ATKINS

Member of the SNC-Lavalin Group

Gloucester City Plan

Transport Assessment Report

Gloucester City Council

October 2019

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1. Executive Summary

1.1. Background

Gloucester City Council appointed Atkins to provide the transport evidence base to support the draft Gloucester City Plan (GCP).

The GCP, together with the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy (JCS), the Gloucestershire Minerals and Waste Local Plans and any Neighbourhood Plans will, when adopted, comprise the statutory development plan for Gloucester up to 2031. Whilst the development plan is primarily concerned with land-use planning, it is shared project that will support the delivery the Council Plan (2017 – 2020) and other strategies and plans.

1.2. Assessment

An assessment of the GCP allocated sites and impact of the GCP on the local highway network is required to understand the impacts of the GCP. The assessment presented in this report provides a robust evidence base to assess of the transport impacts, and to identify any measures required to mitigate any significant impacts forecast to arise from the GCP.

The assessment approach has been agreed with Gloucestershire County Council, the local highway authority, and has been undertaken in two stages:

- The Stage 1 assessment utilised the 2031 Central Severn Vale (CSV) SATURN strategic highway model, which was developed on behalf of the county council, and was previously used to assess the impacts of the JCS. This model was used to assess the GCP proposals and identify which junctions needed to be considered in further detail in Stage 2; and
- The Stage 2 assessment assessed the junctions identified at Stage 1, using standalone junction capacity models to identify if the junctions were forecast to operate above capacity thresholds with the GCP, and where required, assess mitigation measures to reduce any significant impacts forecast to arise from the GCP.

1.3. Findings

Table 1-1 summarises the junctions identified at Stage 1, the findings from Stage 2, summarising which junctions require mitigation, a summary of the mitigation, and estimated costs for those schemes.

The proposed GCP mitigation schemes complement the agreed JCS mitigation package, referred to as DS7 mitigation. The DS7 mitigation includes improvements at two of the four junctions at which mitigation is proposed for the GCP. At these locations, the GCP mitigation should be considered as a short-term measure to mitigate the impact of GCP prior to the implementation of the DS7 mitigation. In summary the junctions at which GCP mitigation has been proposed are:

- **A430 / Spinnaker Road** – mitigation required for the GCP and no mitigation included in DS7 mitigation. However the Gloucestershire County Council's proposed Gloucester Southwest Bypass scheme will replace this scheme;
- **A430 / Llanthony Road** - mitigation required for the GCP and no mitigation included in DS7 mitigation. Therefore, the GCP mitigation should be considered as a permanent improvement;
- **A417 / A430 / Castle Meads Way** – mitigation required for the GCP but improvements proposed as part of DS7 mitigation to upgrade the signal controller to MOVA or SCOOT. The proposed GCP mitigation could complement the JCS mitigation scheme and is considered to provide a permanent improvement; and
- **A38 / B4008 / Cole Avenue** - mitigation required for the GCP but improvements proposed as part of DS7 mitigation to grade separate the junction. The proposed scheme for GCP mitigation, is considered to be required as an interim scheme prior to the DS7 grade separation scheme.

Table 1-1 - Summary of Findings

Junctions Identified at Stage 1	Mitigation Required	Mitigation Proposed	Estimated Costs	Interim or permanent scheme
A430/Gouda Way/Worcester Street	No	N/A	N/A	N/A
A430/A4302	No	N/A	N/A	N/A
A4031/A430/Bristol Road	No	N/A	N/A	N/A
Bristol Road/Clifton Road	No	N/A	N/A	N/A
A430/Spinnaker Road	Yes	Minor changes to permit a two lane right turn from Spinnaker Road	£68.2K	Permanent, however the county council's proposed Gloucester Southwest Bypass scheme will replace this scheme.
A430 / Llanthony Road	Yes	Minor changes to move the A430(S) stopline forward	£31.1K	Permanent - no mitigation proposed at this location as part of JCS
A417 / A430 Castle Meads Way	Yes	Minor changes to permit a two lane right turn from Castle Meads Way	£157.1K	Permanent - JCS includes mitigation, proposed scheme required prior to that but would complement the JCS mitigation
A430/Bristol Road/Goodridge Avenue	No	N/A	N/A	N/A
A38/B4008/Cole Avenue	Yes	Localised junction widening and capacity improvements, needed prior to the JCS mitigation	£265.8K	Interim - JCS includes mitigation, proposed scheme required prior to that, but would be replaced by JCS scheme (grade separation)
M5/A417 J11A (East of M5)	No	N/A	N/A	N/A
		Total Costs	**£522.2K ***	

* **Note**: £522.2K includes the A430 / Spinnaker Road city plan scheme, which will be replaced by the county council's Gloucester Southwest Bypass scheme.

Key

	Junction does not require mitigation, or proposed scheme provides appropriate mitigation for the GCP impacts
	Proposed scheme provides mitigation for the GCP impacts but further improvements needed for the junction to operate satisfactorily.
	Junction requires mitigation

2. Introduction

2.1. Background

Gloucester City Council appointed Atkins in 2017 to provide the transport evidence base to support the draft Gloucester City Plan (GCP).

2.1.1. Gloucester City Plan

The GCP, together with the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy (JCS), the Gloucestershire Minerals and Waste Local Plans and any Neighbourhood Plans will, when adopted, comprise the statutory development plan for Gloucester up to 2031. Whilst the development plan is primarily concerned with land-use planning, it is shared project that will support the delivery the Council Plan (2017 – 2020) and other strategies and plans.

Whilst the JCS identifies larger sites for housing and employment and deals with strategic issues such as major infrastructure delivery and transport, the GCP will identify additional site allocations for smaller scale growth and set out detailed policies for development and key assets will be protected, for example heritage, open spaces and sports facilities.

The GCP will deliver the JCS locally and addresses local issues and priorities. The GCP does not seek to cover strategic issues that are addressed by the JCS or the subsequent review of the JCS.

2.1.2. Joint Core Strategy

The JCS is a partnership between Gloucester City Council, Cheltenham Borough Council and Tewkesbury Borough Council. It is a strategic plan that covers a twenty-year period between 2011 and 2031, addressing cross-boundary planning matters including housing need for each of the local authorities, the need for employment land and strategic site allocations. The constrained nature of both Gloucester City and Cheltenham Borough means that it has been necessary for sites to be identified in Tewkesbury Borough to support the required levels of growth.

The JCS was formally adopted by all three local authorities in December 2017. The review has now begun and an 'Issues and Options' consultation was held between November 2018 and January 2019. This includes a focused and accelerated review of the retail and city/town centre policies which are already progressing. Further information is available on the JCS website at www.jointcorestrategy.org.

2.2. Context

A traffic and transport assessment of the GCP sites and impact of the GCP on the local highway network is required to understand the impacts of proposed site allocations in the GCP. A robust evidence base will enable an assessment of the transport impacts, and can inform sustainable approaches to transport at a plan-making level.

A similar approach has been adopted to consider other Local Plans within the JCS area, that is to use trip generation assumptions associated with the emerging local plan site allocations to identify junctions on the local highway network where impacts would be expected. Further assessment of those junctions would then be undertaken using junction capacity modelling software and, where necessary, mitigation strategies identified to reduce the impact arising from the GCP. The approach has been agreed with the Gloucestershire County Council (county council) which is the local highway authority for Gloucester.

For this assessment, the future year 2031 Central Severn Vale (CSV) SATURN strategic highway model developed on behalf of the county council was used to identify which junctions needed to be considered in further detail. The CSV SATURN model was used by the county council (the local highway authority) to test the impact of the JCS.

The JCS included developments in Gloucester in line with core strategy assumptions for 2031, with development assumptions being made prior to the approval and adoption of the JCS in 2017 in December

2017. The GCP has evolved during the time which has passed since the JCS was adopted, and an updated set of site allocation assumptions now form part of the emerging GCP. This is the context under which this assessment has been undertaken, i.e. that the JCS has been adopted and site allocations in Gloucester have been revised. The assessments therefore compare the GCP with the adopted JCS, as well as considering the GCP and what is required to ensure the GCP 'works' in transport terms.

As part of the GCP assessment, a sustainability assessment of each of the GCP site allocations has been undertaken to demonstrate the site allocations are in appropriate locations to benefit from sustainable transport modes.

2.3. Report Structure

This report outlines the modelling approach and implementation and presents the modelled impacts which allow the identification of key links and junctions. The identified junctions are modelled in more detail and with mitigation which may be required as a result of development.

The report is structured as follows:

- Section 3 – Scope of assessment;
- Section 4 – Gloucester GCP Site Allocations;
- Section 5 – Assessment Methodology;
- Section 6 – Stage 1 Assessment Results;
- Section 7 – Stage 2 Assessment Results;
- Section 8 – Sustainability Assessment;
- Section 9 – Proposed Mitigation; and
- Section 10 – Summary & Conclusions.

3. Scope of Assessments

3.1. Introduction

This section sets out the scope of the assessment of the GCP, including the assessment approach, the study area and the sustainability assessment. The scope of assessment has been agreed with the county council (the local highway authority).

3.2. Assessment Approach

The assessment of the GCP has been undertaken with four key stages:

- **Stage 1 modelling** – using the 2031 CSV SATURN model to test the impact of the GCP compared to the adopted JCS, on Gloucester's road network, and to identify locations where further assessment using local junction capacity models are required to consider the more significant impacts in greater detail. The Stage 1 modelling approach is set out in more detail in Section 5;
- **Stage 2 Junction models** – based on the findings of the Stage 1 modelling, junction capacity analysis has been undertaken at locations identified as having significant impacts compared to the adopted JCS. Additionally, locations where the GCP is forecast to result in operational issues, not necessarily significant when compared the JCS but could risk the success of the GCP if they were to be left unconsidered, have been assessed. The junction assessments have been undertaken using industry standard junction modelling software in Linsig, for signalised junctions and Junctions 9 for roundabouts or priority junctions. Inputs to the models has come from the 2031 CSV SATURN model (forecast traffic flow and turning data, signal staging assumptions) and manual measurement of key Linsig or Junctions 9 input parameters.
- **Sustainability Assessment** – a site by site assessment of sustainability in terms of sustainable transport connections to the city centre and nearby local amenities. Further information is provided in Section 8;
- **Mitigation identification** - based on the findings from the Stage 2 junction models and the sustainability assessment. Where required to ensure the impacts of the GCP are not significant, or exceed the impacts of the adopted JCS, mitigation has been considered, and budget cost estimates provided.

3.3. Study Area

The study area for the assessment is focussed on the Gloucester administrative area. At the start of the study in 2017, it was agreed with the county council (the local highway authority) which the key junctions for consideration where. These are shown in Figure 3-1, and include junctions within the central area, in the wider Gloucester area, and on strategic routes, as follows.

