D alignment, major/moderate increases in traffic noise are anticipated in the opening year at residential receptors in these areas, where properties are not in close proximity to existing roads. Option B is likely to further increase the adverse impact at Thorpe Arnold, and to a lesser extent the eastern edge of Melton Mowbray, and reduce the adverse impact at the two individual properties off the B676 Saxby Road.
- 9.10 The construction noise and vibration will be greatest for Option B due to the additional import of 50,000m³ of fill material to equate the earthworks balance. The potential for significant adverse

construction noise effects extends beyond the two individual properties to the east of Saxby Road and Thorpe Arnold due to the import of the additional fill material from off site. The source of this material is unknown, however, its haulage may cause additional vibration to residents along the route to the site.

- 9.11 Based on the distance between the proposed alignment and residential receptors no significant operational adverse vibration effects are anticipated.
- 9.12 The size of the river crossing bridge would be smaller for Option B than other options; however, a culvert would be required below Roundabout 5 to accommodate the tributary.

Option C Appraisal

- 9.13 Option C is one of the alignments closest to the two individual properties off the B676 Saxby Road, but furthest from Thorpe Arnold and the eastern edge of Melton Mowbray. Based on the business case noise appraisal major/moderate increases in traffic noise are anticipated in the opening year at residential receptors in these areas that are not in close proximity to existing roads.
- 9.14 The potential for significant adverse construction noise effects is likely to be limited to the two individual properties to the east of Saxby Road and Thorpe Arnold. Based on the distance between the scheme and residential receptors no significant adverse vibration effects are anticipated. Compared to Option D (which follows the same alignment), the duration and magnitude of construction impacts associated with Option C are likely to be slightly less than Option D. This is based on the assumption that realigning the power lines would require more extensive construction works than realigning the river.

Option D Appraisal

- 9.15 The alignment of Option D is the same as Option C and therefore the potential for significant adverse construction noise effects is likely to be limited to the two individual properties to the east of Saxby Road and Thorpe Arnold; based on the distance between the scheme and residential receptors no significant adverse vibration effects are anticipated.
- 9.16 Compared to Option C (on the same alignment), the duration and magnitude of construction impacts are likely to be slightly more. This is based on the assumption that realigning the power lines would require more extensive construction works than realigning the river.
- 9.17 Of the four options, Option D is likely to have the greatest adverse impact at the two individual properties to the east of Saxby Road but the least adverse impact at Thorpe Arnold, and to a lesser extent the eastern edge of Melton Mowbray.

Option E Appraisal

- 9.18 The alignment of Option E is very similar to Options C and D, with only a slight realignment of roundabout 5 to the west, which moves it slightly further away from the two individual properties off the B676 Saxby Road and slightly closer to the southern edge of Thorpe Arnold and the eastern edge of Melton Mowbray. Based on the business case noise appraisal of the Option C and D alignment, major/moderate increases in traffic noise are anticipated in the opening year at residential receptors in these areas, where properties are not in close proximity to existing noise sources (e.g. roads). Option E is likely to very slightly increase the adverse impact at Thorpe Arnold, and to an even lesser extent the eastern edge of Melton Mowbray, and very slightly reduce the adverse impact at the two individual properties off the B676 Saxby Road.
- 9.19 The potential for significant adverse construction noise effects is likely to be limited to the two individual properties to the east of Saxby Road and Thorpe Arnold. Based on the distance between the scheme and residential receptors no significant adverse vibration effects are anticipated. The size of the bridge is minimised with this option, however it requires the powerlines to be realigned to enable the construction of the bridge over the River Eye.
- 9.20 Compared to the other three options, Option E is likely to have very similar impact to Options C and D, with the impact at Thorpe Arnold very slightly greater and the impact at the two individual properties to the east of Saxby Road very slightly less.

Summary and Conclusions

- 9.21 In summary, the impact on operational traffic noise of these options at sensitive receptors is identical for options C and D, and likely to be very similar for Option E. Option B has a reduced adverse impact at the two individual properties off the B676 Saxby Road and increased adverse impact at Thorpe Arnold, and to a lesser extent the eastern edge of Melton Mowbray. Option B would likely lead to more properties experiencing significant noise impacts than the other options due to an increased length of the alignment being on embankment to the east of Thorpe Arnold.
- 9.22 With regard to construction impacts, no potentially significant construction vibration effects are anticipated with any of the options. Construction noise impacts are likely to be greatest at Thorpe Arnold with Option B and smallest with Options C and D. Construction noise impacts are likely to be greatest at the two individual properties off the B676 Saxby Road with Options C and D and smallest with Option B. Comparing Options C and D, Option C is likely to result in slightly smaller impacts, assuming the works to realign the river are less extensive than the works to realign the powerlines. Option B requires the import of an additional 50,000m³ of fill material to equate the earthworks balance. The haulage of this material may cause additional noise nuisance and vibration to residents along the route to site.

