Gloucestershire COUNTY COUNCIL

Full Business Case

A40 Over Roundabout Improvements

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1 Introduction

1.1 Purpose of this Document

This document provides information to support the implementation of proposed changes at A40 Over Roundabout, located on the outskirts of Gloucester. This report is based on the preferred design option, and aims to provide the required detail as set out in the Appraisal Summary Report (ASR) for the Full Business Case.

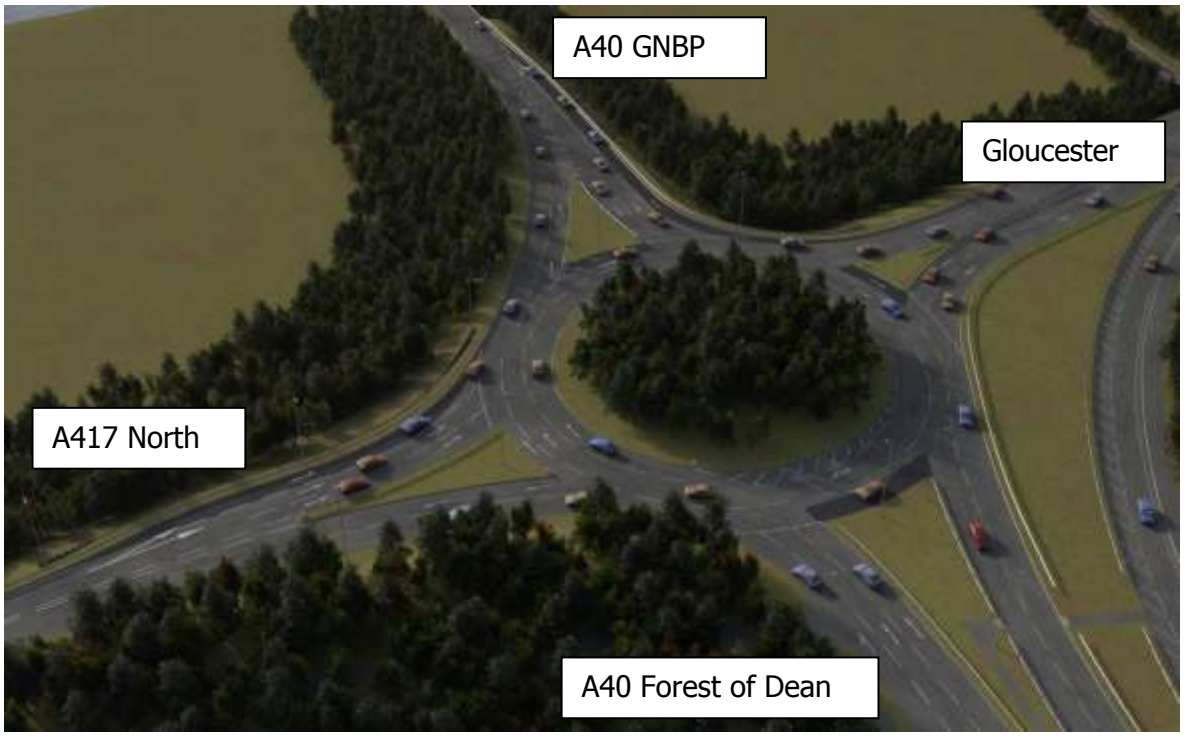

Figure 1.1: A40 Over Roundabout - proposed scheme.

1.2 Need for Proposed Changes

Amey has been requested by Gloucestershire County Council to recommend and design an improvement scheme for the A40 Over Roundabout.

Significant improvements were made to the junction in 2015 by Highways England. This was in addition to major work undertaken by Gloucestershire County Council in 2009 on the western approach, including adding the bus lane. The cost of the Highways England scheme (referred to as A40 Over Roundabout Gloucester Western Approach Widening) was circa £350,000, and was promoted by Highways England as part of their national Pinch Point schemes programme.

The scheme consisted of widening the A40 eastbound approach to three lanes to allow a dedicated right turn lane, and also widening the roundabout carriageway on the northern side. A pedestrian crossing was also re-located to a safer location and improved lighting within the vicinity of the works.

It is the view of the Amey Consulting team in Gloucester that this change has improved the capacity of the roundabout (as evidenced by surveys within this report), and specifically addressed the very long journey times from the west towards the roundabout during the AM peak.

Therefore, this new proposal builds on the past improvements and also seeks to 'future proof' the junction, given the recent improvements, strategic importance of the link and current traffic flows. The overall aim of the proposed scheme is to reduce queues and delays on the A40 'east-west' and A417 'north-south' approaches through A40 Over roundabout, thus improving vehicle journey times and addressing journey reliability problems.

The following aspects of the roundabout have been identified for improvement:

- A417 North: Widening of the southbound approach to the roundabout entry to provide three lanes at the junction stop line;
- A40 East: Widening of the westbound approach to the roundabout entry to provide three lanes at the junction stop line;
- A40 Roundabout – General: The addition of a third circulatory lane within the roundabout.

1.3 A40 Over Roundabout Study Area

The A40 Over Roundabout is located to the northwest of Gloucester and is the primary point of entry into the city for vehicles travelling from the West. The land surrounding the roundabout is mainly agricultural land, as shown in Figure 1.2 below.

Currently there are several footpaths and cycle routes which allow users to navigate the roundabout safely via dedicated cycle and pedestrian routes (however these are limited to in terms of direction).

Figure 1.2: A40 Over Roundabout Study Area

1.4 Sections of the corridor considered for the Full Business Case

Following the Strategic Outline Case (SOC) submission, Amey considered a number of different options in detail as summarised below;

- **Option 1** – signals for A40 west and A417 south arms (GCC scheme)
- **Option 2** – signals for A40 west, A40 east and A417 south.
- **Option 3** – signals for A40 west only.
- **Option 4** – signals A40 west and A40 east.
- **Option 4A** – This has the same layout as Option 4 but without the signals in place.

Options 1 to 3 were not considered further because the benefits were measured to be less than that of Option 4 and 4A. Therefore, after assessment of the results Option 4 and 4A are the two options considered for the Full Business Case.

1.4.1 Option 4

This option, with signals on the roundabout, was shown as a potential scheme in the HA sponsored Route Congestion Study, but discounted as much of its benefit was to the local road network rather than the Trunk Road. Since then, this option has been tested by Amey. The LINSIG modelling demonstrates that the signalling of the two A40 arms offer benefit, giving improved all round junction capacity of all the options tested.

With the two main A40 an arm signalled, this also has the added benefit of providing opportunity for greater control of the roundabout, (and also the possibility of controlling the signals via the Highways England Route Management system) and to maintain its operation during traffic incidents such as accidents or route diversions.

There are a number of key factors that lead to Option 4A being the preferred scheme, as opposed to the signals, summarised as follows:

- Changes recommended to the roundabout such as lane reallocations, changes to the deflection on entry and 'keep clear' boxes can be considered and implemented in the future if appropriate;
- Constraints on the adjacent network, such as Walham Viaduct and Longford roundabout that cause exit blocking eastbound on the A40 – adding signals at this time without a confirmed solution for adjacent junctions is a risk;
- Minimise delay at non-peak times - the signals would only be needed in the peaks, and therefore would either have to be turned off, or if on permanently would cause additional delays at non-peak times for vehicles;
- The non-signalised option provides a higher BCR than with the signals.

1.4.2 Option 4A

Option 4A has the same layout as Option 4 but without the signals in place. The proposed layout and a geotechnical section are shown in Figure 1.3 and 1.4 below. This would provide the benefit of the additional lanes, but remove the cost and possible uncertainty of signals at the junction. Under this option it would be proposed that the construction would allow for the signals to be added at a later date if required, therefore 'future proofing' the junction via the provision of all necessary ducting and cabling during construction. This strategy has been agreed with Highways England as appropriate.

Therefore Option 4A is the recommended scheme for implementation. The rationale for this approach is covered within this Full Business Case document.