Central Area

1 A38/A430/A417/Tewkesbury Road
2 A430/Gouda Way/Worcester Street
3 A430/B4063/Northgate Street
4 A430/A4302
5 A430/B4073/Eastgate Street
6 A4031/A430/Bristol Road
7 Bristol Road/Clifton Road
8 A430/Spinnaker Road
9 A430/Llanthony Road
10 A417/A4301 – St Oswalds Road approach
11 A4301/A417 – Westgate Street approach
12 A417/A430 Castle Meads Way

Wider Area

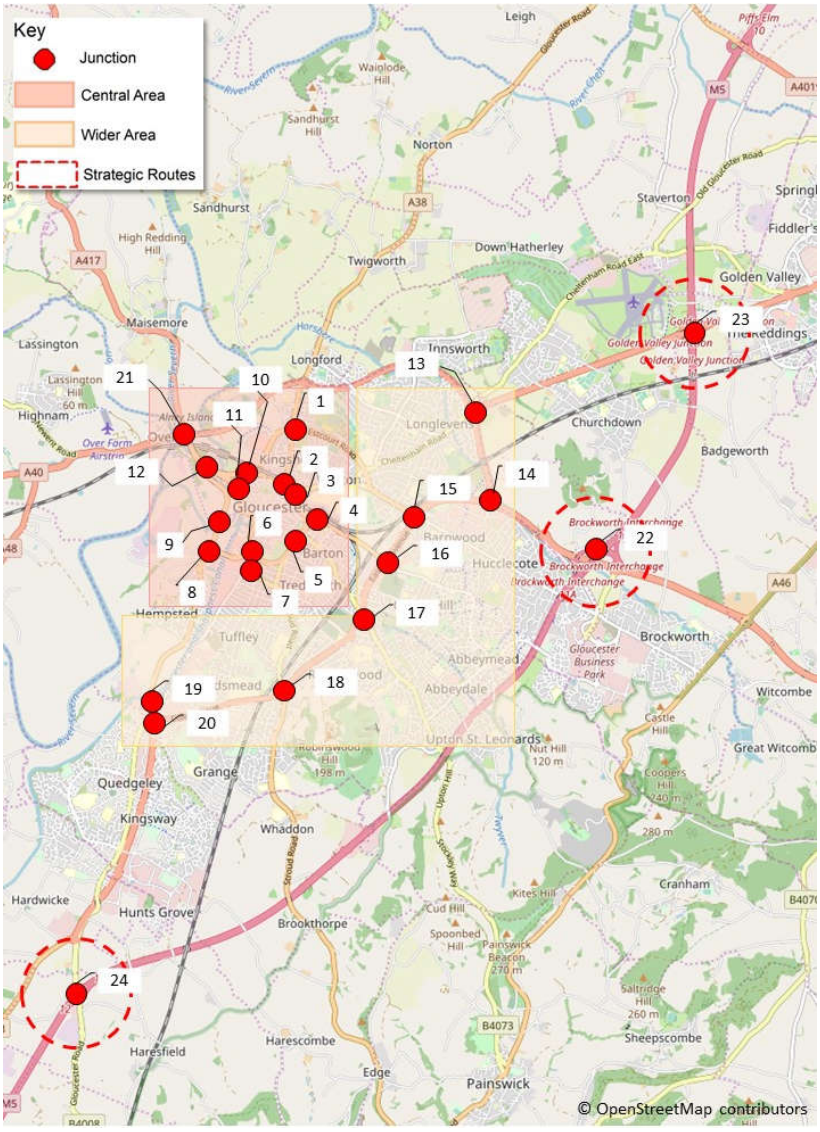
13 A40/A417/B4063
14 AA417/Corinium Avenue/Barnett Way
15 Corinium Avenue/Barnwood Road/Eastern Avenue
16 A38/A4302/Metz Way
17 A38/B4073 Painswick Road
18 A38/A4173/B4672/Reservoir Road
19 A430/Bristol Road/Goodridge Avenue
20 A38/B4008/Cole Avenue

Strategic Routes

22 A417/A417+M5 Link Road / M5 Junction 11A
23 M5/A40 Junction 11
24 M5/B4008 Junction 12

Junction 13, the A40 / A417 Elmbridge Court junction, and Junction 21, the A40 / A417 Over Roundabout junction, were removed from the assessment as they have already been the subject of significant capacity improvement schemes, completed in 2017 and 2018 respectively.

Figure 3-1 – Location of key junctions



A number of these junctions have already been identified as requiring mitigation for the JCS, and have mitigation proposed as part of the approved mitigation strategy, referred to as the Do Something 7 (DS7) scenario for the JCS. The details are set out in the JCS Transport Strategy Summary, dated May 2017 and summarised in Table 3-1.

Table 3-1 - JCS Mitigation Strategy

GCP Ref	Location	JCS Scheme Ref	JCS Scheme Description
12	A417/A430 Castle Meads Way	52	Upgrade signals to MOVA or SCOOT operation to optimise signal timings
15	Corinium Avenue/Barnwood Road/Eastern Avenue	46	Capacity Improvement on 2014 Pinch Point Scheme, by providing 3 lane circulatory on the roundabout between Barnwood Road / A38 Eastern Avenue approaches
18	A38/A4173/B4672/Reservoir Road	47	Remove roundabout and signalising junction (with removal of Reservoir Road approach arm)
20	A38/B4008/Cole Avenue	49	Grade separation to allow straight through movement of north / south traffic on A38 Southern Connector/A430 corridor
22	A417/A417+M5 Link Road / M5 Junction 11A	21	Zoons Roundabout - Junction Improvement: Removing the existing left turn slip from Delta Way (Brockworth) to C&G Roundabout, and signalising the A417 approach (from Cirencester) and the opposing roundabout circulatory movement
		5	Junction wide - Optimise junction operation with improved signing and lining and area wide reassignment
23	M5/A40 Junction 11	4	Signalise South Bound off-slip. North Bound off slip extra lane
24	M5/B4008 Junction 12	6	Upgrade to junction to include 2 lane wide off and on slips

A number of area-wide transport improvements were included in the DS7 mitigation in addition to the above junction improvements. These are summarised in Table 3-2.

Table 3-2 - JCS DS7 Area-wide Mitigation

JCS Scheme Ref	Mode	Scheme Description
54	Cycling	• Completing gaps in existing cycle networks within the Cheltenham and Gloucester urban areas and ensuring linkages into new strategic development sites – comprising a package of small cycle improvements • Improved cycle parking – at key destinations • Cheltenham to Bishops Cleeve Cycle Path
55	Public Transport	• Improved rail service frequency / stopping pattern for passenger services at Ashchurch railway station – ensuring an hourly service • Improved frequency and review bus service coverage of 41/42 and review of existing services • Improved bus service frequency on Gloucester – Cheltenham Service Route 97/ 98 via Churchdown • Mode Shift Points – built into local centres across the JCS area to provide local park and ride (including cycle park) facilities. Enhanced public transport facilities – upgraded bus stop at local community destinations which provide bike parking / RTPI / car parking – encouraging modal shift onto bus for part of the journey
56	Thinktravel	• School Travel Planning – Support for schools to encourage modal shift • Personalised Travel Planning – For new developments – tailored support to inform travel choices before established travel behaviour is established • Business Travel Planning – Support for employers to encourage modal shift • Bike training for children and adults through the travel plan process • Improved cycle information / route finding – Improved signage and promotional materials within the JCS area
57	Highway Operation	• Urban Traffic Control Centre – including full review of traffic signals including expansion of SCOOT and MOVA signals where not covered in elsewhere

In addition to the above schemes, Gloucestershire County Council have developed a scheme for the A430 known as the Gloucester Southwest Bypass scheme, which includes capacity improvements at the A430 / Spinnaker Road junction.

3.4. Sustainability Assessment

PPG 'Transport evidence bases in plan making and decision taking' identifies that access to opportunities to facilitate the use of sustainable modes of transport should be considered.

In order to assess and demonstrate that the draft site allocations are accessible by sustainable transport modes, walking and cycle isochrones, using GIS software, and public transport journey time isochrones, using TRACC software, have been produced for each site. The journey times by each mode of transport have been assessed from Gloucester City Centre and up to two other local centres to demonstrate the journey times from employment, healthcare, education and retail uses to the site allocations.

The minimum standard of provision is assumed to be that all site allocations would be accessible from the city centre and two local centres by sustainable modes. To meet the criteria the sites should be within a 20 minute bus journey of the city centre, and have at least one local amenity within a 10 minute walk or 20 minute cycle from the site. Where this is not achieved consideration has been given to the need for mitigation.

3.5. Assessment Time Periods

The GCP assessments have been undertaken based on the following time periods, in line with the CSV SATURN model used to test the JCS:

- 2031 AM Peak hour (08:00-09:00); and
- 2031 PM Peak hour (17:00-18:00).

The Sustainability Assessment has been undertaken based on current bus timetables and with walking and cycling isochrones based on current routes between sites and local centres. The bus timetable data has been assessed for the AM Peak period (06:30-09:30) and PM Peak period (16:00-19:00).

4. Gloucester City Plan Sites

4.1. Background

The GCP comprises of 22 no. allocated development sites, providing a mix of residential, employment and leisure sites required to meet the growth and quality of life ambitions for Gloucester in the current local plan period to 2031.

The adopted JCS includes growth assumptions for Gloucester, and those assumptions have been reviewed and updated as part of the development of GCP. There are some key differences between the GCP assumptions and JCS assumptions, overall providing a reduced quantum of residential and employment development in line with current market needs and in line with what is now considered appropriate for Gloucester.

The GCP and comparison with the JCS are set out in this section.

4.2. Draft GCP Site Allocations

The GCP comprises of 22 no. allocated development sites, details of which are provided in Table 4-1. The locations of the allocated sites are shown in Figure 4-1.