10. Geology and Soils

Introduction and Methodology

- 10.1 This chapter describes the existing ground conditions and known and/ or suspected contamination and assesses the impacts of each of the river crossing options on geology and soils.
- 10.2 The assessment in this chapter is largely based on the information contained in the following reports:
- AECOM (July, 2017) Melton Mowbray Distributor Road, Preliminary Sources Study Report;
 - AECOM (May 2017) Melton Mowbray Distributor Road, Environmental Impact Assessment Scoping Report;
 - AECOM (October 2017) Evaluation of Highway Alignment Options at River Eye, Technical Note; and
 - Reading Agricultural Consultants Ltd (October 2017) Melton Mowbray Distributor Road, Agricultural Land Classification and Soil Resources.
- 10.3 The impact of each of the options takes into account the potential presence of land and groundwater contamination, ground stability, geological/geomorphological significance, agricultural land, controlled waters, the built environment and human receptors.
- 10.4 Available information which includes the reports mentioned above has been used to establish the baseline conditions within the area of the options.
- 10.5 Each Option has been provided with a rating in terms of overall net impact; positive (+) Very High, High, Medium, Low, Negligible or negative (–) Very High, High, Medium, Low, Negligible.
- 10.6 The limitations of this assessment are that no ground investigation data is available to review the options and any further studies and surveys may identify contamination, ground stability hazards, and/or new soils and geology features that could be impacted.
- 10.7 The study area for this chapter encompasses the area of Options B to E, shown in **Figure 2.3** of this report. The assessment of the impacts will be extended to any notable offsite features within the immediate vicinity (<250m radius).

Baseline Conditions

- 10.8 With reference to the British Geological Survey (BGS) Melton Mowbray Solid Geology and Drift Map (Sheet 142) 1:50,000 scale maps indicate that none of the options are underlain by any artificial ground. However, some Made Ground could be anticipated along Lag Lane (Options C and D) and Saxby Road (All Options) associated with the construction of the current road infrastructure and the railway (All Options). The majority of the options will be underlain by Alluvium – Clay, Silt, Sand and Gravel associated with the River Eye; Head Deposits – Clay, Silt Sand and Gravel; the Oadby Member – Diamicton; and Bytham Sand and Gravel Formation – Sand and Gravel. The Superficial Deposits will be underlain by the solid geology of the Blue Lias Formation – Mudstone which is described as ‘thinly interbedded limestone and calcareous mudstone and siltstone’ by the BGS.
- 10.9 With reference to the Magic website (accessed 15/02/2018), the Alluvium does not have an aquifer designation. The superficial deposits of the Bytham Sand and Gravel Formation is classified as a Secondary ‘B’ Aquifer, described by the Environment Agency as ‘*predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.*’ The Oadby Formation and Head Deposits are classified as Secondary (Undifferentiated) Aquifers described as ‘*predominantly lower permeability layers which may store and yield limited amounts of*

groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers. The Blue Lias Formation is also classified as a Secondary 'Undifferentiated' Aquifer.

- 10.10 The options fall within the 'Eye/Wreake from Langham Brook to Soar catchment', which had a Poor ecological status in 2016 (Good – 2027 objectives) and a Good chemical status in 2016. The River Eye is the main surface water feature in the vicinity of the options and flows towards the east. The River Eye is classed as a Site of Special Scientific Interest (SSSI), but does not have a geological designation. With reference the Envirocheck Report (125020042_1_1) the Options are also within a Nitrate Vulnerable Zone, a 'Name' is 'Not Supplied', a 'Description' of 'Surface Water' is noted and assumed to be associated with the River Eye.
- 10.11 Where Agricultural Land Classification (ALC) grade 3 (good to moderate quality) was identified, an agricultural soil survey was undertaken by Reading Agricultural Consultants to determine whether the land was subgrade 3a or subgrade 3b. The agricultural land on the northern side of the River Eye is classified as subgrade 3b (moderate quality agricultural land), the land to the south of the River Eye is classified as subgrade 3a (good quality agricultural land).