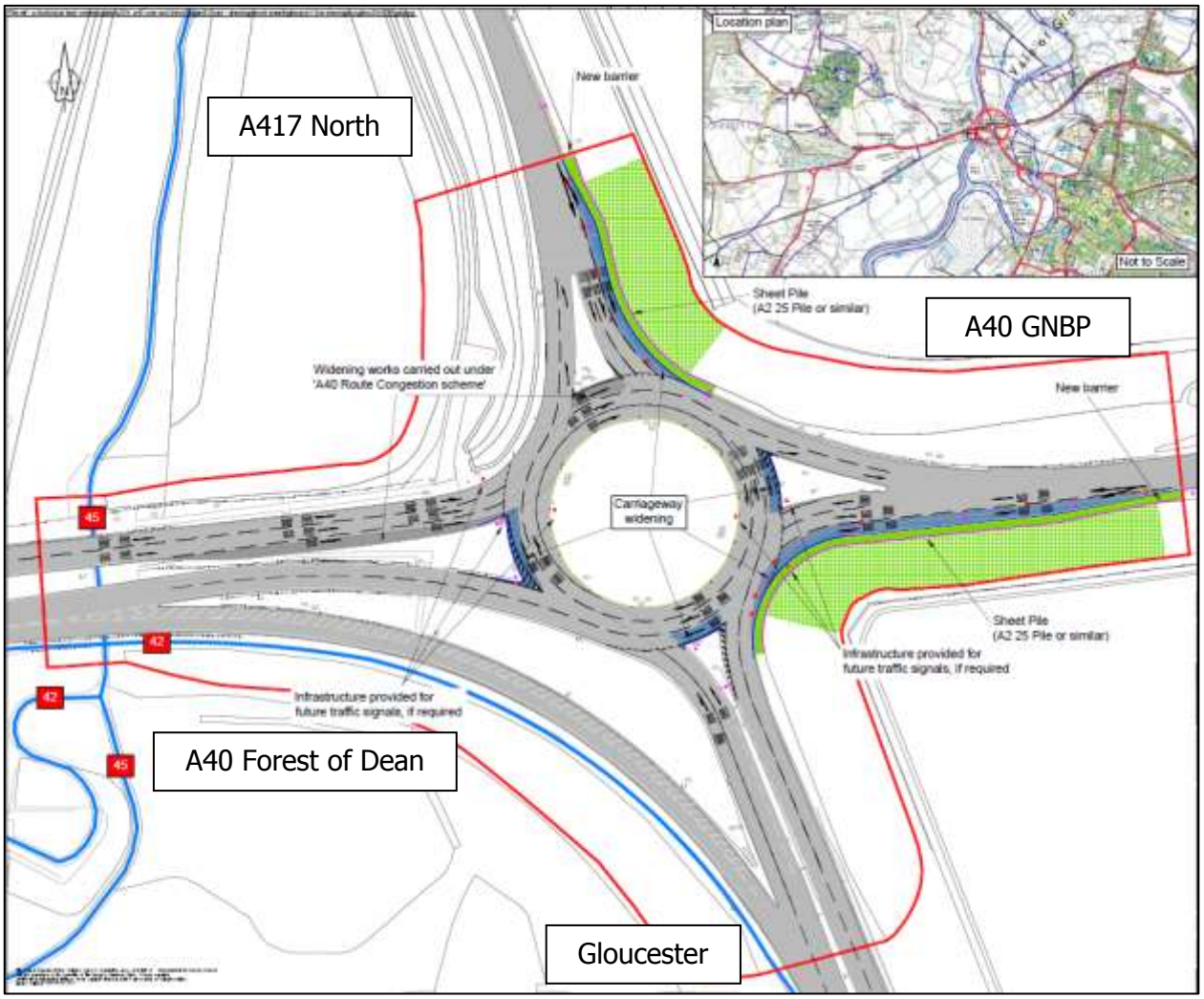

Figure 1.3: Proposed Scheme (Option 4A), Over Roundabout

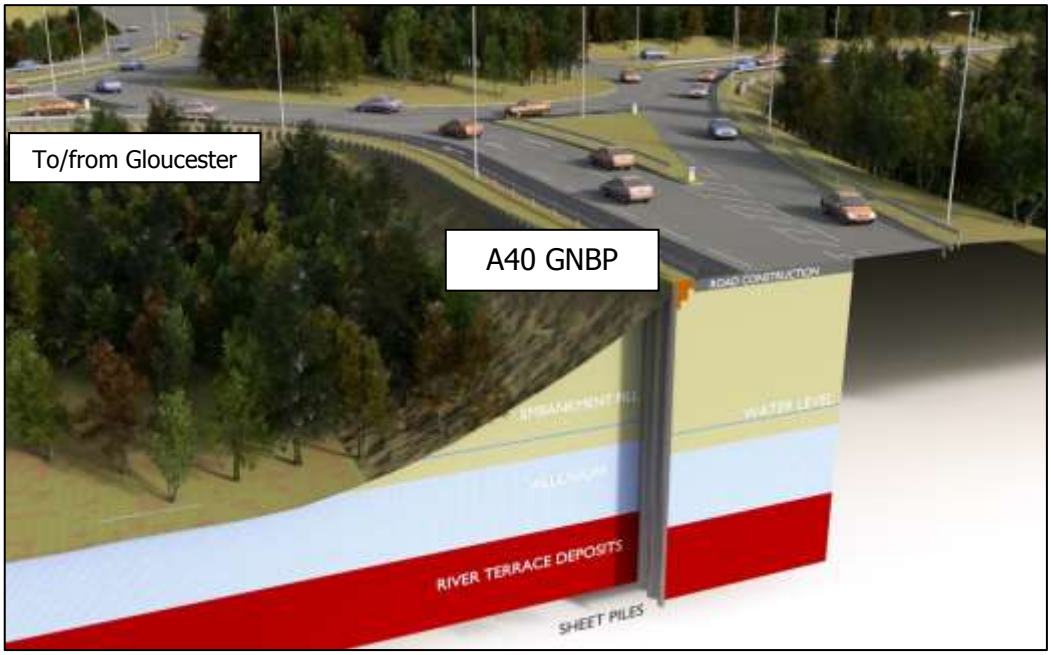

Figure 1.4: Geotechnical Section, Over Roundabout

1.5 5-Case Model

The Transport Business Case process is designed to ensure that investments are directed at the right schemes and that these are managed and delivered in the best way. This ensures that transport investment addresses important issues in an effective way, delivering value for money.

The core of each stage of the Transport Business Case is the 5-Case Model which ensures that schemes:

- Are supported by a robust **case for change** that fits with wider public policy objectives – the 'strategic case';
- Demonstrate **value for money** – the 'economic case';
- Are **commercially viable** – the 'commercial case';
- Are **financially affordable** – the 'financial case'; and
- Are **achievable** – the 'management case'.

This document uses this 5-case model in an appropriate and proportionate way to demonstrate the merit of investing in the proposed A40 Over Roundabout Improvements.

1.5.1 Context of the Transport Business Case Process

Currently promoters of all schemes involving an investment of public funds over £5m ('major schemes') are required to prepare and submit a Transport Business Case. Previously a Business Case would be submitted to the Department for Transport (DFT).

Government policy changes have involved the devolution of decision-making for smaller major schemes, below £5m, to Local Enterprise Partnerships (LEP's). These bodies are designed to direct investment for an area based on economic priorities set through a partnership which is private-sector led. GFirst is the LEP within Gloucestershire. The GFirst LEP Assurance Framework outlines the business case requirements which have been followed for this scheme.

2 The Strategic Case

2.1 Rationale for Intervention

2.1.1 Changes from the Initial Design and Scope of the Study

The overall purpose of the investment is to reduce congestion along all four arms of the A40 Over Roundabout including the A40, A417 and Over Causeway and reduce queue times at the approach to the roundabout.

The overall aim of the scheme is to reduce queues and delays on the A40 'east-west' and A417 'north-south' approaches through A40 Over roundabout, thus improving vehicle journey times and addressing reliability problems.

The initial scope of the scheme, extended west as far as Highnam and Linton Lodge, and also included the review and/or removal of lane restrictions, locally known as 'Linton Lodge hatchings'. These are located on the eastbound A40 (Highways England maintained) between the A40/A48 roundabout and the B4215 junction. The hatchings run for approximately 300m on the inside lane of the dual carriageway.

As reviewed in the Strategic Outline Case, it was established that the hatching was in existence prior to Linton Lodge being developed ,and was introduced by the HA for safety reasons. There is a need to protect vehicles queueing back from the traffic lights owing to the substandard forward visibility on the approaching bend in the vicinity of Linton Lodge. Whilst the Linton Lodge access benefits from the hatching, it is not and was never the primary reason for their installation. Therefore, due to the prevailing safety reasons regarding stopping sight distances, the proposal to review the hatching at Linton Lodge was deleted from the final scheme.

2.1.2 GCC Local Transport Plan Objectives

Gloucestershire's Local Transport Plan (LTP3) sets out the transport strategy for the county encompasses the period from 2015 to 2031. In terms of the Overarching Strategy, the scheme contributes towards all of the key objectives as summarised in Table 2.1 below from LTP3. In particular, the scheme contributes to the objective of supporting sustainable economic growth by making the network more reliable and increasing journey time reliability.

Objective	Expected Outcomes
Support sustainable economic growth	• The transport network is reliable, fit for purpose and demonstrates value for money • Increased journey time reliability • Greater economic activity • Increased footfall in retail areas • A transport network resilient to extreme weather events • A thriving tourist industry which benefits from ease of access to the county's natural, built and historic environmental assets
Enable community connectivity	• Individuals benefit from economic prosperity and social benefits • A financially sustainable passenger transport network • Reduced risk of social isolation • An integrated transport network which provides genuine transport choices • A transport network which provides individuals with the confidence to consider all travel choices
Conserve the environment	• Reduced transport derived carbon emissions • A reduction in solo car use, and an increased uptake of sustainable transport modes (walking, cycling and public transport) • Transport scheme are designed to reduce the adverse impact of transport on Gloucestershire's high quality natural, built and historic environments
Improve community health and well being	• Less car trips resulting in fewer journey delays • Improved air quality • Better safety, security and health by reducing the risk of death, injury or illness arising from transport

Table 2-1 : ***Key Objectives outline by the Local Transport Plan 2015-2031.***

2.2 Summary of Scheme Objectives and Beneficiaries

The overarching goal is to provide a free flowing link in terms of traffic approaching and travelling through the currently heavily congested A40 Roundabout. The three most important outcomes / objectives have been identified as follows:

- Reduce journey times and improve journey time reliability for all users, particularly on the two arms that will be improved (from A417 Maisemore to Over and on the westbound approach from Longford Roundabout);
- Improve local links in the area for all users, including buses;
- Provide the most direct route and quickest route for all users, reducing CO2 emissions, noise and air pollution.

Table 2-2 - Objectives and Stakeholder Benefits

	Main benefits Criteria by Stakeholder
Investment Objective 1 Reduce journey times for all users	**Users** Improving journey times for all users. Improving access to jobs and services. **Residents of Gloucester** Providing an improved transport link, with planning ahead for future development. **Local Enterprise Partnership** Maintaining attractiveness of area for domestic and non-domestic properties. Safeguarding of existing jobs and facilitation of new job creation.
Investment Objective 2 Improving local links in the area	**Users** Improving journey times. Improving access to jobs and services. Enhanced bus service with reduced delay. **Residents of Gloucester** Local Enterprise Partnership Maintaining attractiveness of area for domestic and non-domestic properties. Safeguarding of existing jobs and facilitation of new job creation.
Investment Objective 3 Providing the most direct route, reducing CO_2 emissions, noise and air pollution	**Users** Maintaining lower vehicle operating costs. Avoiding journey time increases and delays. **Local residents and businesses** Environmental stakeholders. Avoiding increase in air pollution CO2 and noise. **Local Enterprise Partnership** Maintaining attractiveness of area.

2.3 Need for the scheme

Whilst the scheme is expected to contribute to the wider economic development of the area, it is focused on improving links between surrounding areas (such as routes to the north accessed via the A417), and the Forest of Dean and Gloucester.

The A40 Over Roundabout scheme improvement will also help support the objectives for growth as set out within the preferred Gloucester-Cheltenham-Tewkesbury Joint Core Strategy (GCT-JCS). This document outlines a preferred strategy for delivering homes and key employment sites in a sustainable manner to meet future needs and foster economic growth. The A40 route provides a key gateway to and from Gloucester, Cheltenham and Tewkesbury to the west and efficient links for travel to key locations will safeguard the quality of life for residents of Gloucestershire.

The latest proposals for the JCS are currently being considered by the Housing Inspectorate. There are still uncertainties regarding the eventual future housing and employment numbers (and their location) to be formally adopted. The County Council have been working constructively with the JCS authorities to assess the transport infrastructure needed if the full JCS proposals are accepted.

Within the JCS plan area a number of strategic housing allocation sites currently under review that would have an impact on Over Roundabout, and also on the Gloucester Northern Bypass including proposed sites at Innsworth, Twigworth and south Churchdown. If these sites are formally adopted, there will be funding available for associated transport mitigation measures, which would highly likely include significant improvements to both the A40 Gloucester Northern Bypass and A40 Longford roundabout.

It is also important to consider the other restrictions on the network that impact on Over, including Walham Viaduct and Longford Roundabout to the east. The County Council are acutely aware of the limitations on junction capacity due to the single lane restriction on the Walham viaduct link section between Longford and Over roundabouts, which can often result in blocking back into Longford roundabout during the PM peak hour. It has therefore been long recognised that there is a need to bring forward a major improvement scheme for this route section between Over and Longford.

2.4 Existing Situation and Delay

All of the results from the surveys below have been taken into account for the design of the submitted scheme (Option 4A).

2.4.1 Video Surveys

A count was commissioned for September 2015 to provide information on the current traffic flows in the autumn period following the Highways England scheme completed in March 2015.

For the traffic surveys in September 2015, as well as the full classified turning count for the junction video surveys were available. The results for the two critical eastern and western arms have been analysed, with the results summarised below. Observations were also taken regarding the blocking back from the eastbound exit (towards Longford) on to the roundabout, as in recent times and before the Western Approach widening scheme (that included widening on the northern circulatory of the roundabout) this has been known to be a problem. This is as a result of the capacity at Longford, and the single lane restriction on Walham Viaduct. The key points from the observation of the videos are as follows;

2.4.2 Blocking back on to the A40 Eastbound towards Longford

The East Bound exit arm towards Longford was blocked significantly between 07.30 and 08.00AM and was blocked approximately 50% of the time during this time period. This Caused traffic queues to increase as vehicles were unable to enter the roundabout due to this congestion.

Blocking back was significantly reduced after 08.00 AM when there was no congestion to prevent vehicles from arm B (A417) entering the roundabout and traffic flow was efficient. There was no blocking back in the PM peak period.

Table 2-3: Time in minutes the A40 towards Longford was blocked

East bound towards Longford		
Time Period	**Time Blocked (Minutes)**	**%**
07.30-07.35	3.3	66%
07.35-07.40	2.3	46%
07.40-07.45	4.15	83%
07.45-07.50	1.25	25%
07.50-07.55	1.15	23%
07.55-08.00	0	0%
08.00-08.05	0	0%
08.05-08.10	0	0%
08.10-08.15	0	0%
08.15-08.20	0	0%
08.20-08.25	0	0%
08.25-08.30	0	0%
08.30-08.35	0	0%
08.35-08.40	0	0%
08.40-08.45	0	0%
08.45-08.50	0	0%
08.50-08.55	0	0%
08.55-09.00	0	0%

2.4.3 A40 approach from Longford

Lane 1 reached maximum capacity during all but one period between 08.00 and 09.00 and this is often replicated in lane 2 during the same periods. Lane 1 often causes access to lane 2 to become blocked as traffic is unable to filter into two lanes.