Figure 4-1 - GCP Site Allocations - Location Plan

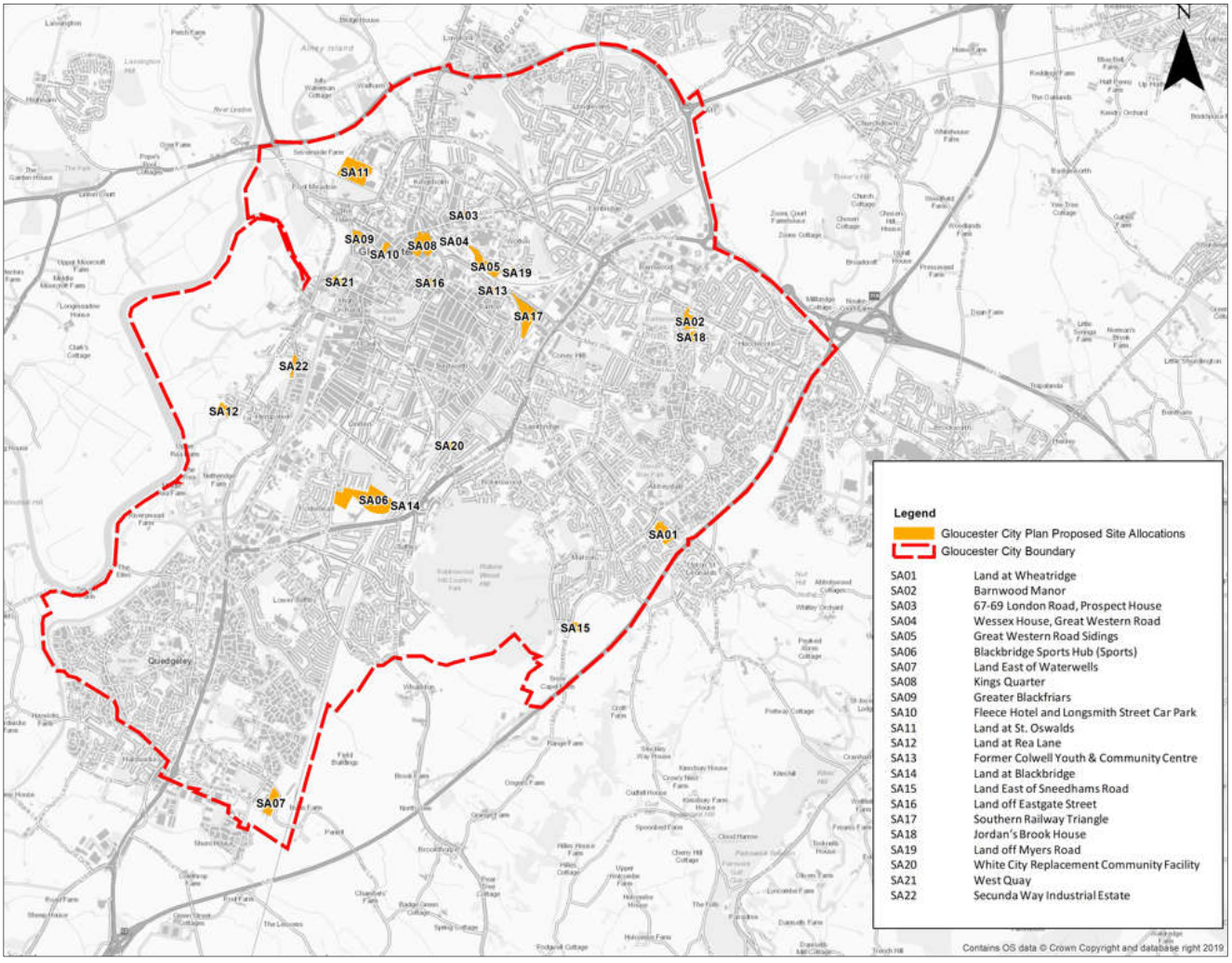


Table 4-1 - GCP Site Allocations - Details

GCP Site Ref	Site Name	Proposed Land Use	Gross site area (Ha)	Assumed no of dwellings	Assumed GFA (Ha)	Comment
SA01	Land at the Wheatridge	School or residential	2.28	10		
SA02	Land at Barnwood Manor	Residential	1.95	26		
SA03	67-69 London Road - Prospect House	Residential	0.35	30		
SA04	Wessex House, Great Western Road	Residential & possibly mixed use	0.3	20		
SA05	Great Western Road Sidings	Residential	4.3	200		
SA06	Blackbridge Sports Hub (Sports)	Sports	9.69	0	3	Assumes sports pitches, taking up 30% of the site area
SA07	Lynton Fields - part of Land East of Waterwells	Employment	2	0	2	Assumed B8 Warehousing with GFA = site area
SA08	King's Quarter	Mixed use	4.5	156		
SA09	Former Quayside House - Greater Blackfriars	Residential, medical, student use	1.58	50		
SA10	Former Fleece Hotel and Longsmith Street Carpark	Mixed use including residential	0.46	25		
SA11	Land at St Oswalds	Residential	6.44	300		
SA12	Land at Rea Lane	Residential	1.2	30		
SA13	Former Colwell Youth & Community Centre	Residential	0.18	20		
SA14	Land off New Dawn View	Residential	0.8	30		
SA15	Land South West of Winneycroft	Residential	0.86	30		
SA16	Land off Eastgate Street	Residential	0.13	15		
SA17	Southern Railway Triangle	Employment	4.22	0	1.69	Assumed B8 Warehousing, GFA = 40% of site area
SA18	Jordan's Brook House	Residential	0.85	20		
SA19	Land off Myers Road	Residential	0.36	10		
SA20	White City Replacement Community Facility	Community use	0.42	0	0.21	Assumed community

						centre, GFA= 50% of site area
SA21	Part of West Quay, the Docks	Appropriate City Centre uses, Residential, Docks uses	0.7	20		
SA22	Secunda Way Industrial Estate	Employment	0.7	0	0.7	Assumed B8 Warehousing
	Total			**992**		

4.3. Trip Generation Assumptions

4.3.1. Trip Rates

The trip rates used to assess the allocated sites have been taken from JCS SATURN modelling work to ensure consistency with previous assessments. The agreed JCS trip rates are set out in Table 4-2. Note the residential trip rates have assumed 'Edge of Town' sites as agreed with the county council (the local highway authority).

Table 4-2 - Agreed JCS Trip Rates

Land Use	Units	AM		PM	
		Departures	Arrivals	Departures	Arrivals
Mixed Private / Non-Private (Suburban Sites)	Per dwelling	0.2350	0.1110	0.1450	0.2330
Mixed private / Non- Private (Edge of Town Sites)	Per dwelling	0.3340	0.1160	0.1610	0.3260
Office	Per sqm GFA	0.0030	0.0223	0.0179	0.0030
Industrial (LV)	Per sqm GFA	0.0004	0.0026	0.0017	0.0002
Industrial (HV)	Per sqm GFA	0.0003	0.0003	0.0002	0.0001
Retail	Per sqm GFA	0.0464	0.0502	0.0653	0.0589
Warehouse	Per sqm GFA	0.0005	0.0010	0.0008	0.0002

4.3.2. GCP Trip Generation

The JCS trip rates have been applied to the proposed GCP site allocations, and the number of trips forecast to be generated during the AM and PM peaks are set out in Table 4-3 and Table 4-4 respectively.

Table 4-3 - GCP Sites Trip Generation – AM Peak

Site Ref	Allocated Site	Proposed Use	Arrival Trips	Departure Trips	Two-way Trips
SA01	Land at the Wheatridge	*Assumed residential*	1	3	**5**
SA02	Land at Barnwood Manor	Residential	3	9	**12**
SA03	67-69 London Road - Prospect House	Residential	3	10	**14**
SA04	Wessex House, Great Western Road	Residential & possibly mixed use	2	7	**9**
SA05	Great Western Road Sidings	Residential	23	67	**90**
SA06	Blackbridge Sports Hub (Sports)	Sports	2	1	**3**
SA07	Lynton Fields - part of Land East of Waterwells	Employment	20	10	**30**
SA08	King's Quarter	*Assumed residential*	22	58	**80**
SA09	Former Quayside House - Greater Blackfriars	Residential, medical, student use	7	19	**26**
SA10	Former Fleece Hotel and Longsmith Street Carpark	Mixed use including residential	4	9	**13**
SA11	Land at St Oswalds	Residential	35	100	**135**
SA12	Land at Rea Lane	Residential	3	10	**14**
SA13	Former Colwell Youth & Community Centre	Residential	2	7	**9**
SA14	Land off New Dawn View	Residential	3	10	**14**
SA15	Land South West of Winneycroft	Residential	3	10	**14**
SA16	Land off Eastgate Street	Residential	2	5	**7**
SA17	Southern Railway Triangle	Employment	17	8	**25**
SA18	Jordan's Brook House	Residential	2	7	**9**
SA19	Land off Myers Road	Residential	1	3	**5**
SA20	White City Replacement Community Facility	Community use	11	4	**15**
SA21	Part of West Quay, the Docks	*Assumed residential*	2	7	**9**
SA22	Secunda Way Industrial Estate	Employment	20	5	**25**
	Total		**188**	**369**	**557**

Table 4-4 - GCP Sites Trip Generation - PM Peak

Site Ref	Allocated Site	Proposed Use	Arrival Trips	Departure Trips	Two-way Trips
SA01	Land at the Wheatridge	*Assumed residential*	3	2	5
SA02	Land at Barnwood Manor	Residential	8	4	13
SA03	67-69 London Road - Prospect House	Residential	10	5	15
SA04	Wessex House, Great Western Road	Residential & possibly mixed use	7	3	10
SA05	Great Western Road Sidings	Residential	65	32	97
SA06	Blackbridge Sports Hub (Sports)	Sports	9	2	11
SA07	Lynton Fields - part of Land East of Waterwells	Employment	4	16	20
SA08	King's Quarter	*Assumed residential*	47	24	71
SA09	Former Quayside House - Greater Blackfriars	Residential, medical, student use	15	8	23
SA10	Former Fleece Hotel and Longsmith Street Carpark	*Assumed residential*	8	4	11
SA11	Land at St Oswalds	Residential	98	48	146
SA12	Land at Rea Lane	Residential	10	5	15
SA13	Former Colwell Youth & Community Centre	Residential	7	3	10
SA14	Land off New Dawn View	Residential	10	5	15
SA15	Land South West of Winneycroft	Residential	10	5	15
SA16	Land off Eastgate Street	Residential	5	2	7
SA17	Southern Railway Triangle	Employment	3	14	17
SA18	Jordan's Brook House	Residential	7	3	10
SA19	Land off Myers Road	Residential	3	2	5
SA20	White City Replacement Community Facility	Community use	61	13	74
SA21	Part of West Quay, the Docks	Appropriate City Centre uses, Residential, Docks uses	7	3	10
SA22	Secunda Way Industrial Estate	Employment	2	13	15
	Total		**399**	**216**	**615**

4.4. Comparison with JCS Development Assumptions

The JCS included agreed assumptions for developments during the JCS period to 2031, for Gloucester. Whilst the JCS identifies larger sites for housing and employment and deals with strategic issues such as major infrastructure delivery and transport, the GCP identifies additional site allocations for smaller scale growth and set out detailed policies for development and key assets will be protected, for example heritage, open spaces and sports facilities. The GCP will deliver the JCS locally and addresses local issues and priorities.

The JCS SATURN Model includes a detailed development log setting out all the future development assumptions. The development log has been reviewed to compare how the assumptions in the JCS model for Gloucester compare to the latest GCP allocations. The review has focused on the log of sites in Gloucester only, assuming no changes to sites in other areas in the JCS area.

The review identified the following, which is summarised in Table 4-5:

- A total of 9 no. sites which are explicitly included in both the GCP and JCS development log, most of which are residential sites. These are referred to as the 'common' sites;
- For the common sites, the GCP has 802 residential units (of its 992 total) vs 893 residential units in the JCS log (of a total of 2,074), and 2 Ha (GCP) employment vs 2.67 Ha employment (JCS);
- The most significant differences within the common sites are:
    - SA08 / Kings Quarter (residential, increase 50 to 156 units);
    - SA09 / Former Quayside House (decrease 445 to 50 units); and
    - SA12 / Land at St Oswalds (increase from 50 to 300 units);

Table 4-5 - JCS and GCP - Common Sites

GCP Site Ref	Allocated Site	Indicative capacity (dwellings) – GCP	*Indicative capacity (dwellings) – JCS Development Log*	Indicative capacity (GFA - employment) – GCP	*Indicative capacity (GFA employment) – JCS Development Log*
SA01	Land at the Wheatridge	10	*60*	-	-
SA02	Land at Barnwood Manor	26	*23*	-	-
SA03	67-69 London Road - Prospect House	30	*30*	-	-
SA05	Great Western Road Sidings	200	*200*	-	-
SA07	Lynton Fields - part of Land East of Waterwells	-	-	2.0 Ha	*2.7 Ha*
SA08	King's Quarter	156	*50*	-	-
SA09	Former Quayside House - Greater Blackfriars	50	*445*	-	-
SA11	Land at St Oswalds	300	*50*	-	-
SA12	Land at Rea Lane	30	*35*	-	-
Total		**802**	***893***	**2.0 Ha**	***2.7 Ha***

There are 11 no. additional residential site allocations and 2 no. additional employment sites in the GCP, which are not in the JCS development log. These are summarised in Table 4-6.