Options Appraisal

Option B Appraisal

- 10.12 A new skewed railway bridge and a new river bridge would be required for Option B, as well as a reinforced earthworks/retaining structure that may be required adjacent to the river. This is likely to require the import of materials from other parts of the scheme or from offsite (subject to environmental acceptability testing).
- 10.13 The change in highway alignment moves from a cutting to embankment at the closest point to Thorpe Arnold. Options C, D and E generate material from cuttings which can be reused on the wider MMDR Scheme (subject to environmental testing). It is estimated that the overall environmental impact of Option B would be significant with an increase in imported material of approximately 50,000m³.
- 10.14 The relocation of the pylons may expose potential Made Ground associated with the construction of the powerlines. However, the material excavated to move the pylons may be used to backfill (subject to re-use acceptability testing) the original pylon foundation locations.
- 10.15 At this stage it is considered that the amount of agricultural land loss (subgrade 3a) would be similar to that for Options D and E, and less of that from Option C. Therefore, the overall net impact of Option B is considered to be negative moderate on geology and soils.

Option C Appraisal

- 10.16 Option C involves the realignment of the River Eye to enable the construction of the bridge without the diversion of the powerlines. A new river bridge and new skewed railway bridge would be required for Option C.
- 10.17 The existing Lag Lane bridge would be demolished for Option C potentially producing waste for landfill if following environmental testing it could not be re-used elsewhere in the scheme.
- 10.18 The indicative river diversion shown in Figure 2.3 notes that a small quantity of material would be excavated from the alignment of the proposed river diversion. This surplus material may be acceptable for re-use elsewhere on the scheme. The indicative river diversion would result in cutting off approximately 1Ha of subgrade 3a agricultural land.
- 10.19 However, should steps be taken to mitigate the loss of access of approximately 1Ha of agricultural land, the only soil loss would be that along the proposed route of the newly excavated channel and the route of the road. Assuming a maximum length of 200m by 10m wide, this would equate to approximately 0.2Ha for the newly excavated channel. The area of agricultural land lost with respect the route of the road in that area is approximately 0.5Ha.

10.20 The proposed highway alignment to the north of roundabout 5 would be in cut, which would result in surplus soils for reuse in other parts of the scheme (subject to environmental acceptability testing and need).

10.21 At this stage it is considered that the amount of agricultural land loss (Subgrade 3a) would be the most significant under Option C, as it may not be possible to provide access to the agricultural land between the original and proposed river alignment. Therefore, the overall net impact of Option C would be negative moderate on geology and soils.

Option D Appraisal

10.22 Option D would require the diversion of the powerlines to enable construction of the bridge without the diversion of the River Eye.

10.23 A new river bridge and new skewed railway bridge would also be required for Option D, as well as the demolition of the existing Lag Lane bridge.

10.24 The relocation of the pylons may expose potential Made Ground associated with the construction of the powerlines. However, the material excavated to move the pylons may be used to backfill (subject to environmental acceptability testing) the original pylon foundation locations.

10.25 At this stage it is considered that the amount of agricultural land loss (Subgrade 3a) would be less than that of Option C, and the same as Options B and E.

10.26 At this stage Option D is considered to have a negative moderate/low impact on geology and soils.

Option E Appraisal

10.27 Option E involves the diversion of the powerlines and realignment of the highway to enable construction of the bridge without diversion of the River Eye.

10.28 The relocation of the pylons may expose potential Made Ground associated with the construction of the powerlines. However, the material excavated to move the pylons may be used to backfill (subject to environmental acceptability testing) the original pylon locations.

10.29 Reinforced earthworks/retaining structure may be required to retain a pylon in Option E. The reinforced earthworks/retaining structure may require import of additional materials to be used in the construction of the retaining structure/earthworks. The existing tributary would require a culvert under roundabout 5.

10.30 A new skewed railway bridge would be required for Option E.

10.31 At this stage it is considered that the amount of agricultural land loss (Subgrade 3a – good quality) would be similar to that of Options B and D, and less than that of Option C.