During the PM period this is almost completely reversed as Lane 2 reaches capacity over 50% of the time compared to lane 1 which only reached capacity once.

2.4.4 A40 approach from the Forest

During the AM periods lane 1 and 3 frequently reach full capacity.

Congestion reaches its peak between 08.00-08.30.

Lane 2 fluctuates throughout this period only reaching full capacity once.

During the PM traffic appears to reduce significantly with all lanes seeing relatively small queue lengths and reaching peak queues between 17.15 and 17.30 but never reaches full capacity.

Lane 2 in the PM has very low queue lengths often below 5 vehicles during this period.

2.5 Journey Times from the Forest of Dean (west) to Over Roundabout

2.5.1 Blue-tooth data

Since the Western Approach Widening Scheme was completed, journey time data is available to estimate the level of improvement from the west. Blue-tooth data was collated in June 2015 for the approaches to Over Roundabout. This demonstrated that the free-flow time from the Highnam Roundabout to Over is just over 2 minutes, and that during the AM peak this only reached just over three minutes and therefore a delay incurred of one minute.

Although not a straight comparison with earlier data, it does indicate that the Western Approach Widening has made a significant difference and improvement to the congestion from the west.

The two Graphs below show the Bluetooth data collected in June 2015. They show the average journey times throughout the day. The red line represents free flow conditions.

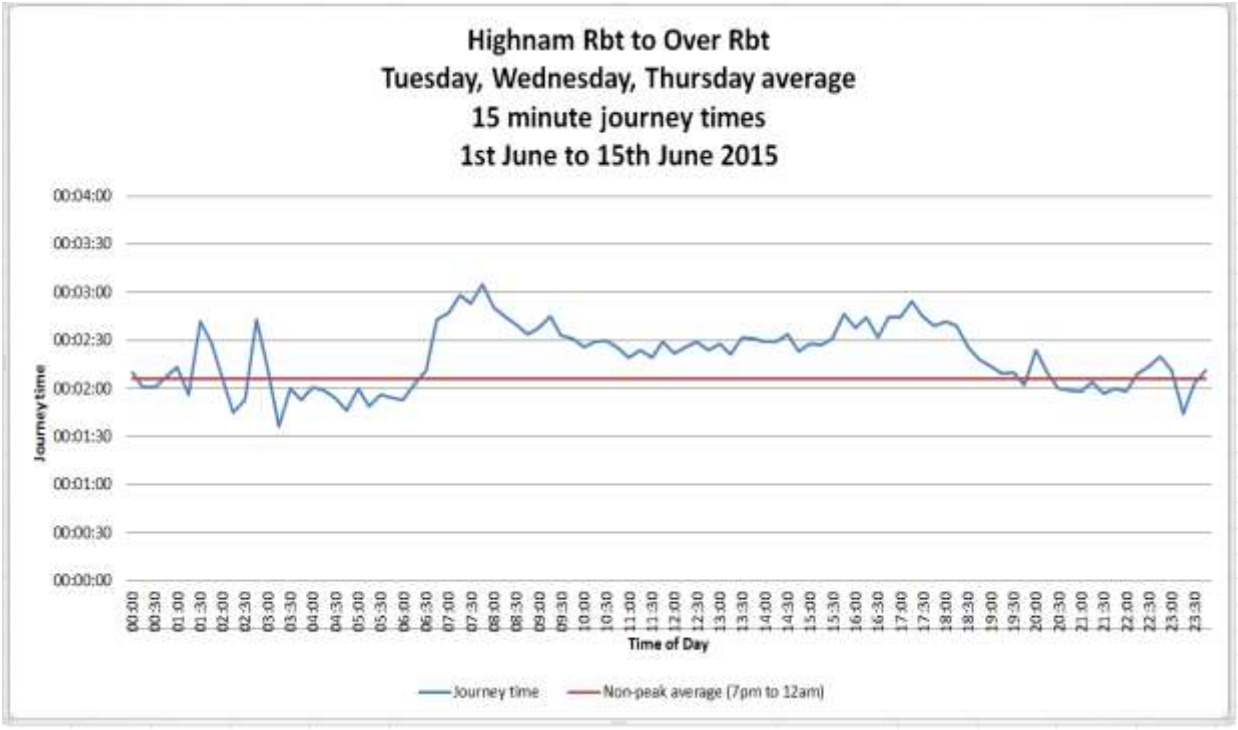

Figure 2-3: Graph shows journey times between Highnam Roundabout & Over roundabout.

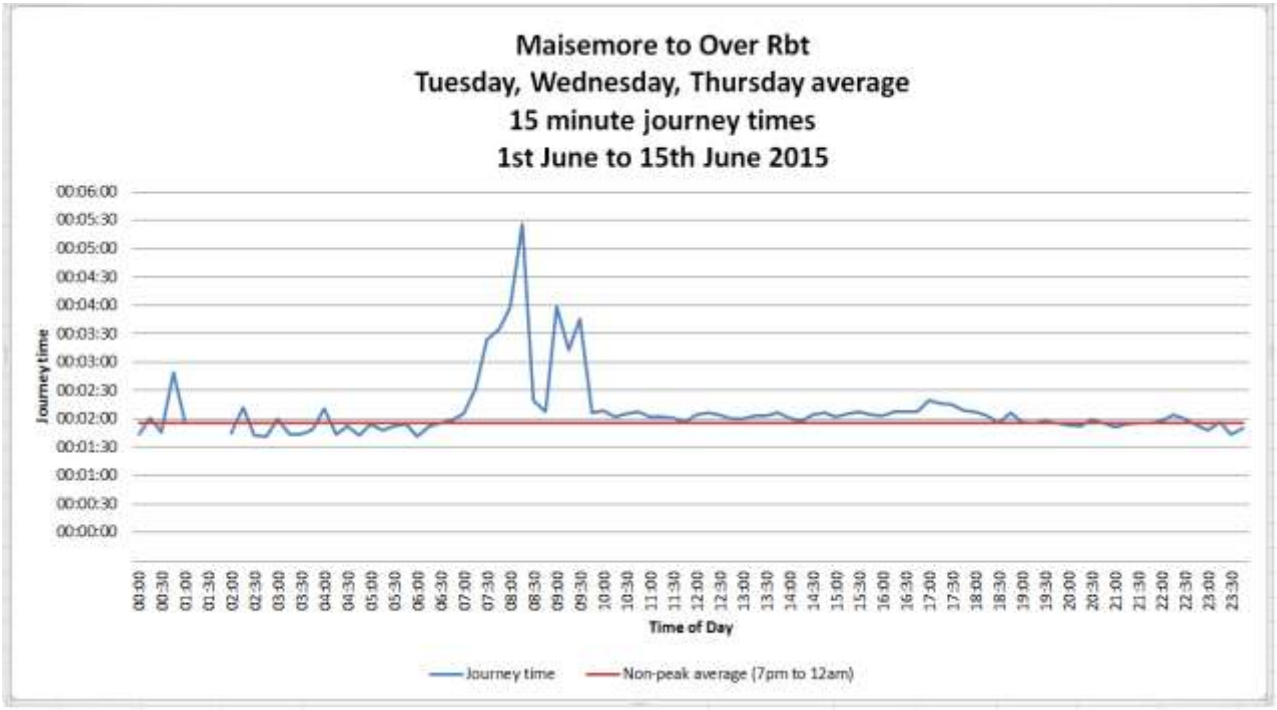

Figure 2-4: Graph shows journey times between Maisemore & Over Roundabout.

2.5.2 Journey Time Observations

In 2014 journey time information was collated locally by staff before the improvement was completed, with the results demonstrating that a delay of 30 minutes was common, with queues as far back as Minsterworth on the A48 on the Murco Garage on the A40 during the AM peak.

These results can be compared with new observations from November 2015 to compare the changes. This data helps to add to the overall picture regarding changes in journey times through the junction.

The average time from Highnam Roundabout through Over Roundabout was 14.5 minutes in 2014 for the AM peak (sample of 21 runs), with times varying between 7 and 21 minutes. A significant reduction is shown following completion of the improvement scheme, with an average time in 2015 of 6.5 minutes (sample of 8 runs), with times varying between 4 and 10 minutes.

These results add to the conclusion that the Western Approach Widening improvements have made a significant difference to the journey times from the Forest of Dean.

2.6 Capacity Assessment of Existing Roundabout

2.6.1 ARCADY Model, Existing Layout

A new ARCADY model was completed using the September 2015 observed traffic flows to assess the current level of operational capacity, and modelled queues and delays. The results are summarised in the tables below.

Table 2-4: ARCADY Summary of Existing Junction Performance, 2015 Flows

Arm	AM		PM	
	Queue	RFC	Queue	RFC
Arm 1 – A40 East	4	0.81	6	0.86
Arm 2 – A417 south	1	0.33	1	0.54
Arm 3 – A40 West	56	1.03	2	0.67
Arm 4 – A417 North	64	1.25	3	0.76

The summary of the existing junction performance shows that the A417 North arm experiences significant queueing and delay in the AM period compared to the other Arms. However the A40W arm also shows a significant increase in the AM period. This correlation is expected as increased delays and vehicle queue lengths prevent vehicles travelling east bound on the A40W from entering the roundabout, consequently increasing delays.

The model outputs also confirm that the PM period experiences comparably less congestion. The largest delays are caused on the A40E and the A417N in the PM but these are significantly lower than delays in the AM.

Tables 2.5 and 2.6 below show the assessment of the roundabout, as per the current layout, for future years of 2017 and 2041 and show the increased levels of congestion. Note that the future year traffic growth has been calculated using TEMPRO assumptions, and do not fully reflect the high level of development that would occur in the area as a result of the JCS Housing Policy and other key developments currently planned. Therefore, the traffic flows and levels of congestion, especially for 2041 are considered to be on the low side of expected conditions.

Table 2-5: ARCADY Summary of Existing Layout, 2017

Arm	AM		PM	
	Queue	RFC	Queue	RFC
Arm 1 – A40 East	4	0.81	13	0.95
Arm 2 – A417 south	1	0.33	2	0.60
Arm 3 – A40 West	68	1.04	3	0.74
Arm 4 – A417 North	69	1.34	7	0.89

Table 2-6: ARCADY Summary of Existing Layout, 2041

Arm	AM		PM	
	Queue	RFC	Queue	RFC
Arm 1 – A40 East	6	0.86	13	0.95
Arm 2 – A417 south	1	0.35	2	0.60
Arm 3 – A40 West	149	1.12	3	0.74
Arm 4 – A417 North	105	1.34	7	0.89

2.7 Scheme Breakdown

2.7.1 Part 1 of improvement

Section 1 of the scheme involves widening the capacity of the A417 towards Maismore allowing a priority lane for traffic approaching the roundabout.

The main benefits of this section of improvement will be a reduction in congestion and therefore queue time, allowing more reliable and efficient service for users travelling in this direction.

There is currently no cycle lane or pedestrian access on this section of the approach to the roundabout. However it is expected that both cycle and pedestrian's numbers will be very low on and around the roundabout due to its location and surrounding services, and anyone who does choose this route as a cyclist will be competent enough to negotiate the roundabout safely using the road.

2.7.2 Part 2 of improvement

Part 2 of the improvement includes a widening of A40 Longford crossover allowing an additional lane to allow traffic travelling towards Gloucester on the Over Causeway. This

will also reduce queue time on the approach to the roundabout which currently experiences a significant amount of delays, which is increased during peak hours. There is currently no cycle lane or pedestrian access on both of the mentioned routes A417 Maisemore and the A40 Cross over towards Longford. However it is expected that both cycle and pedestrian's numbers will be very low on and around the roundabout due to its location and surrounding services and anyone who does choose this route as a cyclist will be competent enough to negotiate the roundabout safely using the road.