Table 4-6 - JCS and GCP - Additional Sites in GCP

GCP Site Ref	Allocated Site	Indicative capacity (dwellings) – GCP	*Indicative capacity (dwellings) – JCS Development Log*	Indicative capacity (GFA - employment) – GCP	*Indicative capacity (GFA employment) – JCS Development Log*
SA04	Wessex House, Great Western Road	20	-	-	-
SA06	Blackbridge Sports Hub (Sports)	-	-	-	-
SA10	Former Fleece Hotel and Longsmith Street Carpark	25	-	-	-
SA13	Former Colwell Youth & Community Centre	20			
SA14	Land off New Dawn View	30			
SA15	Land South West of Winneycroft	30			
SA16	Land off Eastgate Street	15			
SA17	Southern Railway Triangle	-	-	4.22 Ha	-
SA18	Jordan's Brook House	20			
SA19	Land off Myers Road	10			
SA20	White City Replacement Community Facility				
SA21	Part of West Quay, the Docks	20			
SA22	Secunda Way Industrial Estate			0.70 Ha	
Total		**190**	**-**	**4.92 Ha**	**-**

As shown in Table 4-6, the remaining GCP residential sites not already in the JCS CSV log total 9 no. sites, with a total of 190 dwellings and an average of 22 units at each location, with on average c10 trips generated in the peak hour by each site, using the JCS trip rates set out in Table 4-2. Being a strategic model, the CSV SATURN model does not pick up the nuances of these small developments. It is therefore appropriate to assume these sites would be covered by background growth assumptions contained in the CSV SATURN model. The trip generation associated with the 2 no. additional employment sites will be added to the JCS SATURN model matrices.

After the common sites and additional GCP sites were identified, the remaining sites in the JCS CSV log and located in Gloucester were reviewed as follows to determine whether they should continue to be included in the CSV for Gloucester in light of the GCP proposals, or removed:

- As the CSV log dates back to 2013, any sites built, started, or appear from on line mapping to be started, have been assumed to stay included in the model;
- Sites listed as being in Gloucester but which are in the Stroud district are assumed to be in the Stroud Local Plan and therefore assumed to stay included in the model, on the basis it is assumed only site allocations in Gloucester are changing; and

Sites in Gloucester not meeting the above two criteria and do not appear in the GCP, are assumed to be excluded from the model, assuming they are JCS site allocations which are now superseded by the GCP. These are summarised in Table 4-7.

Table 4-7 - JCS and GCP – Review of Remaining Sites – Sites to be Removed from JCS

JCS Site	Dwellings	Other uses	Reason for removal
104 Northgate Street	20	-	Not in GCP and development not started
Bus station / Market Parade - Part of GHURC Kings Quarter Development Site. Assumes up to 200 dwellings, 25,000m2 Non-food Retail, 500m2 Food Retail, 6,750m2 Offices, 1,100m2 A3 Bars & Restaurants.	50	Retail – GFA 1,600m^2	Not in GCP and development not started
Land East of Hempsted - Pre-application discussion or GCP submission	50	-	Not in GCP and development not started
Land South of Grange Road -Pre-application discussion or GCP submission	220	-	Not in GCP and development not started

In summary, the above changes to the JCS in the GCP have an overall impact, by land use, as shown in Table 4-8. This shows that overall the GCP will deliver 742 fewer dwellings compared to the JCS, but with nearly 5 Ha of additional employment development, the latter due to the inclusion of SA17 (Southern Railway Triangle) and SA22 (Secunda Way Industrial Estate).

Table 4-8 - Overall impact of GCP vs JCS

Proposed sites	Residential	Employment
JCS	1734 dwellings + windfall allowance (832 dwellings)	2.0 Ha
GCP	992 dwellings + windfall allowance (832 dwellings)	6.92 Ha
Impact of GCP	**-742 dwellings**	**+4.92 Ha**

5. Modelling Methodology

5.1. Basis of the Modelling

The Central Severn Vale (CSV) SATURN strategic highway model was originally developed on behalf of the county council (the local highway authority) and Highways England, and was used to support the JCS. The model covers the JCS area, including Gloucester, Cheltenham and Tewkesbury and surrounding areas.

The CSV SATURN model was developed in accordance with Department for Transport (DfT) guidelines and advice set out in the Design Manual for Roads and Bridges (DMRB) and WebTAG acceptability criteria. The LMVR for the base model states that the model is an accurate representation of base year conditions.

The JCS forecast models for Do Minimum (DM) and Do Something 7 (DS7) mitigation scenarios were provided by the county council for use in the GCP assessment. Details of the DM and DS7 scenarios are provided in Section 5.3

5.2. Overview of Approach

The modelling approach, as agreed with the city council, takes into account the JCS mitigation strategy, and recognises the assessments are high level on account of the GCP site allocations not being fully defined, meaning for example there is uncertainty around the larger employment sites in the local plan in terms of the amount of development that can take place on a given site area, and in some cases the proposed land uses are not confirmed.

The development assumptions that make up the GCP add local developments to the JCS but the quantum of development assumed in Gloucester is below that in the JCS. As a result, the mitigation strategy for the JCS should cover that required for the GCP at the locations where mitigation has been proposed as part of the JCS. However, there may be other locations within Gloucester where further mitigation could be required to mitigate the impacts of the GCP on Gloucester's local road network.

The modelling approach includes:

- Using the 2031 JCS CSV SATURN model to identify which junctions within the study area set out in Figure 3-1 require further consideration, based on a number of assessment thresholds relating to junction performance, by comparing the JCS and GCP scenarios.
- Test the identified junctions in standalone junction capacity assessment models and identify any mitigation to mitigate the impact of the GCP over the JCS, if appropriate.

The 2031 JCS SATURN model was based on 2,074 residential units for Gloucester, including allocated sites and 832 windfall units. As this number reduces with the GCP, because of a shortfall of sites, the JCS development log will be amended to reflect the current site allocation information for the GCP sites.

5.3. Reference Cases

The JCS 2031 'Do Minimum' (DM) and 'Do Something 7' (DS7) model matrices and networks have been used as the starting point for the assessments. Copies of these scenarios were made and adjusted to reflect the GCP proposals.

The 2031 JCS DM scenario incorporates:

- Committed approved JCS growth, including Strategic Allocations with planning permissions;
- TEMPRO growth for those areas outside the JCS area;
- Committed / delivered transport schemes;
- The JCS proposed Strategic Allocations;
- All unallocated Objectively Assessed Need JCS growth – which includes a windfall allowance of 832 units in Gloucester; and
- 'Do minimum' transport package (where funding has been allocated but not committed).

The 2031 JCS DS7 Scenario in addition to the DM assumptions incorporates:

- Further highway network mitigation associated with the JCS DS7 scenario, which are summarised in Table 3-1, and a 10% reduction in traffic to reflect increased mode share for more sustainable travel.

Therefore the DM and DS7 scenarios predominantly relate to differing highway and transport network assumptions.

5.4. Development Matrices

5.4.1. Review of JCS CSV Development Log

As set out in Section 4, the JCS SATURN Model development log has been reviewed to compare how the assumptions in the JCS model for Gloucester compare to the GCP allocations. The review has focused on Gloucester sites only, assuming no changes to sites in other areas.

The review identified the following:

- A total of 9 no. common sites between the GCP and JCS CSV log, mostly residential sites;
- For those common sites, the GCP has 802 residential units (of its 992 total) vs 893 residential units (of 2,074 total) in the JCS development log, and 2 Ha (GCP) employment vs 2.67 Ha employment (JCS);
- The most significant differences in the common sites are:
    - SA08 / Kings Quarter (residential, increase 50 to 156 units);
    - SA09 / Former Quayside House (decrease 445 to 50 units); and
    - SA11 / Land at St Oswalds (increase from 50 to 300 units).

There are two additional employment sites in the GCP which are not in the JCS development log. The trip generation associated with these sites will be added to the JCS model matrices:

- SA17 / Southern Railway Triangle (employment, additional site in the GCP, 4.22 Ha); and
- SA22 / Secunda Way (employment, additional site in the GCP, 0.7 Ha).

After the common sites and additional GCP sites where identified, the remaining sites in the JCS development log located in Gloucester were reviewed as follows to determine whether they should continue to be included in the SATRUN for Gloucester in light of the GCP proposals:

- As the JCS development log dates back to 2013, any sites built, started, or appear from on line mapping to be started, have been assumed to stay included in the model;
- Sites listed as being in Gloucester, but which are in the Stroud district are assumed to be in the Stroud Local Plan and therefore assumed to stay included in the model; and
- Sites in Gloucester not meeting the above two criteria and not appearing in the GCP, are assumed to be excluded from the model, assuming they are superseded by the GCP.

The remaining GCP residential sites not already in the JCS development log total 9 no. sites, with a total of 190 dwellings, and an average of 22 units at each location. It is appropriate to assume these sites would be covered by background growth assumptions, and as a result have not been explicitly modelled in the GCP model scenarios.

5.4.2. Changes to the JCS SATURN models to reflect GCP

The JCS SATURN models have been adapted to represent the GCP development sites for the GCP model scenarios. Table 5-1 summarises the changes made to represent the GCP, comprising:

- Sites where no change was assumed,
- Sites where the change was assumed to be covered by background growth; and
- Sites where the JCS CSV SATURN model zones representing the development were amended to reflect GCP, including sites removed from the model.

No new zones were added to the model. Where adjustments were made to the trip generation of a particular zone, the previous trip distribution assumptions within the JCS model were retained.

Table 5-1 - Changes to the JCS SATURN Models to Reflect GCP

GCP Site Ref	Site	Modelling assumption	Changes made from (In JCS)	Changes made to (in GCP)
SA01	Land at the Wheatridge	Assume GCP as per JCS – No change	-	-
SA02	Land at Barnwood Manor	Assume GCP as per JCS – No change	-	-
SA03	67-69 London Road - Prospect House	Assume GCP as per JCS – No change	-	-
SA04	Wessex House, Great Western Road	Assume GCP capacity covered by background growth	-	-
SA05	Great Western Road Sidings	Assume GCP as per JCS – No change	-	-
SA06	Blackbridge Sports Hub (Sports)	Assume GCP capacity covered by background growth	-	-
SA07	Lynton Fields - part of Land East of Waterwells	Assume GCP (2 Ha) as per JCS (2.67 Ha)		
SA08	King's Quarter	Update JCS zone trips to reflect GCP	50 dwellings	156 dwellings
SA09	Former Quayside House - Greater Blackfriars	Update JCS zone trips to reflect GCP	445 dwellings	50 dwellings
SA10	Former Fleece Hotel and Longsmith Street Carpark	Assume GCP as per JCS – No change	-	-
SA11	Land at St Oswalds	Update JCS zone trips to reflect GCP	50 dwellings	300 dwellings
SA12	Land at Rea Lane	Assume GCP as per JCS – No change	-	-
SA13	Former Colwell Youth & Community Centre	Assume GCP capacity covered by background growth	-	-
SA14	Land off New Dawn View	Assume GCP capacity covered by background growth	-	-
SA15	Land South West of Winneycroft	Assume GCP capacity covered by background growth	-	-
SA16	Land off Eastgate Street	Assume GCP capacity covered by background growth	-	-
SA17	Southern Railway Triangle	Update JCS assumptions to reflect GCP, add SA17 to Northern Railway Triangle zone, assuming same access from Metz Way	0 Ha	4.22 Ha
SA18	Jordan's Brook House	Assume GCP capacity covered by background growth	-	-

SA19	Land off Myers Road	Assume GCP capacity covered by background growth	-	-
SA20	White City Replacement Community Facility	Assume GCP capacity covered by background growth	-	-
SA21	Part of West Quay, the Docks	Assume GCP capacity covered by background growth	-	-
SA22	Secunda Way Industrial Estate	Update JCS model to add SA22 to zone representing adjacent site	0 Ha	0.7 Ha
-	104 Northgate Street	Removed as not built and not in GCP	20 dwellings	0 dwellings
-	Bus Station / Market Parade	Removed as not built and not in GCP	50 dwellings 1,600 sqm retail	0 dwellings 0 sqm retail
-	Land East of Hempsted	Removed as not built and not in GCP	50 dwellings	0 dwellings
-	Land South of Grange Road	Removed as not built and not in GCP	220 dwellings	0 dwellings
Total change to JCS CSV SATURN models, dwellings				**-379**
Total change to JCS CSV SATURN models, employment				**+4.92 Ha**
Total change to JCS CSV SATURN models, retail				**-1,600sqm**

5.5. Model Scenarios

The changes that will be made to the JCS CSV SATURN model scenarios for use in the GCP assessments, and the key modelling assumptions are:

- **Reference Case Do Minimum (DM)** - use the JCS SATURN DM model (JCS DM) with no changes;
- **Reference Case DS7 -** use the JCS SATURN DS7 model (JCS DS7) with no changes
- **GCP DM** - the JCS DM but with trip generation for GCP sites amended as set out in Table 5-1. All other sites common to the GCP and development log will remain unchanged as the development assumptions for these sites are broadly similar in the GCP and JCS; and
- **GCP DS7** – As per the GCP DM but with the DS7 highway network.