10.32 The overall impact of Option E on soils and geology is considered to be negative moderate/low.

Summary and Conclusions

10.33 In summary, Option B would have the lowest effect on loss of subgrade 3a agricultural land as it does not require the diversion of the River Eye; but would require more materials in construction due to the change from cutting to embankment for the highway section near Thorpe Arnold. Option C is considered to have the most significant impact due to a greater loss of subgrade 3a agricultural land (circa. 0.7ha) due to the River cutting off access to some of the land to the north should this not be mitigated.

11. Materials

- 11.1 Although the different options may give rise to slightly different types and quantities of waste there are unlikely to be any significant differences between the proposed options from the waste management perspective.
- 11.2 None of the options have any direct impacts on existing or proposed waste management sites.
- 11.3 The earthworks quantities for Options C, D and E are similar, with the overall scheme quantities of cut and fill material requiring a relatively small amount of imported fill material to achieve earthworks balance.
- 11.4 Option B would provide a reduced quantity of cut material and require additional quantities of fill material due to the increased sections of embankment. This significantly impacts the earthworks balance with the import of an additional $\sim 50,000\text{m}^3$ of material required to achieve a balance. The transport of this material would cause additional impacts on air quality, traffic, noise and greenhouse gas emissions.
- 11.5 All options are of broadly comparable length, but overall Option B would require larger quantities of construction materials. Whilst the design of any Option C river diversion is very indicative at this stage, the river is not particularly large and excavated material from diversion excavations would be used as fill material or for landscaping.

12. Costs

12.1 For the purposes of this report a high level cost comparison has been prepared for each option. The cost comparison includes the key aspects directly relating to the river crossing for each option. It should be noted that the construction cost for the proposed MMDR scheme is estimated to be £60M.

Table 12.1: High level cost comparison MMDR River Crossing Options

Option A: Construction of bridge beneath powerlines – (without realignment of River Eye or diversion of powerlines)	Cost / £M
Option A is not feasible due to conflict with powerlines and has been included for comparison only	
Cost of River Eye Bridge	0.70
Cost of Demolishing existing River Eye Bridge and environmental works directly associated with reinstatement of river bank approx. 10m up/downstream	0.02
Total	0.70

Option B: Realignment of highway to enable construction of bridge – (without diversion of powerlines or diversion of River Eye);	Cost / £M
Cost of River Eye Bridge	0.70
Cost of Demolishing existing River Eye Bridge and environmental works directly associated with reinstatement of river bank approx. 10m up/downstream	0.02
Diversion of powerlines (required as insufficient clearance to earthworks) £1m-£1.5m	1.25
Additional bridge required over brook (new crossing required adjacent to village)	0.35
50,000 cu.m additional fill	1.00
Additional section of reinforced earth retaining slope adjacent to River Eye	0.10
Total	3.42

Option C: Realignment of River Eye to enable construction of bridge – (without diversion of powerlines);	Cost / £M
Cost of River Eye Bridge	0.70
Cost of Demolishing existing River Eye Bridge and environmental works directly associated with reinstatement of river bank approx. 10m up/downstream	0.02
River Diversion channel construction £100k (conservative estimate of channel diversion costs & environmental works directly associated with channel diversion)	0.10
Total	0.82

Option D: Diversion of powerlines to enable construction of bridge – (without diversion of River Eye);	Cost / £M
Cost of River Eye Bridge (additional cost due to extended length of bridge & intermediate supports required due to existing river meander)	1.75
Cost of Demolishing existing River Eye Bridge and environmental works directly associated with reinstatement of river bank approx. 10m up/downstream	0.02
Diversion of powerlines	1.25
Additional section of reinforced earth retaining slope adjacent to River Eye	0.10
Total	3.12

Option E: Diversion of powerlines and realignment of highway to enable construction of bridge – (without diversion of River Eye);	Cost / £M
Cost of River Eye Bridge	0.70
Cost of Demolishing existing River Eye Bridge and environmental works directly associated with reinstatement of river bank approx. 10m up/downstream	0.02
Diversion of powerlines	1.25
Extended or diverted culvert for brook passing beneath route at proposed roundabout	0.35
Total	2.32