2.7.3 Part 3 of Improvement

Part 3 includes increasing the capacity of the roundabout to 3 lanes around the entire roundabout. This will increase the capacity of the roundabout and allow all lanes to be in use at one time.

3 Economic Case

3.1 Introduction

An economic appraisal has been conducted in relation to this scheme, the benefits of undertaking the scheme and the disbenefits of not undertaking the works have been analysed qualitatively, along with consideration of the costs of the proposed works.

3.2 Economy

3.2.1 Business, individual users and transport providers

Substantial reduction in journey times during peak periods for all users, particularly for trips from the A417 North (Maisemore) in the AM Peak. This can be interpreted from the predicted reduction in queue lengths.

3.2.2 Reliability impacts on business users

Substantial improvement for A40 Over Roundabout, with improved links between Gloucester and surrounding areas. As seen in Figures 2.3 and 2.4 there are existing issues regarding reliability of journey times, and this will improved by the proposed scheme.

3.2.3 Regeneration

The scheme improvements will impact on areas subject to regeneration – as detailed for the Joint Core Strategy. The scheme will improve connectivity between regeneration areas in the Forest of Dean with populations and opportunities located to the east of Over.

3.2.4 Wider impacts

The scheme will form part of the wider strategy to improve the Gloucester Northern Bypass, and links to strategic links in Gloucestershire and wider afield. The scheme will impact on the Joint Core Strategy (JCS) housing and employment sites, providing wider economic benefit and potential jobs across the Country. The wider economy may also see benefit by improving the strategic highway links to the motorways and routes across the country.

3.3 Environment

3.3.1 Noise

A noise assessment (Appendix B2) was carried out to assess the potential noise effects both in terms of operation of the scheme as well as during construction of the scheme. The effects of construction noise have been assessed in terms of BS 5228-1. Road traffic noise calculations were carried out in accordance with the Calculation of Road Traffic Noise (CRTN) Manual.

The closest noise sensitive receptors (residential) are located in the village of Over, approximately 200m to the west of the scheme. The widening of the carriageway has the potential to move the noise source closer to nearby receptors. However, it is assumed that the proposed scheme does not alter the main parameters used in the calculations i.e. traffic volumes, average speed and composition of HGVs.

During construction, the closest receptors are not expected to experience significant effects if the works are to be carried out during the day however significant effects are expected if works are to be carried out during the evening or at night. As a result mitigation in the form of best practicable means is recommended and these will be provided in a Construction Environmental Management Plan.

The results show that there is no expected change in operational noise levels as a result of the widening of the Over roundabout. The Contractor should however agree appropriate mitigation measures with the local authority's Environmental Health Officer for noise generated during the construction phase of the works.

3.3.2 Air Quality

The Air Quality Assessment (Appendix B1) assessed the temporary and permanent impacts on air quality associated with the scheme. The assessment was completed in accordance with the Department for Transport TAG Unit A3 guidelines and, where appropriate, the Design Manual for Roads and Bridges (DMRB).

There are few residential and commercial receptors within 200m of the scheme. The potential adverse effects of dust soiling on people and on nearby ecological receptors are low and through the recommended site-specific mitigation measures, become

negligible. The potential adverse effects of PM_{10} on human health during construction are expected to be negligible.

The assessment report also assessed the permanent effects from associated operational vehicle movements on local ambient levels of NO_2 and PM_{10}. The predicted concentrations with and without the scheme both in the first year of operation and the future year of operation are well below the respective air quality objectives for both NO_2 and PM_{10}. The overall effects of traffic on ambient air quality have therefore been assessed as being imperceptible and as such no mitigation is deemed to be required for the operational phase of the scheme.

The overall impact of the scheme on air quality has been classed as neutral/not significant.

3.3.3 Greenhouse gases

A detailed assessment of greenhouse gas (GHG) emissions has not been carried out as none of the criteria, to determine whether the A40/A417 Roundabout is classed as an 'affected' road, are forecast to be met (see Appendix B1 for more information). GHG emissions were therefore not assessed quantitatively and a regional assessment of air quality impacts considered unnecessary.

As the primary aim of the A40 Over Improvements is to reduce congestion by improving the capacity and flow of road traffic using the roundabout the scheme will contribute to minimising greenhouse gas emissions. The vehicle kilometres travelled are not expected to change significantly as a result of the Project and optimum traffic flow and speeds are more likely to be achieved as a result of the improvement works. This is consistent with the vision and aims of the LTP3 for an environmentally and financially sustainable transport network.

3.3.4 Landscape

A qualitative review of A40 Over Roundabout and alteration with respect to the Web TAG appraisal method for landscape was undertaken (Appendix B3). The local character of the area consists of gently sloping agricultural land under grass and arable production on the edge of Gloucester. The scheme is not within a conservation area or Area of Outstanding Natural Beauty (AONB). The Cotswold AONB starts approximately

6km southeast of the scheme. It is however located on the edge of Alney Island Local Nature Reserve (LNR).

Vegetation clearance will have a negative impact on the current landscape setting although this is not likely to have a significant adverse impact. There are no Tree Preservation Orders identified on the roundabout at the A417 Over Causeway and the A40. Tree impact will depend on the construction methods and working space required, but collaboration with the arboriculture officer throughout the detailed design process and on site will ensure trees are retained where possible.

In the medium term it is expected that seeds already present in the bank will germinate and saplings will grow due to the available space. Trees/shrubs to remain will be protected during construction to retain the positive visual amenity. Although the carriageway widening will increase the feel of urbanisation throughout the highway corridor, the impact overall is expected to be slight adverse effect.

3.3.5 Townscape

A qualitative assessment of the impacts of the proposed scheme on townscape has been undertaken (Appendix B4). The scheme is not highly visible from urban areas and open spaces; the carriageway widening is therefore unlikely to have a significant adverse impact on the surrounding settings.

There is currently a busy road infrastructure in place at present which is visible to a number of visual receptors (road users). It is determined that the scheme will have a neutral effect on the local townscape. The proposed improvements will likely have no impact on the layout, scale and appearance of the surrounding built environment.

3.3.6 Heritage or historic resources

The initial environmental scoping assessment identified that two Scheduled Monuments lie within 500m of the scheme: Over Bridge (NHLE No. 1015873) representing the original alignment of the crossing over the River Severn (170m to SW of the Scheme), and Over earthwork (NHLE No. 1002092) site of a medieval moat (approx. 430m to NW). No further designated heritage assets (Listed Buildings, Registered Battlefields, Registered Parks and Gardens or Conservation Areas) lie within 500m of the Scheme. Historic England's Pastscape records five undesignated heritage assets within 500m; four relate to former crossings of the River Severn and the other

identifies the site of a late 19th century Isolation Hospital. The location of the scheme within the Severn Valley raises the potential for currently unknown archaeological remains (particularly prehistoric and Roman) to survive, however as the works are to take place within disturbed ground within the highway boundary the potential for these is considered insignificant.

No permanent impacts to historic resources are anticipated due to the location of the scheme within the existing artificial embankment. Impact would therefore be neutral and this topic has been scoped out from further assessment.

3.3.7 Biodiversity

A preliminary ecological (scoping) appraisal of the site has been carried out (Appendix B5) and is intended to record relevant habitats, including any that are formally designated for nature conservation, and to highlight the potential for legally-protected or otherwise notable species. There are no sites of international or national environmental importance that will be impacted directly or indirectly through the scheme. An ecological walkover revealed that the scheme has the potential to impact the habitats of birds (e.g. scrub, trees), bats and badgers.

Local Nature Reserve (LNR) and Key Wildlife Site (KWS) Alney Island lies directly adjacent to the scheme boundary and in order to prevent impact upon this site, no materials or liquids will be stored adjacent to the LNR and KWS, and contractors shall be made aware of its location and aware that no access to this area or storage of materials within this area is allowed without prior approval from an ecologist.

The removal of broadleaved plantation woodland is likely to have a short term minor negative impact upon birds and bats, however, the erection of bird boxes on trees not impacted by the scheme could result in a positive impact for birds. The erection of bat boxes on mature trees in the wider area of this scheme could also have a medium to long term positive impact upon bats, and where possible works will take place during the day to negate the use of artificial lighting which can negatively impact upon commuting and foraging bats.

Inactive badger setts were found within the scheme boundary. The badger sett will be re-surveyed prior to construction to ensure that it is still inactive. If the badger sett has become active a licence from Natural England will be required to disturb the sett prior

to construction. As a precaution any excavations present on site that are left overnight will have graded edges to allow any badgers (and any other mammals) that may fall in the excavation, to leave.

The required vegetation clearance will be undertaken between September and February (inclusive) to avoid the nesting bird season. If any vegetation clearance is required during the breeding season (March-August) then an inspection for active nests will be made within 48 hours prior to cutting. If an active nest is found, a buffer zone will need to be established and works delayed at this location until the chicks have fledged.

With the implementation of mitigation measures, the overall impact on the natural and urban environment has been assessed as broadly neutral.

3.3.8 Water environment / flooding

The River Severn flows either side of Over Roundabout and is approximately 150m at closest point. The Roundabout itself is within flood zone 2 (land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) in any year), but the surrounding area is within flood zone 3 (land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year).

There is no change to the drainage system in terms of the proposed outfall flow rates and locations; therefore this topic has not been assessed further. The drainage design philosophy for the scheme is to keep everything as current and store any additional flow in the system and/or through attenuation. Storm blocks and an orifice plate will be installed by the A40 Westbound to attenuate additional flow coming from the roundabout. Orifice plates will also be installed for the other two outfalls. The drainage system has been modelled to ensure the system can cope for a 30 year return period flood plus 20% climate change in line with design standard.

The Lead Local Flood Authority (GCC) and the Environment Agency should, however, be contacted to discuss any flood management actions/issues under the Flood and Water Management Act 2010. Appropriate pollution prevention measures will be implemented during works to prevent contamination to the water environment.

3.4 Social

3.4.1 Commuting and other users

Improved reliability and efficiency of the A40 Roundabout will improve journey times and encourage use and travel to Gloucester, the Forest of Dean and other surrounding areas.

3.4.2 Reliability impacts on commuting and other users

Substantial reductions in the variability of peak journey times, resulting in less "lost time" for commuters.

3.4.3 Physical activity

Pedestrian and cycle routes will remain unchanged under the proposed scheme. Therefore the physical activity impacts of the scheme are considered to be neutral.

3.4.4 Journey quality

Perception of journey quality will be improved by a smoother and predictable transit to all links on the A40 Roundabout.

3.4.5 Accidents

The existing accidents have been reviewed covering the period 2010 to 2015 covering the A40 Over roundabout and approaching links. The data suggests that between 2010 and 2015 there has been 2 serious accidents on the roundabout and around 8 "Slight" accidents which have occurred directly on the roundabout. On the two arms in which this scheme will effect there has only been 1 "slight" accident on each arm. This is expected to remain low as no change in traffic volumes is expected as a result of the scheme.