A summary of the scenarios is provided in Table 5-2.

Table 5-2 - Model Scenarios

Scenario	Demand	Network
JCS DM	• As per agreed JCS assumptions	As per agreed JCS DM
GCP DM	• Include sites built and started, sites listed in Gloucester but in Stroud district. • Amend developments to reflect changes to the GCP sites as shown in Table 5-1 • No change in background growth	As per agreed JCS DM
JCS DS7	• As per agreed JCS assumptions	As per agreed JCS DS7 mitigation
GCP DS7	• As per GCP DM	As per agreed JCS DS7 mitigation

5.6. Other model assumptions

The time periods that have been considered are the AM and PM peak hours, for the 2031 forecast year.

It was assumed the level of growth in the model will not be constrained to the level of growth in DS7, for the DM and DS scenarios.

No adjustments were made to background growth factors to reflect the reduced quantum of residential units in Gloucester. The background growth assumptions are therefore robust and will make further allowance for the 9 no smaller residential sites in the GCP which are not in the JCS, for which it has been assumed the trip generation is covered by background traffic growth assumptions made in the JCS model.

5.7. Model Outputs

The GCP assessments comprised:

- GCP DM vs JCS DM, to identify the impact of the GCP without the DS7 mitigation; and
- GCP DS7 vs JCS DS7, to identify the impact of the GCP with the DS7 mitigation in place.

Model outputs include plots and spreadsheet tables to determine changes in junction flow or performance. The plots and spreadsheets have been used to identify the following for the above two tests (for both AM and PM peaks):

- Junction inbound traffic volume increase more than 20%; or
- Junction delay increase is above 30s; or
- Junction volume / capacity (V/C) ratio increases to above 85%; or
- Junction V/C ratio increase is above 20%.

The results of these tests will determine the number of junctions which need to be considered in greater detail using standalone junction capacity models using Junctions 9 or Linsig as appropriate. However, the study areas will be limited to the network of 23 no. junctions that form part of the study area as shown in Figure 3-1.

Further analysis of the outputs will identify any junctions in either the GCP DM or GCP DS7 scenarios where the V/C of any arm exceeds 85%.

The junctions that are identified from the above will be considered in further detail using industry standard standalone junction capacity modelling software, using LinSig for signal junctions and Junction 9 for priority-controlled roundabouts.

6. Stage 1 Modelling Results

This section presents a comparison of 2031 JCS and GCP outputs from the SATURN model.

6.1. Overall Development Impact

Overall network performance statistics have been extracted from the SATURN model runs for the GCP and JCS model runs with the DS7 network scenario. The overall statistics are for the entire model, therefore include the Cheltenham, Tewkesbury and surrounding areas as well as Gloucester. The performance statistics are shown in Table 6-1.

The statistics demonstrate and overall network performance improvement with the GCP compared to the JCS, commensurate with the reduction in trips generated by proposed developments in Gloucester with the GCP compared to the JCS development assumptions. The GCP results in an overall network improvement in both the AM and PM peak hours, with a greater improvement in the PM peak.

Table 6-1 - Overall Network Performance

Variable	Unit	JCS DS7	GCP DS7	Difference
AM Peak hour				
Total Trips Loaded	PCU	99688.6	99447.1	-241.5
Total Transient Queues	Hours	6620.1	6255.8	-364.3
Total Over Capacity Queues	Hours	10111.1	5699.8	-4411.3
Link Cruise Time	Hours	22263.6	21221.5	-1042.1
Total Travel Time	Hours	38994.8	33287.1	-5707.7
Total Travel Distance	Km	1343878.8	1309979.3	-33899.5
Total Overall Average Speed	KPH	34.5	39.4	4.9
Total Penalty Times	Hours	19.4	19.2	-0.2
PM Peak Hour				
Total Trips Loaded	PCU	98156.1	97964.9	-191.2
Total Transient Queues	Hours	6884.3	6323.1	-561.2
Total Over Capacity Queues	Hours	10901	5944.9	-4956.1
Link Cruise Time	Hours	21595.7	20827.4	-768.3
Total Travel Time	Hours	39380.9	33095.5	-6285.4
Total Travel Distance	Km	1308183.3	1279628.3	-28555
Total Overall Average Speed	KPH	33.2	38.7	5.5
Total Penalty Times	Hours	13.5	13.5	0

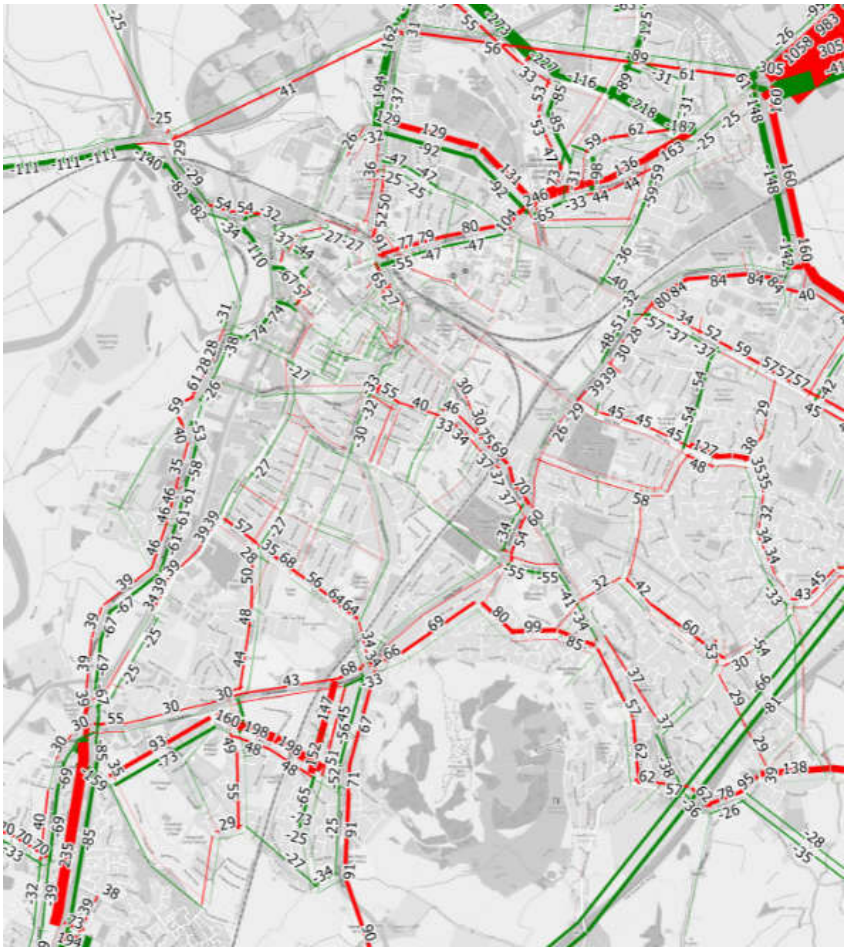
6.2. Network Flows

The CSV SATURN model has been used to compare the following scenarios:

- GCP DM vs JCS DM, to identify the impact of the GCP without the DS7 mitigation; and
- GCP DS7 vs JCS DS7, to identify the impact of the GCP with the DS7 mitigation in place.

Flow difference plots for the above comparisons, for AM and PM peak hours, have been produced and included in Appendix A. Extracts of these plots showing are provided in Figure 6-1 to Figure 6-4. Links shown as green indicate a flow reduction with GCP and links shown as red indicate a flow increase with GCP. The width of the coloured line indicates the relative scale of the change.

Figure 6-1 - Flow Difference Plot Extract – AM Peak with DM network



The large increase in the north east corner of the plot of AM peak with network DM comparison is due to traffic diverting as a result of A40 route into Cheltenham being particularly over capacity. This is only an issue in the AM peak with the DM network, as can be seen from the subsequent plots.