Options Summary	Cost / £M
Option A: Construction of bridge beneath powerlines – (without realignment of River Eye or diversion of powerlines)	0.70
Option B: Realignment of highway to enable construction of bridge – (without diversion of powerlines or diversion of River Eye);	3.42
Option C: Realignment of River Eye to enable construction of bridge – (without diversion of powerlines);	0.82
Option D: Diversion of powerlines to enable construction of bridge – (without diversion of River Eye);	3.12
Option E: Diversion of powerlines and realignment of highway to enable construction of bridge – (without diversion of River Eye);	2.32

13. Summary and Conclusion

Option Assessment Summary

- 13.1 The proposed MMDR alignment would cross the River Eye, which is a designated SSSI and considered to be a waterbody of very high importance. Five options (Options A-E) have been explored for the alignment of the MMDR in this location to inform development of a design with the least environmental impacts.
- 13.2 Option A was discounted at an early stage as being unfeasible as it requires construction of a bridge under high voltage powerlines. The remaining four options have been assessed in terms of their impacts on the water environment (hydro-morphology and water quality), nature conservation, flood risk, cultural heritage, landscape and visual impact, air quality, noise, geology and soils and materials. Where quantitative data was available at this stage in the design process, it has been used to inform the assessment but in many cases the assessment has been qualitative in nature.
- 13.3 As part of this options appraisal, the costs for each option are also provided, which shows significant differences in the construction costs.
- 13.4 Table 13.1 summarises the findings from the environmental appraisal of the proposed Options.

Table 13.1: Option Appraisal Summary

Topic	Option B	Option C	Option D	Option E	Summary
Water Environment	<p>Potential for moderate adverse impacts during construction (with the application of good practice mitigation) by virtue of the proximity of works to the River Eye and a constrained working area.</p> <p>Potential for minor adverse impacts on the morphology of the River Eye due to the potential for new structures to encroach onto riparian habitats and disconnect natural peak flows processes, despite removal of the existing Lag Lane bridge and restoration of the river in its place.</p> <p>Potential moderate adverse impact on the tributary (which is a less sensitive watercourse than the River Eye) due to the requirement for an additional crossing of the tributary of the River Eye close to Lag Lane.</p> <p>Negligible impact from future routine highway runoff and spillage risk based on preliminary drainage design and water quality risk assessment.</p> <p>Potential for seasonal minor adverse impacts from de-icing salts in highway runoff.</p>	<p>Negligible impact during construction as the river diversion, new bridge and demolition of the existing bridge could be undertaken offline from the River Eye. This assumes good practice mitigation is applied.</p> <p>Potential for minor adverse impacts on the morphology of the River Eye due to the potential for new structures to encroach onto riparian habitats and disconnect natural peak flows processes, despite removal of the existing Lag Lane Bridge and restoration of the river in its place.</p> <p>Re-meandering itself is considered neutral, or perhaps minor beneficial if considered as priming for full restoration, which requires functional flow improvements.</p> <p>Potential moderate adverse impact due to the extension of the culvert to the tributary of the River Eye close to Lag Lane.</p> <p>Negligible impact from future routine highway runoff and spillage risk based on preliminary drainage design and water quality risk assessment.</p>	<p>Potential for moderate adverse impacts during construction with the application of good practice mitigation due to the requirement for in channel works to construct an intermediate support.</p> <p>Potential for moderate adverse impacts on the morphology of the River Eye due to the potential direct loss of river bed, increased risk of vertical and lateral scour, and new structures encroaching onto riparian habitats and disconnect natural peak flows processes, despite removal of the existing Lag Lane Bridge and restoration of the river in its place.</p> <p>Potential moderate adverse impact due to the extension of the culvert to the tributary of the River Eye close to Lag Lane.</p> <p>Negligible impact from future routine highway runoff and spillage risk based on preliminary drainage design and water quality risk assessment.</p> <p>Potential for seasonal minor adverse impacts from de-icing salts in highway runoff.</p>	<p>Potential for minor adverse impacts during construction with the application of good practice mitigation.</p> <p>Potential for minor adverse impacts on the morphology of the River Eye due to the potential for new structures to encroach onto riparian habitats and disconnect natural peak flows processes, despite removal of the existing Lag Lane Bridge and restoration of the river in its place.</p> <p>Potential moderate adverse impact due to the extension of the culvert to the tributary of the River Eye close to Lag Lane, unless it could be diverted around new roundabout and an open water channel installed to the confluence with the River Eye (which would be moderate beneficial).</p> <p>Negligible impact from future routine highway runoff and spillage risk based on preliminary drainage design and water quality risk assessment.</p> <p>Potential for seasonal minor adverse impacts from de-icing salts in highway runoff.</p>	<p>All options have the potential for adverse impacts on the River Eye during construction, but these are most significant with Option B (due to the river being on three sides of the works and the constrained location) and Option D (due to the larger bridge and construction of supports in the river). Construction impacts would be minor for Option E (as the bridge is smaller than for Options B and D and the location is less constrained) and negligible for Option C as the bridge construction (and demolition of existing bridge) can be completed offline from the river.</p> <p>Options B and D are predicted to have a moderate adverse impact on the morphology of the River Eye (large/ very large adverse effects), with Options C and E having a minor adverse impact (moderate/ larger adverse effects).</p> <p>All options would have some impact on the tributary of the River Eye, with an additional crossing in option B and culverting for all other options.</p> <p>These impacts should be considered in the context of the importance of the tributary which, while connected to the River Eye, is considerably less</p>