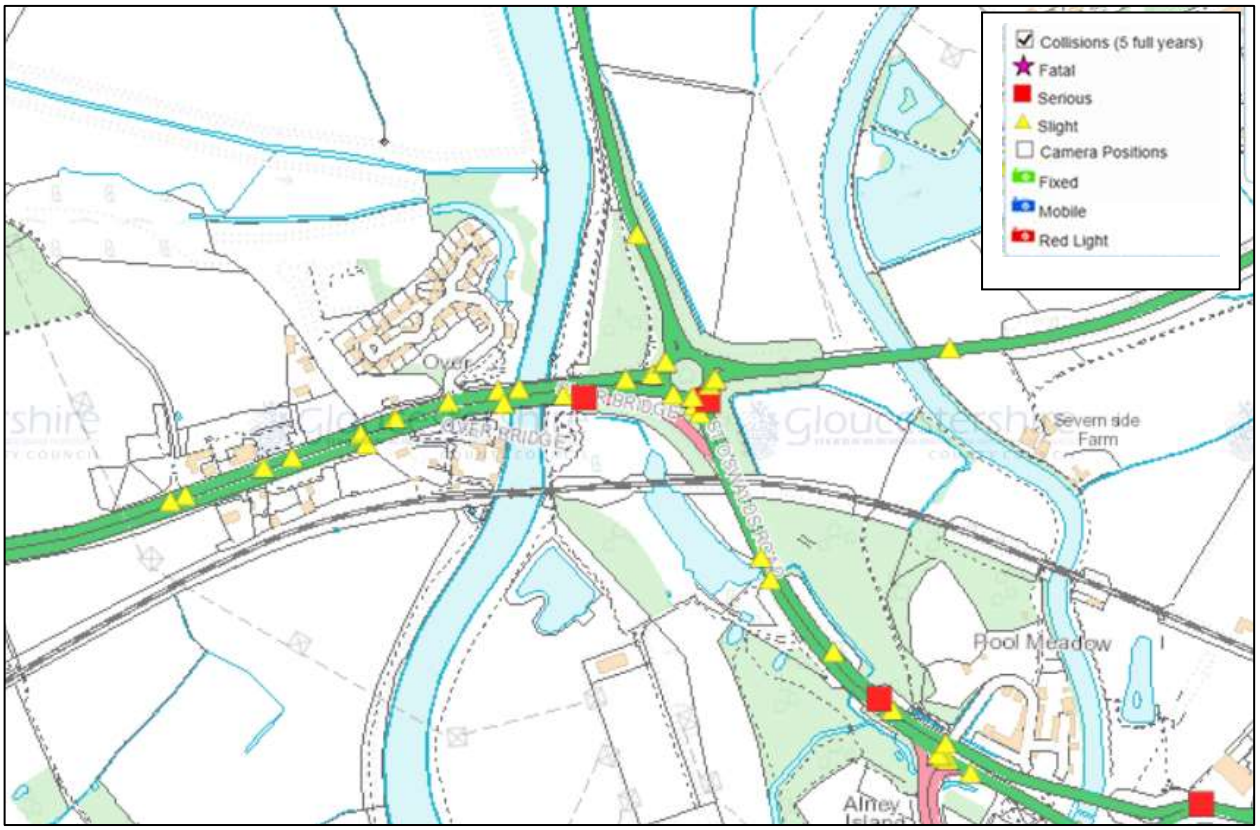

Figure 3-1: Over Roundabout Accident Data between 2010 and 2015.

4 Security

No change to security is predicted to arise due to the scheme and therefore no assessment will be completed.

4.1.1 Access to services

As there are no proposed changes in routings or timings of current public transport services, an assessment of access to services is not proposed.

4.1.2 Affordability

Affordability of the service will remain the same with no changes to service costs. The improvements in congestion around the A40 Roundabout might encourage cyclist on these routes. However due to the location of the scheme it is unlikely to be a significant increase and pedestrian number will be low.

4.1.3 Severance

Neutral impact expected.

4.1.4 Equality impacts

No Impact expected

4.2 Critical Success Factors

There are several 'Critical Success Factors' (CSF) that will determine if the scheme can be introduced satisfactorily. These CSF are essentially a combination of performance, finance and delivery assurances, as suggested in HM Treasury's 'The Green Book' and which can be assessed qualitatively and broadly aligned under the five criteria of the Business Case. The CSFs for the Over scheme are as follows:

CSF1: Strategic Fit (Strategic Case)

- Will enable housing and employment development (for example at the JCS sites) to be brought forward;
- Enables development (housing; employment) to take place, where residents or employees have access to an improved highway network;
- Improve road safety;
- Improvement in quality and reduction in travel time for all vehicles

CSF 2: Value for Money (Economic Case)

- Will maximise return on investment, striking a balance between the cost of delivery and the cost to the economy of non-delivery;

CSF 3: Achievability (Commercial Case)

- Deliverable utilising current engineering solutions;
- Limits long-term maintenance liabilities.

CSF 4: Affordability (Financial Case)

- Deliverable within the capital funding available;
- Revenue liabilities for the option are affordable within current budgets.

CRF 5: Timescale for Implementation (Management Case)

- Can be delivered within the timeframe of available funding.

4.3 Junction Modelling

4.3.1 LINSIG Modelling, Option 4

A LINSIG model has been completed using the new September 2015 flows to assess the current level of operational capacity and modelled queues and delays based on Option 4, with the signals on the roundabout for the two A40 arms.

The results from the LINSIG assessment are summarised in the tables below;

Table 3.1: Summary of LINSIG Results, 2015 Flows

Arm Description	Network Results			
	AM		PM	
	DoS%	Queue	DoS%	Queue
A40 W Ahead Left	96.4	21	92.9	13
A40 W Ahead	82.7	9	58.6	5
A417 N Ahead	45.4	2	38.0	1
A417 N Ahead	61.1	3	41.0	1
A40 E Left Ahead	88.0	9	93.0	13
A40 E Ahead	79.0	7	86.5	11
A417 S Ahead	44.2	2	58.3	4
A417 S Ahead	44.2	2	85.4	9
Network Performance (PRC)	**-7.1%**		**-3.3%**	
Total Network Delay	**45 pcu/Hr**		**38 pcu/Hr**	

Table 3.2: Summary of LINSIG Results, 2017 Flows

Arm Description	Network Results			
	AM		PM	
	DoS%	Queue	DoS%	Queue
A40 W Ahead Left	97.4	23	93.7	14
A40 W Ahead	83.5	9	59.3	5
A417 N Ahead	46.5	2	38.7	1
A417 N Ahead	62.2	3	41.8	1
A40 E Left Ahead	88.9	9	93.8	13
A40 E Ahead	79.8	7	87.2	11
A417 S Ahead	44.9	2	59.1	4
A417 S Ahead	44.9	2	86.4	9
Network Performance (PRC)	**-8.3%**		**-4.2%**	
Total Network Delay	**48 pcu/Hr**		**40 pcu/Hr**	

Table 3.3: Summary of LINSIG Results, 2041 Flows

Arm Description	Network Results			
	AM		PM	
	DoS%	Queue	DoS%	Queue
A40 W Ahead Left	111.3	71	94.0	15
A40 W Ahead	92.5	14	60.8	5
A417 N Ahead	45.7	2	43.7	2
A417 N Ahead	61.4	3	47.2	2
A40 E Left Ahead	102.1	19	93.7	14
A40 E Ahead	89.7	10	88.1	12
A417 S Ahead	48.0	2	64.6	4
A417 S Ahead	48.1	2	94.4	14
Network Performance (PRC)	**-23.7%**		**-4.9%**	
Total Network Delay	**111 pcu/Hr**		**47 pcu/Hr**	

In summary, the AM LINSIG modelling results show that A40W experiences the highest vehicle queue length.

The PM results convey a very similar pattern to the AM period showing again the A40W and the A40E to be the most congested arms for the signalised arm.

In conclusion the signalised option does reduce queue times and increase the level of service across all lanes approaching the roundabout. The AM period remains the most congested period but congestion remains relatively low and acceptable with no real major delays. The PM period suggests that congestion is less of an issue when compared to the AM, and congestion appears to be reduced significantly on all arms during this period and most significantly on arms with the highest flow rates. It does show a significant improvement compared to the Do-Nothing of leaving the roundabout as is (Table 2.5 and 2.6), where there was a modelled indicative queue of over 100 vehicles on the A40 West and A417 North arms.

4.3.2 ARCADY Model, Option 4A

The modelling for Option 4A assumes the same lane widening on the approaches to the roundabout and circulatory, but without implementing any traffic signals.

Table 3-4 below summarises the results for Option 4A using the ARCADY model.

Table 3.4: ARCADY Summary of Proposed Junction Performance, Option 4A

Arm	AM		PM	
	Queue (veh)	RFC	Queue (veh)	RFC
Arm 1 – A40 East	1	0.59	2	0.63
Arm 2 – A417 south	1	0.37	2	0.61
Arm 3 – A40 West	49	1.02	2	0.66
Arm 4 – A417 North	1	0.53	1	0.39

Table 3.5: ARCADY Option 4A 2017 Flows

Arm	AM		PM	
	Queue (veh)	RFC	Queue (veh)	RFC
Arm 1 – A40 East	2	0.60	2	0.64
Arm 2 – A417 south	1	0.37	2	0.61
Arm 3 – A40 West	61	1.04	2	0.67
Arm 4 – A417 North	1	0.54	1	0.40

Table 3-6: ARCADY Option 4A 2041 Flows

Arm	AM		PM	
	Queue (veh)	RFC	Queue (veh)	RFC
Arm 1 – A40 East	2	0.64	2	0.70
Arm 2 – A417 south	1	0.40	2	0.67
Arm 3 – A40 West	139	1.11	3	0.73
Arm 4 – A417 North	1	0.57	1	0.44

The summary results convey a significant reduction in queue lengths and traffic congestion on the entire roundabout. The most substantial improvement is evident in the AM period and most significantly congestion on the A417 N. This reduction is also replicated in the PM period.

In summary the ARCADY assessment confirms that the proposed plans for the Over Roundabout decrease congestion and increase the efficiency of the roundabout for every arm. Most considerably the congestion experienced on the A417N during the AM period which was identified in the video reviews to severely effect A40W, is predicted to reduce.

The results for 2041 can be compared to the assessment for the existing layout, as in Table 3.7 below.

Table 3-7: ARCADY 2041 Flows, Existing Layout and Proposed (Queue, Vehicles)

Arm	AM		PM	
	Existing	Proposed	Existing	Proposed
Arm 1 – A40 East	6	2	13	2
Arm 2 – A417 south	1	1	2	2
Arm 3 – A40 West	149	139	3	3
Arm 4 – A417 North	105	1	7	1

4.4 BCR Calculations

The economic assessment for the A40 Over roundabout design has been undertaken using a bespoke spreadsheet model that has been developed to compare the scheme costs and the monetary cost benefits associated with an enlarged widened roundabout. The ARCADY results above have been used as the basis for the calculations. The delay (seconds) has been calculated and inputted to the spreadsheet, demonstrating that the enlarged roundabout provides capacity benefit and reduces delay for vehicles.

The monetary cost benefits for this delay saving to drivers by journey purpose has been calculated from the TAG data book (Resource cost values, £ per hour (2010 prices) and calculated for 30 and 60 years. A 30 year and 60 year BCR value has been calculated by comparing the monetary costs calculated from the delay saving with the present value construction costs.

A Benefit to Cost Ratio (BCR) calculation has been completed for both schemes, with the results summarised as follows:

Option 4 – Full Signalisation

- 30 year BCR 10.30
- 60 year BCR 22.91

Option 4A – Roundabout Widening, no signals

- 30 year BCR 19.95
- 60 year BCR 45.76

Note that the BCR for Option 4A has been revised as a result of new cost estimates for the final scheme. The BCR for Option 4 is as per previous assessment work to compare the two schemes.

Therefore the results show that both schemes have a positive BCR, with Option 4A producing a higher BCR score. This has contributed to Option 4A being taken forward as the recommended scheme.