Figure 6-2 - Flow Difference Plot Extract – PM Peak with DM network

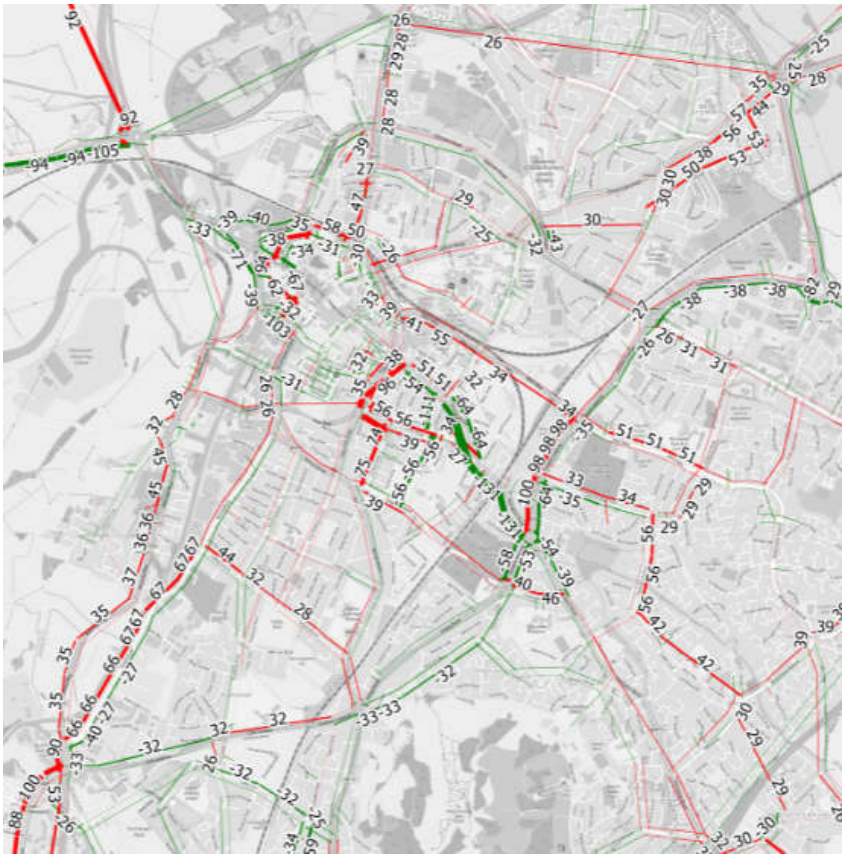


Figure 6-3 - Flow Difference Plot Extract – AM Peak with DS7 network

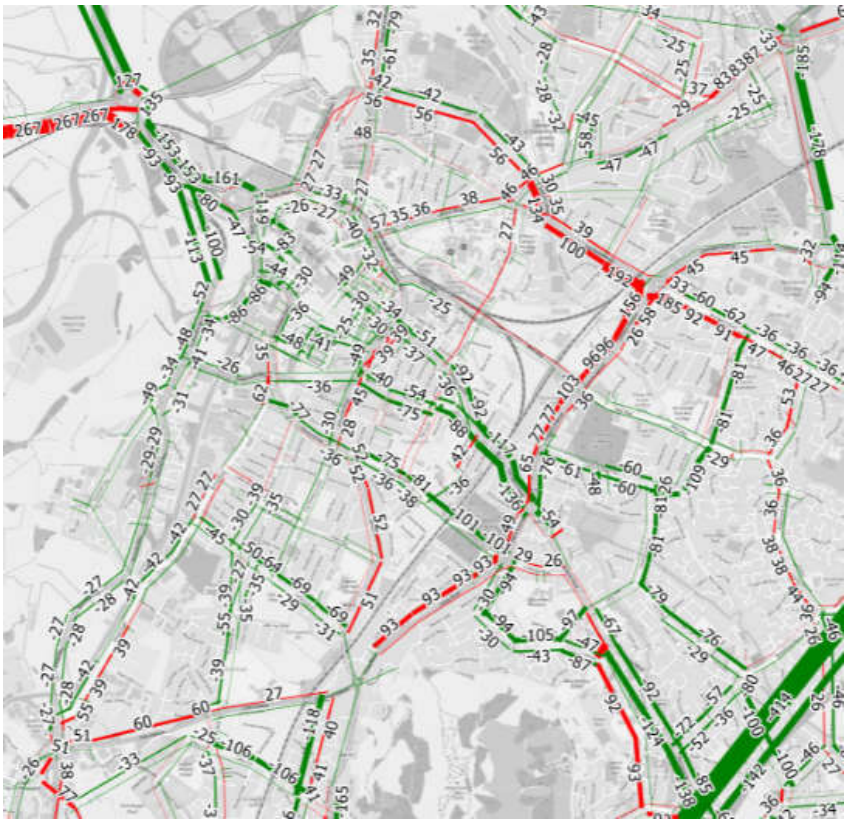
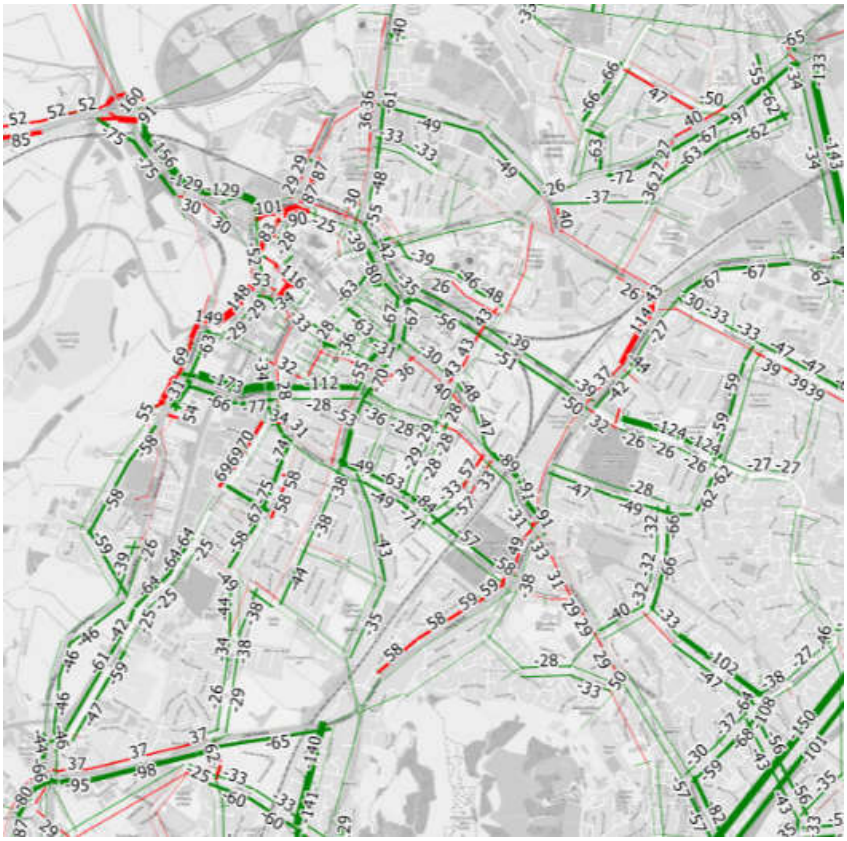


Figure 6-4 - Flow Difference Plot – PM Peak with DS7 network



6.3. Selection of Junctions

Model outputs include spreadsheet tables which have been used to determine changes in junction flow or performance between the GCP and JCS scenarios, against the following criteria:

- Node inbound traffic volume increase > 20%; or
- Node delay increase is > 30s;
- Node volume / capacity (V/C) ratio increases to > 85%; or
- Node V/C ratio increase is > 20%.

6.3.1. Performance Criteria Assessment

Table 6-2 shows a summary of the junctions that exceed the performance criteria set out above. The full assessment is provided in Appendix B. The table shows that only two criteria were exceeded, those being the delay increase and node V/C increase criteria, and only for the comparison based on the JCS DM network. When based on the JCS DS7 network, none of the criteria are exceeded.

Table 6-2 - Summary of Junctions Exceeding the Performance Criteria

Criteria	AM Peak – with DM network	PM Peak – with DM network	AM Peak – with DS7 network	PM Peak – with DS7 network
Node inbound traffic volume increase > 20%	None	None	None	None
Node delay increase is > 30s	• J20 – A38 / B4008 / Cole Avenue • J22B – M5 / A417 (East of J11A)	• J12 – A417 / A430 Castle Meads Way • J20 – A38 / B4008 / Cole Avenue	None	None
Node volume / capacity (V/C) ratio increases to > 85%	None	None	None	None
Node V/C ratio increase is > 20%	• J9 A430 / Llanthony Road	None	None	None

6.3.2. Review of GCP Performance

On reviewing the SATURN model outputs, in addition to considering the performance criteria set out above, junctions have been identified where the GCP is forecast to result in junctions being above the capacity thresholds, with a V/C > 85%, with either the JCS DM or JCS DS7 networks. Whilst the impacts at these junctions were not necessarily significant in the performance criteria assessment when compared the JCS scenario, if the junctions are forecast to be operating above capacity thresholds with the GCP it could risk the success of the GCP if they were left unconsidered.

Table 6-3 provides a summary of the junctions which are forecast to have V/C > 85% of at least one arm, with the GCP. A total of 9 no. junctions meet this criteria, including 3 no. of which have already been identified for further assessment in Table 6-2. The full assessment is provided in Appendix B.

Table 6-3 - Junctions Forecast to have V/C > 85% with GCP

Junction	GCP with DM Network AM	GCP with DM Network PM	GCP with DS7 Network AM	GCP with DS7 Network PM
J2 – A430 / Gouda Way / Worcester Street	Yes – V/C 100.9%		Yes – V/C 92.6%	
J4 – A430 / A4302 Metz Way		Yes – V/C 91.2%		
J6 – A4031 / A430 / Bristol Road	Yes – V/C 93.5%	Yes – V/C 107.1%	Yes – V/C 92.4%	Yes – V/C 102.8%
J7 – Bristol Road / Clifton Road	Yes – V/C 100.9%	Yes – V/C 91.7%	Yes – V/C 89.3%	
J8 – A430 / Spinnaker Road	Yes – V/C 93.2%		Yes – V/C 89.6%	
J9 – A430 / Llanthony Road	Yes – V/C 93.9%	Yes – V/C 99.0%	Yes – V/C 99.9%	Yes – V/C 95.1%
J19 – A430 / Bristol Road / Goodridge Avenue		Yes – V/C 100.9%		
J20 – A38 / B4008 / Cole Avenue	Yes – V/C 107.1%	Yes – V/C 99.1%		
J22B – M5 / A417 (East of M5)	Yes – V/C 106.0%			

6.4. Junctions to be Considered at Stage 2

Based on the assessments detailed in this section, the following junctions have been identified as requiring further assessment in Stage 2 of this study:

- J2 - A430/Gouda Way/Worcester Street;
- J4 - A430/A4302;
- J6 - A4031/A430/Bristol Road;
- J7 - Bristol Road/Clifton Road;
- J8 - A430/Spinnaker Road;
- J9 - A430 / Llanthony Road;
- J12 - A417 / A430 Castle Meads Way;
- J19 - A430/Bristol Road/Goodridge Avenue;
- J20 - A38/B4008/Cole Avenue; and
- J22B - M5/A417 Junction 11A (East of M5).

7. Stage 2 Junction Assessments

The 10 no. junctions identified in Stage 1 as needing further and more detailed analysis are set out in Section 6.4. In Stage 2, these junctions have been assessed for the GCP development scenario with the JCS DM and JCS DS7 road network assumptions, using Linsig or Junctions 9. This section summarises the Stage 2 assessments.

7.1. Key Assumptions and Definitions

7.1.1. Model Inputs

The key inputs into the junction models are:

- Junction layout – this is entered manually and is based on measurements of geometric parameters using AutoCAD software. OS base mapping has been used to measure the parameters, and online aerial mapping has been used to inform items such as lane details, presence and type of pedestrian crossings and any cycle facilities, which may not be apparent on the OS base mapping. Site visits were also undertaken on 5th September 2019 to verify the on-site conditions;
- Traffic flow data – this has been taken directly from the GCP scenarios in the CSV SATURN model, using 2031 AM and PM peak hours as the basis for assessment, using 'actual' flows outputs from the SATURN model; and
- Signal data (Linsig models only) – signal staging data has been taken from the CSV SATURN model. It was observed that the signal staging assumed in the CSV SATURN model did not account for pedestrian crossings, so for junctions where pedestrian crossings form part of the junction staging, the staging has been amended to reflect that. Phase intergreens have calculated manually using TRL Traffic Advisory Leaflet TAL 1/06.

7.1.2. Definitions

The following terms are used throughout this section in relation to the outputs of junction models:

- **Degree of Saturation (DoS)** – A signalised junction is considered to be at capacity when the Degree of Saturation on any lane is at 90%. LinSig sets the theoretical capacity of a lane at 90%. However in practice signal junctions can operate within capacity up to a DoS of 100%, and therefore given the assessments are being undertake for 2031, a DoS of 95% will be assumed as the capacity threshold.
- **Practical Reserve Capacity (PRC)** – represents the additional traffic that a signalised junction could accommodate based on the worst performing lane assuming a DoS of 90% as being at capacity. A negative PRC indicates that the junction is over its theoretical capacity.
- **Ratio of Flow to Capacity (RFC)** – Priority controlled junctions use RFC as a measure of capacity. RFC is provided for the give way movements rather than individual lanes. A priority junction is considered to be at theoretical capacity with an RFC of 0.85.
- **Mean Max Queue (MMQ)** – for signal junctions this represents the worst queue by lane in the modelled time period. The 'Mean' refers to the fact that it is the mean over a number of cycles of the maximum queue occurring each cycle.
- **Passenger car units (PCU)** – in junction modelling terms, different vehicles classes are converted to PCUs, where 1 PCU equates to 5.75m. Cars have a PCU value of 1 whereas HGV typically have a PCU of 2.0.