	Overall, large/very large adverse effects are predicted to the water environment	Potential for seasonal minor adverse impacts from de-icing salts in highway runoff. Overall, moderate/large adverse effects are predicted to the water environment.	Overall, large/very large adverse effects are predicted to the water environment	Overall, moderate/large adverse effects are predicted to the water environment.	than the river itself. The impacts are therefore unlikely to be significant in Environmental Impact Assessment terms. All options would have a negligible impact from future routine highway run off and spillage risk and potential for seasonal minor adverse impacts from de-icing salts.
Nature Conservation	Habitat loss and degradation to riparian habitats. Medium risk of disturbance from light spill, vehicle movements and pedestrians. Medium risk of wildlife mortality. High risk of severance and degradation of wildlife corridors and ecological connectivity. High risk of pollutant and sediment runoff. Overall medium adverse effect.	Direct loss of a section of the River Eye SSSI. Habitat loss and degradation to riparian habitats. Medium risk of disturbance from light spill, vehicle movements and pedestrians. Medium risk of wildlife mortality. Medium risk of severance and degradation of wildlife corridors and ecological connectivity. Medium risk of pollutant and sediment runoff. Opportunity as part of the river diversion to enhance sections of the SSSI to facilitate restoration of favourable conservation status and make the river corridor and riparian habitats more resilient to future environmental and man-made changes. Overall high/medium adverse effect in the short term but with the potential to be neutral/ minor beneficial in the longer term.	Habitat loss and degradation to riparian habitats. High risk of disturbance from light spill, vehicle movements and pedestrians. High risk of severance and degradation of wildlife corridors and ecological connectivity. High risk of pollutant and sediment runoff. Overall high adverse effect.	Habitat loss and degradation to riparian habitats. Medium risk of disturbance from light spill, vehicle movements and pedestrians. Medium risk of severance and degradation of wildlife corridors and ecological connectivity. Medium risk of pollutant and sediment runoff. Overall medium/low adverse effect.	There is likely to be significant adverse effects from all options at varying levels; however Options C would present the greatest opportunity for ecological enhancement for the restoration of the SSSI. Option D would have the highest impact on ecology.
Flood Risk	The span of the river crossing for Option B would be wider than the existing Lag Lane Bridge so is likely	The larger span bridge crossing across the diverted river section is likely to provide an improvement to	Option D requires a significantly longer bridge, potentially with intermediate piers within the	The span of the river crossing would be wider than the Lag Lane bridge, decreasing flood levels upstream and	Whilst there are differences in the way in which options would affect flood risk and compensatory