4.5 Appraisal Summary Table

Table 3.8: Appraisal Summary Table

Impacts		Summary of key impacts	Assessment		
			Quantitative	**Qualitative**	**Monetary £m(NPV)**
Economy	**Business users & transport providers**	Avoidance of increased costs, increased journey times, increased delay.	• 30 year BCR 19.95 • 60 year BCR 45.76	Significantly Beneficial	Value (£m) 2010 prices, discounted to 2010 **£1.8M**
	Reliability impact on Business users	Avoid increase in journey times and increase safety.	See "commuting and other users"	Significantly Beneficial	N/A
	Regeneration	Maintaining attractiveness of area for domestic and non- domestic properties. • Improving journey times. • Improving access to jobs and services. • Improving local bus service reliability. • Direct, safe route for all vehicles.	Not calculated for this scheme	Significantly Beneficial	N/A
Environmental	**Noise**	During construction, the closest receptors are not expected to experience significant effects if the works are to be carried out during the day however significant effects are expected if works are to be carried out during the evening or at night. As a result mitigation in the form of best practicable means is recommended. The results show that there is no expected change in operational noise levels as a result of the widening of the Over roundabout.	Not assessed	Neutral Impact	
	Air Quality	The potential adverse effects of dust soiling on people and on nearby ecological receptors are low and through the recommended site-specific mitigation measures, become negligible. The potential adverse effects of	Not assessed	Neutral Impact	

Impacts		Summary of key impacts	Assessment		
			Quantitative	Qualitative	Monetary £m(NPV)
		PM10 on human health during construction are expected to be negligible. The overall effects of traffic on ambient air quality have therefore been assessed as being imperceptible and as such no mitigation is deemed to be required for the operational phase of the scheme.			
	Greenhouse gases	A greenhouse gas assessment has not been carried out, but as the primary aim of the A40 Over Improvements aim to reduce congestion by improving the capacity and flow of road traffic using the roundabout the scheme will contribute to minimising greenhouse gas emissions.	Not assessed	Neutral Impact	
	Landscape	The carriageway widening will increase the feel of urbanisation throughout the highway corridor, and tree removal will open up the views. Overall the impact is expected to be a slight adverse effect.	Not quantified	Slight adverse	N/A
	Townscape	The proposed improvements will likely have no impact on the layout, scale and appearance of the surrounding built environment. It is determined that the scheme will have a neutral effect on the local townscape.	Not quantified	Neutral Impact	N/A
	Biodiversity	The implementation of mitigation measures, the overall impact on the natural and urban environment has been assessed as broadly neutral.	Not quantified	Neutral Impact	N/A
	Water Environment	The scheme is within flood zone 2 and the drainage system has been modelled to ensure the system can cope for a 30 year return period plus 20% climate change in line with design standard. There will be a neutral impact as long as mitigation measures are implemented.	Not quantified	Neutral Impact	
Social	**Commuting and Other users**	Avoidance of increased costs, increased journey times, increased delays and reduced reliability. Journey time saving primarily on the A417 (N) towards Maisemore and the A40 GNBP corridor.	Not quantified	Significantly Beneficial	N/A

Impacts		Summary of key impacts	Assessment		
			Quantitative	Qualitative	Monetary £m(NPV)
	Reliability impact on Commuting and Other users	Improved journey time reliability for all users including buses. Increase capacity of the lanes proposed by the scheme will reduce queue times and increase efficiency of the junctions.	Not quantified	Significantly Beneficial	N/A
	Physical activity	This scheme is unlikely to have a direct impact upon Physical activity.	Not quantified	Significantly Beneficial	N/A
	Journey quality	Journey times will be improved by a quicker and predictable transit through Over Roundabout.	Not quantified	Moderately Beneficial	N/A
	Accidents	Accident figures are expected to remain low due to a more organised and efficient roundabout.	Refer to Accident Data	Slightly Beneficial	N/A
	Security	No Impact expected.	Not quantified	Neutral	N/A
	Access to services	Access to services will not be affected by the proposed scheme, apart from an improved route into and Gloucester and improved access to the forest of dean and other surrounding areas.	Not quantified	Slightly Beneficial	N/A
	Affordability	Provision of LEP funds **£2.23M**, Developer S106 **£0.12M**	Developer funds have been secured	N/A	N/A
	Severance	No impact expected	Not quantified	Neutral	N/A
	Option and non-use values	Not relevant	N/A	N/A	N/A

Impacts		Summary of key impacts	Assessment		
			Quantitative	Qualitative	Monetary £m(NPV)
Public Accounts	**Cost to Broad Transport Budget**	User benefits Non-user benefits	Cost of scheme is £2.35M with £0.12M from Developer S106	Expected net overall benefit	N/A
	Indirect Tax Revenues	No Impact Expected	Not quantified	N/A	N/A

4.6 Value for Money Statement

4.6.1 VfM Category

The VfM has been prepared in accordance with the DfT's "Value for money assessment: advice note for local transport decision makers". The overall qualitative outcome is Very High. This VfM is based on the quantified BCR for the scheme of 19.95 over 30 years (i.e. Very High).

5 Commercial Case

5.1 Bus Services

There have been previous improvements to bus routes on the A40 (w) Arm from the Forest of Dean, as a result of the bus lane (starting at the Toby Carvery). Further improvements to the Over junction would benefit a large number of bus routes which operate at present. The scheme would improve bus reliability on all routes and most significantly the buses which use the A417 (N) from Maisemore. This improvement would be most significant at peak times and will encourage users to use the bus services which currently use the A40 Over Roundabout. Details of which can be seen below.

Stagecoach bus services currently operating are as follows;

23 - Gloucester - Lydney - Coleford: Half hourly at peak, hourly off peak.
24 - Gloucester - Cinderford – Coleford: Hourly at peak, 2 hourly off peak 30-hourly all .
31 - Gloucester - Cinderford – Coleford: Hourly all day.
32/132 -Gloucester - Newent - Ross or Ledbury: Half hourly at peak, hourly off peak.
33 - Gloucester to Ross – Hereford: Hourly all day,
Newent school buses - 3 journeys Gloucester - Newent / Newent – Gloucester.

Collectively, these services carry a total of 1,450,000 passengers per annum. It is important to note that other services are available, apart from those listed above.

5.2 Commercial Issues

The scheme will generate no direct income for the County Council.

5.3 Scheme Procurement

5.3.1 Procurement Options

GCC have identified three procurement options for the delivery of their LEP funded schemes. The alternative options are:

A. Full OJEU tender (Schemes greater than OJEU limit of £4,322,012)

GCC would opt for an 'open' tender, where anyone may submit a tender, or a 'restricted' tender, where a Pre-Qualification is used to whittle down the open market to a pre-determined number of tenderers. This process takes approximately one month and the first part is a 47 day minimum period for GCC to publish a contract notice on the OJEU website.

The minimum tender period is 6 weeks but could be longer for more complex schemes. Once the tenders are received they will be assessed and a preferred supplier identified. There is a mandatory 10 day 'standstill' period, during which unsuccessful tenderers may challenge the intention to award to the preferred contractor.

B. Open Tender (Schemes greater than £1M but less than OJEU limit)

GCC would opt for an 'open' tender, where anyone may submit a tender; this would include Pre-Qualification criteria which will be used to select 5 tenderers.

Schemes will be procured via ProContract and this would include prior notifications of the tender approximately 4 weeks before the formal tender. Depending upon the complexity of the scheme supplier engagement presentations will be arranged.

The minimum tender period is 6 weeks but could be longer for more complex schemes. The successful 5 tenders will be assessed and a preferred supplier identified. A 10 day 'standstill' period will be adopted, during which unsuccessful tenderers may challenge the intention to award to the preferred contractor.

C. Delivery through Amey Highways Term Maintenance Contract (HTMC) (Schemes less than £500k).

This option is strictly not procurement as the HTMC is an existing contract. The HTMC is based on a Schedule of Rates agreed at the inception of the contract. The price for each individual scheme is determined by identifying the quantities of each required item into a Bill of Quantities. Amey may price 'star' items if no rate already exists for the required item. If the scope of a specific scheme is different from the item coverage within the HTMC contract a new rate can be negotiated.

The preferred procurement route for the A40 Over Roundabout Improvements scheme is Option B Open Tender.

This option has been selected due to the estimated value of the scheme.

A detailed design has been produced for the scheme and the works are standard construction. For budget certainty the scheme will be procured on a lump sum basis as an ECC Option A contract (Lump Sum with Activity schedule).

5.4 Commercial Risk Assessment

The table below provides a summary of the identified commercial risks surrounding the scheme.

Qualitative Commercial Risk Assessment										
Scheme Commercial Risk Item	**Likelihood of Risk Arising (✓)**			**Impact Severity (✓)**			**Predicted Effect on Scheme Procurement, Delivery & Operation (✓)**			**Immediate Bearer of Risk and Suggested Mitigation**
	Low	**Medium**	**High**	**Slight**	**Moderate**	**Severe**	**Slight**	**Moderate**	**Severe**	
Scheme construction is delayed and/or costs increase. Eg from unexpected engineering difficulties.		✓				✓		✓		GCC, as scheme promoter, bears the risk. Ensure that scheme development, design, procurement and construction procedures are sufficiently robust to minimise likelihood of construction difficulties.
Ongoing maintenance costs of scheme higher than expected	✓			✓			✓			GCC, as scheme promoter, bears the risk. Ensure that scheme design, materials selection and construction procedures are sufficiently robust to minimise likelihood of maintenance issues.

Table 4-1: Scheme Commercial Risk Assessment

6 Financial Case

6.1 Project Costs

This section considers the capital costs associated with the proposed scheme investment.

6.1.1 Breakdown and Time Profile of Project Costs

Scheme Cost Breakdown and Profile						
Project Cost Components	**Capital Cost Items**	*** Cost Estimate Status (O/P/D/T)**	**Costs by year (£) Year of Estimate:**			
			2016/17	**2017/18**	**2018/19**	**2019/20**
Design & Management	Design fees, Surveys and trial holes	D	£250,000	£90,000	£80,000	£12,000
Construction including Traffic-Related Maintenance	Non-Routine Re-construction Re-Surfacing of carriageway and cycleway Signals upgrade	D	0	£560,000	£1,035,000	0
Contingency	(As appropriate)	D	£50,000	£100,000	£170,000	£3,000
Indirect Tax	Non-Recoverable VAT (if applicable)	-	-	-	-	-
Total Cost	Including Risk Adjustment Excluding optimism Bias (NB - Not Base Cost with Real Cost Adjustment)	D	**£300,000**	**£750,000**	**£1,285,000**	**£15,000**
*O = Outline estimate, P= Preliminary estimate, D = Detailed estimate, T = Tender price,						
*O = Outline estimate, P= Preliminary estimate, D = Detailed estimate, T = Tender price,						

Table 5.1: Scheme Capital Cost Breakdown and Profile

6.2 Project Funding

This section considers the capital funding requirements and commitments for the proposed scheme investment.

6.2.1 Sources of Funding

The sources of funding for the scheme are summarised below.

Scheme Funding Sources and Profile of Contributions						
		Funding Contributions by year				
Funding Source	**Fund Details**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**All Years**
Gov. / LEP (direct)	GFirst LEP	£300,000	*£750,000	*£1,180,000	0	£2,230,000
S106	Longford Housing development	0	0	£105,000	£15,000	£120,000
All Funding Sources	Total	**£300,000**	**£750,000**	**£1,285,000**	**£15,000**	**£2,350,000**

**subject to progress with the A40 Elmbridge Roundabout Scheme it may be possible to bring some of this spend forward to earlier years.*

Table 5.2: Scheme Funding Sources and Profile of Contributions.

6.2.2 Security and Earliest Availability of Funds

A Section 106 agreement dated 17th May 2013 for the Longford Housing development has secured funds of £120,000 towards improvements to the A40 Over roundabout. These funds are with GCC.

Security of Scheme funding Sources and Earliest Availability						
		Security of Funding Contribution (✓)			**Earliest Available Date for Securing Fund Contribution**	
Funding Source	**Fund Details**	**Low**	**Medium**	**High**	**Part Funding Date**	**Full Funding Date**
GLTB/LEP	LEP			✓	Dec 2016	2018/19
Private Funding	Private			✓	NA	2016/17

Table 5.3: Security and Availability of Scheme Funding Contributions

6.3 Financial Risk Management Strategy

This section examines the risks associated with the costs and financial requirements of the onsite infrastructure and engineering works. It considers the mitigation that may be needed to handle the identified risks, if they arise.