7.2. Junctions and Scenarios Assessed in Stage 2

The junctions identified for further assessment in Stage 2, and the scenarios for which they have been assessed, are summarised in Table 7-1 This includes reasons why only 4 no. of the 10 no. junctions are being considered in the with the JCS DS7 network scenario.

Table 7-1 - Summary of Junctions and Scenarios Tested in Stage 2

Junction Ref	Location	GCP DM	GCP DS7	Comments	Section Reference
Junctions identified based on Node Thresholds					
9	A430 / Llanthony Road	✓	✓	Node thresholds exceeded in DM & DS7 and no mitigation proposed in JCS	7.4.1
12	A417 / A430 Castle Meads Way	✓	✗	DS7 not considered further as node threshold not exceeded and mitigation is proposed as part of JCS	7.4.2
20	A38/B4008/Cole Avenue	✓	✗	DS7 not considered further as node threshold not exceeded and mitigation is proposed as part of JCS	7.4.3
22B	M5/A417 Jnc 11A (East of M5)	✓	✗	DS7 not considered further as node threshold not exceeded and mitigation is proposed as part of JCS	7.4.4
Junctions identified performance with GCP					
2	A430/Gouda Way/Worcester Street	✓	✓	One arm with V/C > 85% with GCP DM & DS7, and no mitigation proposed in JCS	7.5.1
4	A430/A4302	✓	✗	One arm with V/C > 85% with GCP DM only	7.5.2
6	A4031/A430/Bristol Road	✓	✓	One arm has V/C > 85% in AM and two in PM with GCP DM & DS7, and no mitigation proposed in JCS	7.5.3
7	Bristol Road/Clifton Road	✓	✓	One arm has V/C > 85% in AM and PM with GCP DM & in DS7 AM, and no mitigation proposed in JCS	7.5.4
8	A430/Spinnaker Road	✓	✓	One arm has V/C > 85% in AM in DM & DS7, and no mitigation proposed in JCS	7.5.5
19	A430/Bristol Road/Goodridge Avenue	✓	✗	One arm has V/C >85% with GCP DM	7.5.6

7.3. Junctions Identified Based on Node Thresholds

7.3.1. Junction 9 – A430 / Llanthony Road

Description of Junction

The A430 / Llanthony Road is a signal-controlled crossroads, with three arms – as shown in Figure 7-1.

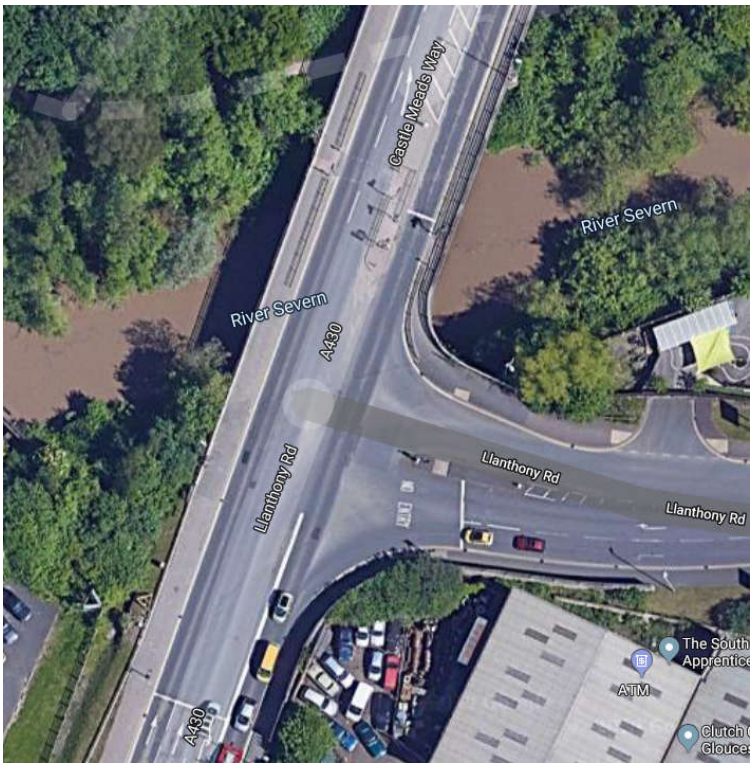
The junction is located to the west of Gloucester and is located on the A430 route which links A417 to the north with the A38 and M5 Junction 12 to the south. LLanthony Road provides access into the western docks area and to Gloucestershire College.

The junction is located adjacent to a bridge over the River Severn, with the A430(N) arm being on the bridge structure. As such the junction is constrained and significant improvements would potentially require widening the bridge.

The junction layout is shown in Figure 7-1 and can be summarised as follows:

- The **A430(N)** is a single carriageway road, with a single lane on approach to the signals and at the signal stop line. The exit from the signals has two lanes, which then reduce to a single lane north of the river bridge;
- **Llanthony Road** is a single carriageway road, with one lane in each direction, but with the junction approach flaring to two lanes prior to the stop line. The lane designation at the stop line is Lane 1: left turn and Lane 2: right turn; and
- The **A430 (S)** arm is a single carriageway road. On approach to the signals the A430(S) flares out from a single lane to provide three lanes at the stop line, and the exit from the junction has a single lane. The lane designation at the stop line is Lane 1 & 2: ahead only and Lane 3: right turn. The signal stop line is set back from the junction, resulting in long intergreen periods which impact on junction operation.
- Pedestrian crossings are provided across the A430(N) arm only.

Figure 7-1 - Junction layout - A430 / Llanthony Road - Map data ©2019 Google



Junction Performance with GCP (with JCS DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in **Table 7-2**.

The results show the junction is forecast to operate slightly above capacity thresholds in both the AM and PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-2 - Linsig Results - A430 / Llanthony Road - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 (N) entry Left Ahead	92.1%	55.8	31.8	91.3%	52.4	29.2
Llanthony Road entry Right Left	57.0%	29.8	11.1	91.0%	47.6	21.9
A430 (S) entry Ahead	87.8%	20.0	44.6	88.0%	24.3	44.0
A430 (S) entry Ahead Right	92.3%	51.3	25.6	89.4%	49.4	23.9
PRC	-2.5%			-1.4%		
Total Delay (pcuHr)	34.39			39.36		

Junction Performance with GCP (with JCS DS7 Network)

A summary of the results for the GCP with JCS DS7 network scenario is presented in Table 7-3, and based on the same assumptions as for assessment with the JCS DM network.

The results show the junction is forecast to operate slightly above capacity thresholds in the AM peak hours in 2031, and well within capacity in the PM peak, with GCP and with the JCS DS7 network.

Table 7-3 - Linsig Results - A430 / Llanthony Road - with GCP (JCS DS7 Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 (N) entry Left Ahead	94.0%	57.8	34.5	63.5%	16.9	16.9
Llanthony Road entry Right Left	93.9%	45.3	10.1	61.2%	47.5	7.5
A430 (S) entry Ahead	81.1%	18.5	41.9	52.3%	8.2	13.5
A430 (S) entry Ahead Right	86.1%	61.2	26.3	63.2%	14.0	14.5
PRC	-4.5%			41.8%		
Total Delay (pcuHr)	37.92			13.13		

Mitigation

As the junction is forecast to operate above capacity thresholds with GCP in place for both the JCS DM and DS7 network scenarios, a mitigation scheme has been proposed. This is considered further in Section 9.2.

7.3.2. Junction 12 - A417/A430 Castle Meads Way

Description of Junction

The A417/A430 Castle Meads Way is a signal-controlled junction with three arms – as shown in Figure 7-2.

The junction is located to the north-west of Gloucester and is located on the A430 route which links A417 to the north with the A38 and M5 Junction 12 to the south, and on the A417 route from the A40 at Over to M5 Junction 11A. A417 Westgate Street (E) provides access into The Docks area and the city centre.

The junction layout is shown in Figure 7-2, and can be summarised as follows:

- **A417 Westgate Street (E)** is a dual carriageway road. On approach to the signals the A417(E) flares out to provide four lanes at the stop line. The lane designation at the stop line is Lane 1: left turn only to A430(S), Lane 2&3: ahead only towards the A40, and Lane 3: right turn towards Westend Parade. The exit from the junction has two lanes and a bus stop located in a layby at the junction exit.
- **A430 Castle Meads Way (S)** is a single carriageway road. On approach to the signals the A430(S) flares out to provide three lanes at the stop line, designated as Lane 1&2: left turn only A417(W), and Lane 3: right turn only to A417(E). The exit from the junction has two lanes, reducing to a single lane south of the junction.
- **A417 Over Causeway (W)** is a dual carriageway road. On approach to the signals the A417 (W) flares out to provide four lanes at the stop line. The lane designations at the stop line are Lane 1: left turn and ahead, Lane 2: ahead only, and Lanes 3&4: right turn to A430(S). The exit from the junction has two lanes.
- **Westmead Parade** is a single carriageway road providing access to a small residential area and caravan park. The Westmead Parade arm has a single lane at the stop line and on exit from the junction.
- Pedestrian Crossings are provided across the A430(S) arm only.

Figure 7-2 - Junction Layout - A417/A430 Castle Meads Way - Map data ©2019 Google

Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-4.

The results show the junction is forecast to operate above capacity thresholds in the AM peak and within capacity thresholds in the PM peak in 2031 with GCP and with the JCS DM network.

Mitigation

As the junction is forecast to be operate above capacity thresholds with GCP in place for the JCS DM network scenarios, a mitigation scheme has been proposed. This is considered further in Section 9.3.

Table 7-4 - Linsig Results - A417/A430 Castle Meads - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Westend Parade entry Ahead Right Left	30.7%	75.5	1.4	13.7%	70.5	0.6
A417 East entry Left Ahead	95.7%	98.7	19.0	83.3%	59.4	15.9
A417 East entry Ahead Right	97.4%	119.4	20.0	83.0%	62.3	15.6
A430 Castle Meads Way entry Left	98.0%	65	47.8	82.3%	36.0	25.4
A430 Castle Meads Way entry Left Ahead Right	111.6%	274.7	52.6	82.6%	36.6	25.6
A417 West entry Left Ahead	114.4%	301.6	93.8	59.3%	19.2	15.1
A417 West entry Right Ahead	97.4%	81.4	25.6	68.1%	32.2	9.3
PRC	-27.1%			8.0%		
Total Delay (pcuHr)	180.61			41.83		

7.3.3. Junction 20 - A38/B4008/Cole Avenue

Description of Junction

The A38/B4008/Cole Avenue is a signal-controlled junction, with four arms – as shown in Figure 7-3.

The junction is situated to the south-west of Gloucester and is located on the A430 route which links A417 and A40 with the A38 and M5 Junction 12 to the south, and with A38 and M5 Junction 11 to the east.

The junction layout is shown in Figure 7-3, and can be summarised as follows:

- **A430 (N)** is a dual carriageway road. On approach to the signals the A430 (N) flares out to provide five lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to the A38 (E), Lanes 2&3: ahead only to A38 (S) and towards M5, Lanes 4&5: right turn to B4008. The exit from the junction has three lanes.
- **A38 (E)** is a single carriage road. On approach to the signals the A38 (E) flares out providing five lanes at the stop line. The lane designations are Lanes 1&2: left turn to A38 southbound towards M5, Lanes 3&4: ahead only, Lane 5: right turn to A430 Bristol Road northbound. The exit from the junction has two lanes.
- **A38 (S)** is a dual carriageway road. On approach to the signals the A38 (S) flares out to provide six lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to B4008, Lanes 2 to 4: ahead to A430 (N) towards A40 and A417, Lanes 5&6: right turn to A38 (E) towards A40 and A417 towards Cheltenham. The exit from the junction has two lanes.
- **B4008 (W)** is a dual carriageway road. On approach to the signals the B4008 (W) flares out to provide four lanes at the stop line with Lane 1: left turn to A430 (N), Lanes 2&3: ahead to A38 (E), and Lane 5: right turn to A38 (S) towards the M5. The exit from the junction has two lanes.
- Pedestrian Crossings are provided across all arms the junction.