	to decrease flood levels upstream of the river crossing.	flood levels upstream and downstream of the crossing point.	watercourse. Piers would permanently alter the watercourse, but it is likely that water levels would still decrease downstream and upstream.	downstream of the crossing point.	measures employed, all options would have a low impact on flood risk and deliver some localised improvements.
	Option B would require an additional crossing of the tributary of the River Eye to the east of Thorpe Arnold.	The proposed river diversion is unlikely to adversely impact flood risk to any built-up areas since there are none located close to the diverted river section.	Overall net impact on flood risk would be low if appropriate compensatory storage is provided.	Option E requires an increased length of the tributary of the River Eye to be diverted in new culverts under roundabout 5. The existing culvert joining the tributary to the River Eye is reported to be undersized, so this could provide an improvement to flood risk in the area.	All options involve the raising of ground levels within flood zones 2 and 3, impacts of which would need to be mitigated by provision of compensatory flood storage and flood alleviation culverts.
	Overall net impact on flood risk would be low as long as mitigation measures are constructed.	Overall net impact on flood risk would be low as long as the river diversion is designed such that the flows are not restricted and appropriate compensatory storage is provided.		Overall net impact on flood risk would be low if appropriate compensatory storage is provided.	
Cultural Heritage	No designated assets nearby. Could impact former canal but with mitigation unlikely to be more than slight adverse effect.	No designated assets nearby. Could impact former canal but with mitigation unlikely to be more than slight adverse effect. Potential impact on River Eye as a heritage asset due to diversion (compared to other options) but with mitigation unlikely to be more than slight adverse effect.	No designated assets nearby. Could impact former canal but with mitigation unlikely to be more than slight adverse effect. ..	No designated assets nearby. Could impact former canal but with mitigation unlikely to be more than slight adverse effect.	Negligible difference between options. No significant effect on cultural heritage with mitigation for all Options.
Landscape and Visual Impact	Low adverse landscape effects and medium adverse visual effects. . More significant visual effects on Thorpe Arnold than Options C, D and E due to the alignment being in closer proximity to the village, and a greater length being on embankment.	Low adverse landscape effect and medium adverse visual effects. River diversion may present an opportunity for enhanced landscape planting.	Low adverse landscape effect and medium adverse visual effect.	Low adverse landscape effect and medium adverse visual effect.	Overall there is little difference in the effect of all the Options on landscape and visual. However, Option C provides the greatest opportunity for enhancing the landscape
Air Quality	Due to low baseline pollutant concentration and the distance	Air quality impact would be limited to the two properties along B676 Saxby	Similar to Option C; negative	Similar to Option C; negative	Options B would have a negligible impact on air quality due to the low

	<p>between Option B and sensitive receptors (considering the construction traffic on air quality due to the material requirement for this Option), the overall effect would be negligible</p>	<p>Road during construction with a slight increase in air quality during operation at these two properties and the River Eye SSSI. The effect would likely be negative low/negligible</p>	<p>low/negligible effect.</p>	<p>low/negligible effect.</p>	<p>baseline pollutant concentrations in the area and the new highway being located more than 200m from sensitive residential receptors and the River Eye SSSI. Although this Option would require more construction material than the other options the impact of construction traffic on air quality would be negligible due to the low baseline pollutant.</p> <p>Options C, D and E may have a greater impact on air quality during construction activities and operation although this impact is anticipated to be small and is still considered to be low negative/negligible.</p>
<p>Noise and Vibration</p>	<p>Option B is likely to have the greatest adverse noise impact at Thorpe Arnold and to a lesser extent the eastern edge of Melton Mowbray, and the least adverse impact at the two individual properties to the east of B676 Saxby Road.</p> <p>Option B would potentially result in a more significant increase in construction traffic noise on local roads, than the other options, due to the quantity of material required for its construction.</p> <p>Major/ moderate noise effects on properties in the above areas. No significant vibration effects.</p>	<p>Options C and D are likely to have the greatest adverse impact at the two individual properties to the east of B676 Saxby Road and the least adverse impact at Thorpe Arnold, and to a lesser extent the eastern edge of Melton Mowbray.</p> <p>Major/ moderate noise effects on properties in these areas. No significant vibration effects.</p>	<p>As per Option C.</p>	<p>Option E is likely to have a very similar impact to Options C and D, with the impact at Thorpe Arnold very slightly greater and the impact at the two individual properties to the east of Saxby Road very slightly less.</p> <p>Major/ moderate noise effects on properties in these areas. No significant vibration effects.</p>	<p>Impact of operational traffic noise at sensitive receptors is identical for options C and D, and likely to be very similar for Option E. Only Option B is likely to have a noticeably different effect, reducing the adverse impact at the two individual properties off the B676 Saxby Road and increasing the adverse impact at Thorpe Arnold, and to a lesser extent the eastern edge of Melton Mowbray.</p> <p>No significant vibration effects with any options.</p>