6.3.1 Risks to the Scheme Cost Estimate and Funding Strategy

Table 5.4 show the financial risks and suggested mitigation measures associated with this scheme.

Table 5.4: Scheme Financial Risk Assessment

Qualitative Financial Risk Assessment										
Scheme Financial Risk Item	**Likelihood of Risk Arising (✓)**			**Impact Severity (✓)**			**Predicted Effect on Scheme Delivery & Outcome (✓)**			**Suggested Mitigation**
	Low	**Medium**	**High**	**Slight**	**Moderate**	**Severe**	**Slight**	**Moderate**	**Severe**	
Unforeseen increase in scheme cost reduces the VfM (i.e. BCR nearer to 1.0 'low')	✓			✓			✓			Amend preferred scheme design content to reduce scheme cost and increase VfM / BCR
Earmarked / secured funds do not cover current scheme capital cost	✓				✓			✓		Amend preferred scheme design content to reduce scheme cost

6.4 Ongoing Maintenance

The scheme will include the following additional carriageway surface areas;

	Gloucester County Council Network	Highways England Network
Southbound Approach	80 m2	100 m2
Westbound Approach	85 m2	300 m2
Eastbound Approach	-	47 m2
Northbound Approach	-	79 m2
	165	526

Gloucestershire County Council

The following information is from the GCC Maintenance contract;

To cover two surface treatments and a surface course resurfacing, the cost of the ongoing maintenance is estimated as £23.20 per m2. Over a 30 year design life this would equate to £0.77p per m2 per year. The scheme will construct additional Gloucester County Council carriageway area of 165 m2.

The additional maintenance liability would therefore equate to £127.05 per year and GCC will include for this in maintenance budgets.

Highways England

The scheme will also construct additional Highways England carriageway area of 526 m2. A section 6 agreement will be put in place between Gloucestershire County Council and Highways England. This will confirm that a zero commuted sum payment, for any additional future maintenance liability for the HE resulting from these works. This has been discussed in principle and agreed with Highways England. Work to complete this agreement is being drafted and should be in place by December 2016.

7 Management Case

7.1 Overview

The Management Case outlines how the proposed scheme and its intended outcomes will be delivered successfully. It gives assurances that the scheme content, programme, resources, impacts, problems, affected groups and decision makers, will all be handled appropriately, to ensure that the scheme is ultimately successful.

7.2 Project Governance, Roles and Responsibilities

7.2.1 Project Governance

GCC have set up a clear and robust structure to provide accountability and an effectual decision making process for the management of the LEP funded schemes. Each scheme will have a designated project manager who will be an appropriately trained and experienced member of GCC staff.

A detailed breakdown of meetings (along with the attendees, scope and output of each) which make up the established governance process is set out below.

7.2.2 Project Board Meetings (PBM)

PB meetings are held monthly to discuss individual progress on each scheme and are chaired by Amey Project Managers (PMs). Attendees include representatives for different aspects of LEP management (i.e. Communication, Traffic, Risk Management, Amey design and/or construction team). Progress is also discussed in technical detail raising any issues or concerns for all to action. A progress report, minutes of meeting and an update on programme dates are provided ahead of the meeting for collation and production of the LEP progress and highlight Report.

7.2.3 LEP Progress and Highlight Report

The Progress and Highlight Reports sent by the GCC PMs comprise of the following updates; general progress, project finances, issues, risks and meeting dates. The report also identifies any areas of concern or where decisions are required by the PB meeting. An agreed version of the latest Progress and Highlight Report is issued to the PB meeting attendees during the meeting.

7.3 Project Management Structure

Gloucestershire County Council and Amey have agreed a project management structure for the project, as shown in Table 6.1 below.

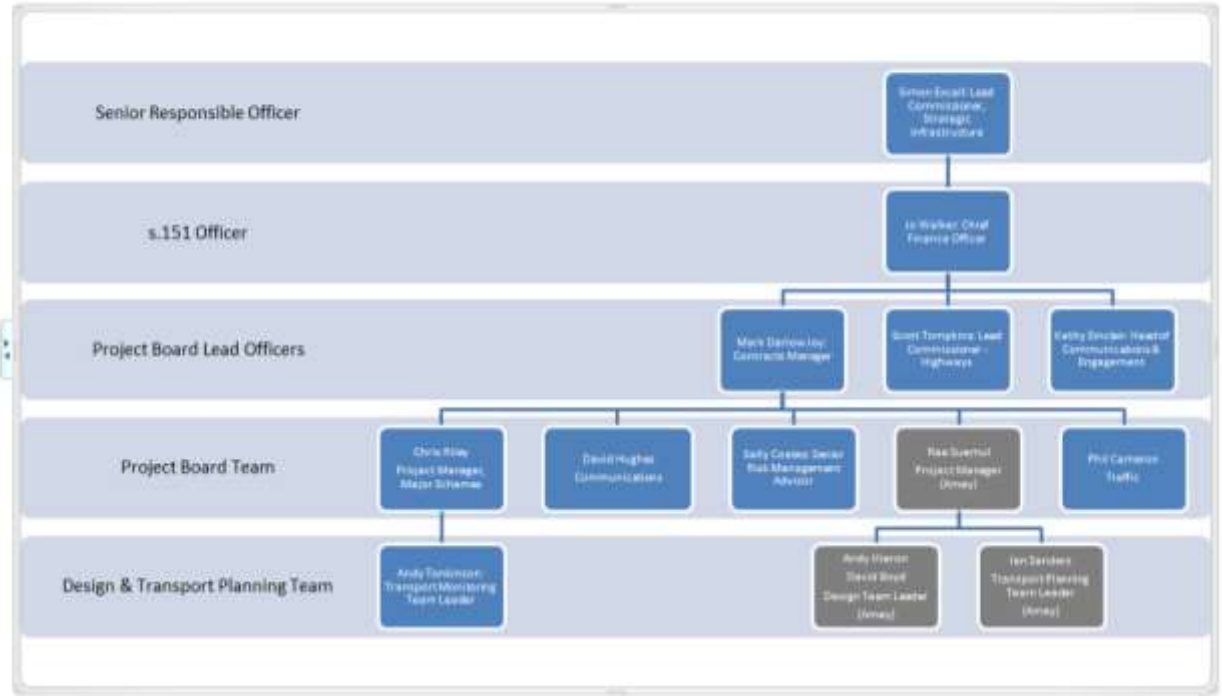

Table 6.1: Project Management Structure

A full GANTT chart showing the proposed project programme is included as an Appendix E.

7.4 Public Consultation

The key outcomes from the consultation can be summarised as below. Two public consultation events were held for the proposed A40 Over Roundabout Improvement Scheme. One was held at Hartpury Village Hall on the 20th September 2016 and the other at Highnam Community Centre on the 22nd September 2016. There were between 60-70 attendees at these events.

The overall consensus of the feedback received was positive with general support for the scheme and there were no notable objections to any of the proposed changes.

A list of key points raised are summarised below, and where possible the points will be incorporated into the final designs. The green box items will be incorporated within the design and the amber/yellow box items will be included subject to further consideration.

Suggestions and concerns raised by attendees	**How responded to and addressed**
Entering the roundabout from the A417 southbound is difficult as there are too few gaps in the traffic.	The scheme design improves this situation. Two of the three vehicle lanes will be extended, on the A417 southbound approach. This will allow more vehicles to enter the roundabout when a gap becomes available.
The lane markings and destinations on the approaches to the roundabout and the spiral markings on the roundabout are confusing and need to be amended.	In light of the comments received the existing and proposed road markings will be reviewed. The Design Team will ensure that the final road marking layout provide clearer indication to drivers on which lanes they should be using.
Improved signing is required to show lane destinations in advance of the roundabout.	The design layout will include lane destination signing positioned in advance of the junction
Entering the roundabout from the A417 southbound can be hazardous as vehicle speeds on the roundabout can be high. Vehicle speeds need to be reduced.	Design Team will review alternative options to reduce traffic speeds on the A40 eastbound approach to the roundabout. These will be discussed with Highways England and included in the scheme if acceptable.
In peak periods the traffic on the A40 is queued right across the junction and stops vehicles entering the roundabout from the A417. Can we install yellow box junction markings or Keep Clear markings.	The suggestion will be considered further. The Design Team will investigate whether the installation of road markings to keep the highway clear could be accommodated.
Cycling on the roundabout is dangerous, there are off road cycletracks near-by but they are in a poor condition. Can they be improved?	The Design Team will undertake a review of the existing off carriageway cycle facilities and consider what improvements could be included in the Over roundabout scheme subject to funding constraints.
There is a merge where 2 lanes go into 1 on the A40 eastbound exit from the roundabout. The merge is difficult and should be removed.	The layout of the merge will be reviewed by the design team and amendments will be made if appropriate. The final design will be subject to an independent Safety Audit.

Suggestions and concerns raised by attendees	How responded to and addressed
Box junction or keep clear marks where the A417 southbound joins the roundabout.	The layout of the roundabout will be reviewed by the design team and amendments will be made if appropriate. The final design will be subject to an independent Safety Audit.
The proposals don't go far enough; the scheme should include traffic signals to allow traffic to exit the A417 safely and without delay.	The installation of traffic signals has been considered and the traffic analysis showed that they may be required in the future, in order to reduce delays on the A417. To "future proof" the scheme ducting and draw pits for traffic signals will be installed as part of this scheme.
There is a greater problem along the A40 Northern Bypass due to the single carriageway between Over and Longford. Why not widen the A40?	The single carriageway does restrict exit from the roundabout where the carriageway narrows from 2 to 1 lane. The early merging on the exit discourages motorists from using 2 lanes on the roundabout. Extensive widening of the A40 would be very expensive and is not funded as a scheme.
Could the funds be spent on raising the carriageway level to stop it flooding?	Funding for the scheme comes from the GFirst LEP and is designated for Major Capital Schemes that meet specific Governmental criteria including increased connectivity and promoting growth. The funds cannot be used for any other purpose. The County Council has investigated raising the level of the road; unfortunately the potentially high cost of this scheme has meant that it has not received funding yet. But reducing flooding on the A417 still remains an objective for the County Council and will be part of their long term plans.
Can vegetation on the roundabout be removed to improve visibility and help drivers leaving the A417.	The removal of vegetation to increase visibility between approaching vehicles and those waiting can unacceptably increase vehicle speeds as drivers can see further ahead and attempt to enter the roundabout at speed.

Suggestions and concerns raised by attendees	How responded to and addressed
Could the scheme be installed before 2018	Works could start earlier but only if there are no other works on the A40 in the near vicinity, which could affect traffic. The Elmbridge roundabout scheme is due to be completed in September 2017 and the A40 Over scheme is currently programmed to follow in early 2018.

7.5 Communications and Engagement Management

GCC have a tried and tested Communication and Engagement Management Plan which is used on all major projects. Effective use of the plan has resulted in limited adverse feedback from the public and ensured successful delivery of schemes both from a project management and public relations perspective. This section will provide further information on how stakeholders are identified, how they are communicated to and the methods/ techniques used to communicate.

7.5.1 Aims and objectives

The main aim of the Communication and Engagement Plan is to ensure that stakeholders and members of the general public are kept informed throughout the development and implementation of a scheme. This can range from keeping key stakeholders updated with critical information, essential to the successful delivery of the scheme to providing information to the general public.

Table 6.3 below indicates the approach used by GCC to categorise the various scheme stakeholders.

Stakeholder Category	Stakeholder Characteristics
Beneficiary	Stakeholders who will receive some direct or indirect benefit from the scheme.
Affected	Stakeholders who are directly affected by the scheme in terms of its construction and/ or operation
Interest	Stakeholders who have some interest in the scheme, although not affected directly by its construction or operation
Statutory	Stakeholders who have a statutory interest in the scheme, its construction, operation or wider impacts
Funding	Stakeholders who are involved in the funding of the construction or operation of the scheme

Table 6.3: Stakeholder Categorisation Approach

7.5.2 Engagement Categories

The information supplied to stakeholders can vary depending on their involvement with the scheme. The following table indicates the level of engagement that the variety of stakeholders can expect in relation to this scheme.