Geology and Soils	<p>The impact of Option B would be significant with an increase in imported material of approximately 50,000m³. However this Option would have the least impact on subgrade 3a agricultural soils and therefore the overall effect would be moderate adverse.</p>	<p>The amount of agricultural land loss (Subgrade 3a) would be the most significant under Option C, as it may not be possible to provide access to the agricultural land between the original and proposed river alignment. The overall effect is moderate adverse effect</p>	<p>The loss of subgrade 3a agricultural soils would be less than Option C and similar to Option B and E resulting in a moderate /low adverse effect.</p>	<p>The loss of subgrade 3a agricultural soils would be less than Option C and similar to Option B and D resulting in a moderate/low adverse effect.</p>	<p>It is anticipated that Option B would have the lowest effect on loss of subgrade 3a agricultural land as diversion of the River Eye and the power lines is not required. However, larger quantity of construction material would be required for Option B (than any other option) as there is a longer length of embankment required. Option C is considered to have the most significant impact on agricultural soils due to a greater loss of subgrade 3a agricultural land (circa. 10,000m²) due to the River cutting off access to some of the land to the north.</p>
Materials	<p>No direct impacts on existing or proposed waste management sites. However this Option would require significant quantities of additional fill material.</p>	<p>No direct impacts on existing or proposed waste management sites. There is no requirement for significant quantities of surplus fill material.</p>	<p>No direct impacts on existing or proposed waste management sites. There is no requirement for significant quantities of surplus fill material.</p>	<p>No direct impacts on existing or proposed waste management sites. There is no requirement for significant quantities of surplus fill material.</p>	<p>There are unlikely to be any significant differences between the proposed options from a waste management perspective; however Option B was shown to require significantly greater quantities of construction material than the other Options.</p>

Conclusion

13.5 The Options appraisal suggests that there are no significant differences between Options B-E in terms of cultural heritage, air quality, waste, and landscape & visual; however, the main differences were identified within nature conservation, material, water resources and to a lesser extent noise and soils. A brief description is provided below:

- **Water resources:** Options C and E performed best.
- **Nature conservation:** Option D performed the worst, Option E was the best performer while Option C was better than B.
- **Noise and Vibration:** Option B performed worst in relation to Thorpe Arnold and the edge of Melton Mowbray and performs best in relation to properties east of Saxby road. Options C and D perform worst with regard to properties east of Saxby road and best for Thorpe Arnold and east of Melton Mowbray. Option E performed similarly to Options C and D for Thorpe Arnold and better than C and D for properties east of Saxby Road.
- Option B would potentially contribute to a greater increase in construction traffic noise along local roads that would be required to transport approximately 50,000m³ of material to the site.
- **Soils:** In terms of loss of subgrade 3a agricultural soils Option C performed worst while Option D, B and E were similar. Option B performed the worst of the four Options with regard to the quantity of construction material that would be required.
- **Material:** All the proposed options are similar in terms of material requirement with the exception of Option B which would require a significant amount of additional fill material (~50,000m³).

13.6 In terms of cost, Option C is the least expensive and Option B is the most expensive. Option D is more expensive than Option C but less than Option B and more than Option E. Option E is more expensive than Option C but less than Option B.

Recommendations

13.7 Based on this assessment of the options and bearing in mind the limitations of the study as described in this report, it is recommended that either Option C or E is progressed as the preferred option for the River Eye Crossing for the proposed Melton Mowbray Distributor Road Scheme.

13.8 In order to minimise the impact of whichever Option is selected, it is important that appropriate mitigation measures are considered as part of the ongoing scheme assessment and incorporated into the final designs.

Next Steps

13.9 This report was produced as part of statutory consultation to inform the design for the proposed River Eye Crossing. The report should not be released within the public domain and should be issued to all the relevant statutory consultees.

13.10 Following submission of the report it is anticipated that a follow on meeting would be scheduled to further discuss the contents of the report and to select a preferred option that is feasible and in the best interest of the environment, in order to progress the proposed MMDR Scheme through detailed design.

References

- *AECOM (July, 2017) Melton Mowbray Distributor Road, Preliminary Sources Study Report;*
- *AECOM (May 2017) Melton Mowbray Distributor Road, Environmental Impact Assessment Scoping Report;*
- *AECOM (October 2017) Evaluation of Highway Alignment Options at River Eye, Technical Note; and*
- *Reading Agricultural Consultants Ltd (October 2017) Melton Mowbray Distributor Road, Agricultural Land Classification and Soil Resources.*
- *Melton Borough Council (2016). 2016 Air Quality Annual Status Report (ASR). In fulfilment of Part IV of the Environment Act 1995. LAQM*