Engagement Category	Details of Engagement Method
Intensive consultation	Stakeholders who are directly affected by the scheme and whose agreement is required in order for the scheme to progress. Consultation throughout the design and implementation.
Consultation	Stakeholders who are affected by the scheme and can contribute to the success of its design, construction or operation. Consultation at key stages
Information	Stakeholders with some interest in the scheme or its use. Information to be provided at appropriate stages

Table 6.4: Stakeholder Engagement Levels

7.6 Stakeholder Communication

Table 6.5 below summarises the strategy for managing engagement with stakeholders for the scheme. It itemises the relevant stakeholders and interests and indicates the stakeholder category with which each is associated.

The following stakeholders have been notified of the scheme and their input sought.

Name of Stakeholder / Interest Group	Stakeholder Category	Engagement and Consultation Level	Engagement Method
Highways England	Beneficiary Statutory Affected	Intensive consultation	Direct contact and regular meetings
Parish Councils	Beneficiary	Consultation	Pre-exhibition briefing
Local MPs	Interest	Consultation	Pre-exhibition briefing
Elected Members	Interest	Intensive consultation	Pre-exhibition briefing
Scheme users	Beneficiary	Consultation Information	Public Share Events
Access and rights of way groups (including Sustrans)	Interest	Consultation	
Local press	Interest	Information	Pre-exhibition briefing
Local Enterprise Partnership	Beneficiary Funding	Information	Through LGF Business Cases & progress reports

Table 6.5: Stakeholder Management Strategy and Method

- Highways England – Regular meetings have been held with the agency and their technical approval agents Skanska. Details of design development are reviewed and the scheme co-ordinated with other Highways England schemes
- Member engagement - Pre- consultation meetings have been held to discuss the scheme in detail with GCC project manager on a one to one basis. Details also provided for all online content which included a public share event literature, display boards and drawings. Feedback was positive with no suggested amendments.

- Parish Councils – Email was sent to 56 parish councils (from GCC project manager) inviting them to public share events and also providing link to online scheme resources including scheme introduction and information, public share event literature, display boards and drawings. Responses were limited however many of the parishes sent representatives to the public share events.

- Public Share Events – Events held in local venues on a drop in basis. Large scale plans and graphic together with scheme introduction, background and FAQs. The event was manned by scheme designers and engineers together with GCC project manager. Attendees offered personal tour of information available and in depth discussions about issues, concerns, improvements etc. Most attendees took the opportunity to ask questions and give their own views of the scheme.

The following stakeholders will be contacted after the scheme has been approved for funding and GCC road space booked.

Name of Stakeholder / Interest Group	Stakeholder Category	Engagement and Consultation Level	Engagement Method
Emergency Services	Statutory	Intensive consultation	Direct contact
Road Haulage Association	Interest	Consultation	Direct contact
Freight Transport Association	Interest	Consultation	Direct contact

7.7 Evidence of Previously Successful Management Strategy

GCC have a successful track record of delivering major transport schemes within the county. The most recent of which was the Walls G&G Roundabout Contract (WC&G).

The WC&G scheme, completed in October 2014, was designed to support economic development, job creation and social regeneration, improving access with high quality connections between the urban centres, transport hubs and development sites. The overall objectives of the scheme were to unlock the development potential of the area, attract inward investment and maximise job opportunities for local people. The extent of the scheme is shown on the two layout plans below.

The scheme was successfully delivered within budget and on programme through the adoption of a robust management approach. The total value of the scheme was £3.1M of which £0.5M was funded by Central Government. The scheme was procured through a full OJEU tender process.

The intended scheme outcomes are currently being monitored but the intended benefits of the scheme are anticipated to be realised.

7.8 Availability and Suitability of Resources

The scheme is intended to be delivered using a collaborative approach between GCC staff and their appointed support organisation Amey. GCC have identified appropriately trained and experienced staff that will be the responsible for the management of the scheme. The identified staff, fulfilling the GCC Project Manager and Amey Project Manager roles, has been ring-fenced to support the scheme throughout its duration, from design through scheme procurement and onto construction supervision. They will have more junior staff available to support them as required.

GCC will utilise dedicated Amey resource through an existing contract to undertake design and also provide early contractor involvement (ECI), where appropriate, to the design process to ensure best value.

7.9 Design and Construction Methodology

7.9.1 Design Methodology

The scheme design is standard detail and in accordance with current issues of:

- Gloucestershire County Council's Manual for Streets
- Design Manual for Roads and Bridges
- Local Transport Notes
- Inclusive Mobility
- Traffic Signs Manual and Traffic Signs Regulations and General Directions 2016
- Sewers for Adoption design code

7.9.2 Construction Methodology

The proposed works all involve standard construction methodology in accordance with Specification for Highway Works. The proposed works do not require special construction techniques and could be wholly carried out by conventional methods

The Contractor selected for the works will have a proven track record in carrying out similar works.

7.10 Legal Powers Required for Construction

7.10.1 Land/Access

All works are within the highways boundary and there is no requirement for land acquisition for temporary or permanent works.

The majority of the scheme work is on the Trunk Road and fall on Highways England's (HE) network. In order to undertake the works GCC are required to obtain a section 6 agreement, this allows the County Council to carry out works on the Trunk Road network. Included within the section 6 agreement is a section that details that there will be a zero commuted sum payment, for any additional future maintenance liability for the HE resulting from these works.

This has been discussed in principle and informally agreed with HE. Work to complete this agreement is being drafted and should be in place by December 2016.

7.10.2 Traffic Regulation Orders (TRO)

No permanent traffic regulation orders are required.

7.10.3 Environmental Restraints

No exceptional restraints have been identified.

7.11 Project Programme

The following milestone dates are from the schemes delivery programme, Gantt chart is included as an Appendix C;

Activity	Target Date
Submit Full Business Case for Approval	13th October 2016
Approve Full Business Case	13th December 2016
*Issue Supplier Engagement Notice	20th July 2017
Issue Tender Documents	31st August 2017
Tenders Return	12th October 2017
Complete Tender assessment and award	16th November 2017
*Construction Start	15th January 2018
Construction End	31st May 2018

*The scheme has been programmed to 4 month after anticipated completion of the Elmbridge Roundabout Improvement works. It may be possible to start the A40 Over Roundabout scheme earlier than the indicated date subject to progress of the Elmbridge scheme.

7.12 Benefit Realisation Strategy

7.12.1 Scope of the Plan

The Benefits Realisation Strategy is designed to enable benefits that are expected to be derived from the scheme to be planned for, tracked and realised.

7.12.2 Expected Benefits

The outputs and benefits are those expected to be derived from the scheme:

- Outputs – tangible effects that are funded and produced directly as a result of the scheme; and/or
- Outcomes – final impacts brought about by the scheme in the short, medium and long term.

7.12.3 Benefit Measurement Methods

To determine whether the scheme benefits are being realised, the desired outputs and outcomes have been converted into measurable indicators of scheme benefits, as set out in the table below. Benefits have been classified as 'Quantitative' (Qn) or 'Qualitative' (Ql). Quantitative benefits are those which can be measured in terms of specific numerical values on a continuous scale, whether in absolute or percentage terms, whereas qualitative benefits are measured in category-based or descriptive terms.

Ref	Benefit (Desired Output / Outcome)	Benefit Indicator	Target	Type	Specific Data Requirements	Owner
Desired Outputs						
1	Implement the junction improvements	Improved traffic flow on the highway	Reduced Queue Times as a result of the scheme	Qn	Basemap Bluetooth Data	GCC
Desired Outcomes						
2	Improvement in journey times from Maisemore to Over	Journey Time Reduction for AM Peak (2015 Base)	Reduction in vehicle journey times immediately after the scheme is implemented	Qn	BaseMap Bluetooth Data	GCC
3	Minimal accidents at Over Roundabout	Number of accidents	Reduction over 5 years	Qn	Accident Data	GCC

Table 6.6: Outputs and Outcomes - Indicators and Targets

7.12.4 Baseline Data

Baseline data for journey times are included with the Bluetooth results in the report. The traffic counts below for Over were collected in March 2016 and show the total vehicle counts, during peak hours and throughout the day.

Table 6.7: A40 West, Traffic Counts 2016

A40 West (EB)	AM Peak (Veh)	PM Peak (Veh)	12 Hour (Veh)	24 Hour (Veh)
Eastbound	1857	1146	15935	19776
Westbound	1125	2549	18939	23153

Table 6.8: Westgate Bridge Traffic Counts 2016

Westgate Bridge	AM Peak (Veh)	PM Peak (Veh)	12 Hour (Veh)	24 Hour (Veh)
Eastbound	1872	1115	15422	18644
Westbound	1326	2483	18123	21796

7.12.5 The One Year After Study

The One Year after Study will be carried out no less than one year after the completion of the scheme. It will include assessment against scheme objectives / Desired Outcomes.

7.12.6 The Five Year After Study

The Five Year after Study will follow the same format as the One Year after Study but it will be able to provide a final appraisal of the scheme that includes all benefits. The Evaluation Summary Table will be updated to include five year results. A further consultation exercise to consult on the views of stakeholders and the public is possible.

7.12.7 Actions to be undertaken for Benefit Realisation Strategy

Tracking of the scheme benefits will be a key element in understanding the success of the scheme. The scheme objectives have been used to develop the desired outputs and outcomes (Table 6.6 above). The table below links the Benefit Realisation for specific measures with responsibility. It is also important to refer to the Risk Register for specific risks and associated controls throughout the project.

Measures	Monitoring	Benefits Realisation	Responsible for Delivery
Delivery on time	Through contract management	Through contract management	Amey/Contractor/GCC
Delivery on budget	Through contract management	Through contract management	Amey/Contractor/GCC
Growth (housing, jobs)	Derived from traffic surveys and ATC data	Realisation involves other schemes, including non-transport (e.g. JCS development)	LEP
Wider economic benefits		Realisation involves other schemes, including non-transport (e.g. development)	LEP

Table 6.9: Benefits Realisation and Monitoring

7.13 Key Project Risks

A project risk register is to be maintained throughout the scheme duration.

The Construction risks will be passed to contractor during the construction. The Project Risk Register is included as Appendix D. phase.

8 Conclusions and Recommendations

8.1 Conclusions

The survey work undertaken by Amey indicates that the Highways England Western Approach Widening Works in 2015 have significantly improved congestion through the roundabout, especially for the approach from the Forest of Dean (A40 West). However, it is advised that additional improvements would provide further betterment and future-proof the junction for increased traffic flows that are anticipated due to significant development across Gloucestershire.

It is recommended that Option 4A is constructed, with the ducting and provision for the signals, leaving the possibility that the signals could be installed at a later date. The Value for money assessment for the scheme (Option 4a) is "Very High", with the quantified BCR of 19.95 over 30 years.

Future development in the local area (as proposed in the JCS Joint Core Strategy Housing site) and associated infrastructure works will in time increase the capacity of the adjacent local junctions (critically the single carriageway link over Walham Viaduct, Longford Roundabout and possible changes to the Gloucester Northern Bypass). The signals could therefore be implemented in the future, after the impact of the proposed scheme has been assessed and if the adjacent network can absorb increased traffic flows travelling through Over Roundabout.

8.2 Recommended Next Steps

Development and delivery of the scheme should be approved and scheduled for the 2017/2018 financial year.

8.3 Funding Recommendation

Due to the outcomes reported in this study, and the anticipated return on the public funded aspects of the proposal, it is advised that the scheme meets the criteria of schemes for the LEP and therefore should be approved for funding.