Figure 7-3 - Junction Layout - A38/B4008/Cole Avenue - Map data ©2019 Google

Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-5.

The results show the junction is forecast to operate above capacity thresholds in both the AM and PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-5 - Linsig Results - A38/B4008/Cole Avenue - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Westend Parade entry Ahead Left	101.5%	138.1	31.5	111.5%	269.5	59.0
Westend Parade entry Ahead	100.9%	133.4	29.7	107.0%	207.3	45.2
Westend Parade entry Right	26.3%	32.4	4.2	68.2%	51.5	11.0
Westend Parade entry Right	26.3%	32.4	4.2	68.2%	51.5	11.0
A417 East entry Left Ahead	121.5%	395.5	91.7	110.0%	240.0	59.0
A417 East entry Ahead Right	120.4%	410.4	56.1	74.0%	66.2	6.9
A430 Castle Meads Way entry Left Ahead	118.0%	356.0	74.2	108.2%	214.7	50.9
A430 Castle Meads Way entry Ahead	117.3%	359.5	64.2	82.6%	62.6	15.0
A430 Castle Meads Way entry Ahead	117.3%	359.5	64.2	82.4%	62.4	14.9
A430 Castle Meads Way entry Right	93.4%	63.0	24.1	110.3%	254.5	59.5
A417 West entry Left	120.6%	389.2	127.2	95.8%	72.6	31.4
A417 West entry Ahead	69.3%	87.5	4.8	95.4%	129.1	13.8
A417 West entry Right Ahead	94.6%	88.1	8.3	106.3%	223.4	25.4
PRC	-35.0%			-23.9%		
Total Delay (pcuHr)	474.15			286.77		

Mitigation

As the junction is forecast to be over capacity with GCP in place for the JCS DM network scenarios, a mitigation scheme has been proposed. This is considered further in Section 9.40.

7.3.4. Junction 22B - A417/B4641

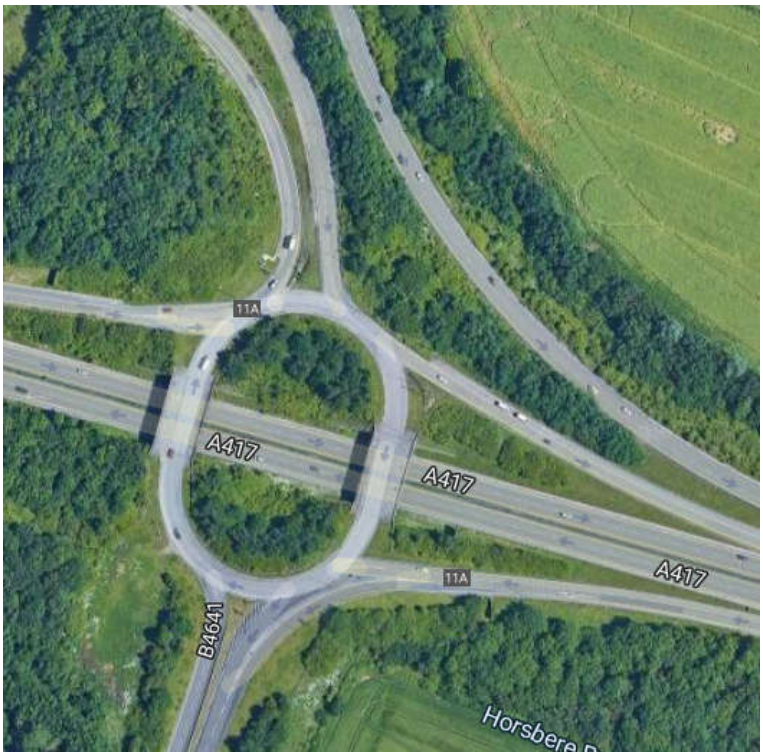
Description of Junction

A417/B4641 Valiant Way junction is a four arm grade separated roundabout, as shown in Figure 7-4, and forms part of M5 Junction 11A. The roundabout is located to the east of the M5, and provides access between M5 (S) and the A417 dual carriageway between Gloucester and Cheltenham.

The junction layout is shown in Figure 7-4, and can be summarised as follows:

- The **M5 Northbound Off Slip** has two lanes between the M5 diverge and the roundabout, with two lanes at the roundabout give-way line. The lanes are not designated for specific destinations but allow for left turns to A417 eastbound, ahead movements towards B4641. Exit from the junction towards the M5 southbound has a single lane.
- The **A417 (E) approach** is the A417 westbound off slip. On approach to the roundabout the off slip flares out to provide a segregated free flow left turn lane to B4641, and two lanes at the roundabout give way line.
- **B4641 Valiant Way** approach is a dual carriageway road providing two lanes at the roundabout give way line with no lane designations but allowing ahead movement towards M5 southbound and right turns to A417 eastbound. The exit from the junction has one lane.
- The **A417 (W) approach** is the A417 eastbound off slip, which has two lanes flaring out to three lanes at the give way line. The left lane is designated for the M5, but lanes 2 & 3 are not designated however the vast majority of movements from these lanes will to the B4641.

Figure 7-4 - Junction Layout - A417/B4641 - Map data ©2019 Google



Junction Performance with GCP (DM Network)

The junction has been modelled using Junctions 9. A summary of the results for the GCP with JCS DM network scenario is presented in Table **7-6**. Junction operates fractionally above capacity thresholds in AM, with maximum RFC of 0.88, and below capacity thresholds in the PM peak.

Table 7-6 – Junction 9 Results – A417/B4641 - with GCP (JCS DM Network)

	AM				PM			
	Queue (PCU)	Delay (s)	RFC	LOS	Queue (PCU)	Delay (s)	RFC	LOS
1 - M5 Slip (N)	7.8	25.55	0.88	D	1.5	8.18	0.58	A
2 - A417 (E)	0.7	2.62	0.37	A	0.3	2.11	0.21	A
3 - B4641 Valiant Way (S)	0.6	2.94	0.35	A	0.7	2.57	0.39	A
4 - A417 (W)	2.2	16.54	0.67	C	3.7	21.18	0.77	C

Mitigation

The junction is forecast to operate fractionally over capacity but given its location east of the M5 it is unlikely that the junction being over capacity is due to the GCP.

As noted in Section 6.2, the A40 corridor into Cheltenham is over capacity in JCS SATURN model in the AM peak with the DM network. This results in a large number of trips exiting M5 at Junction 11A to head east to the A46, and on to Cheltenham, to avoid delays at Junction 11 and on the A40 corridor. The JCS DS7 scenario includes improvements to M5 Junction 11 and the A40 corridor, as well as new slip roads at M5 Junction 10, which will mean Cheltenham-bound traffic will stay on the M5 and the routing via Junction 11A and A46 identified in the DM at Stage 1 will not be an issue in the long term.

Therefore, it is considered that mitigation is not required at this location in support of the GCP.

7.4. Junctions Identified Based on Performance with GCP

7.4.1. Junction 2 – A430/Gouda Way/Worcester Street

Description of Junction

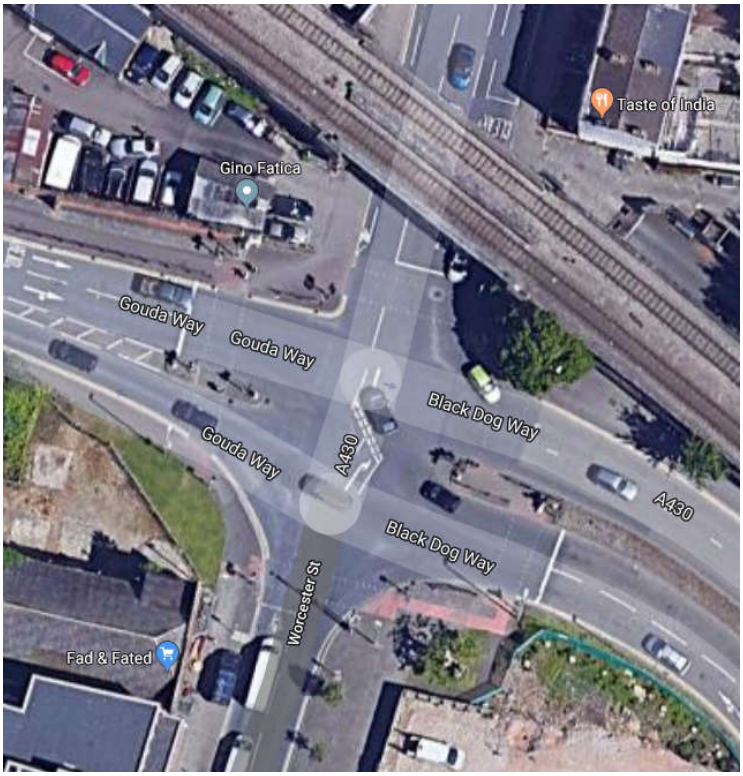
The A430 / Gouda Way / Worcester Street junction is a signal-controlled junction with four arms – as shown in Figure 7-5.

The junction is situated north of the city centre and The Docks. The junction is the A430 route around the city centre and Kingsholm Road provides access to the north towards the A417, A40 and Tewkesbury. The junction is close to the main railway line serving Gloucester, and the line passed over the Kingsholm Road arm immediately to the north of the junction.

The junction layout is shown in Figure 7-5, and can be summarised as follows:

- **A430 (N) Kingsholm Road** is a single carriageway road. On approach to the signals the A430 (N) flares out providing two lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A430 (E), Lane 2: ahead towards Worcester Street and right turn to A430 (W) Gouda Way. Exit from the junctions has one lane.
- **A430 (E) Black Dog Way** is a dual carriageway road approaching the signalised junction with two lanes at the stop line. The lane designation at the stop line is Lane 1: right turn to Worcester Street and ahead towards A430 (W) Gouda Way, Lane 2: right turn towards A430 (N) Kingsholm Road. The exit from the junction has two lanes.
- **Worcester Street (S)** is a single carriageway road with a single lane at the stop line. The exit from the junction has one lane.
- **A430 (W) Gouda Way** is a single carriageway road. On approach to the signals the A430 (N) flares out providing two lanes at the stop line. The lane designation at the stop line is Lane 1: ahead towards A430 (E), Lane 2: ahead and right turn to Worcester Street (S). The left turn from A430 (W) to Kingsholm Road is not permitted. The exit from the junction has one lane.
- Pedestrian crossings are provided across all arms.

Figure 7-5 - Junction Layout - A430/Gouda Way/Worcester Street - Map data ©2019 Google



Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-7.

The results show the junction is forecast to operate below capacity thresholds in both the AM and the PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-7 - Linsig Results - A430/Gouda Way/Worcester Street - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Worcester Street (N) entry Ahead Right Left	88.2%	81.4	9.1	42.2%	15.5	3.9
Black Dog Way entry Left Ahead	89.2%	33.0	20.7	74.3%	17.7	7.0
Black Dog Way entry Right	27.0%	23.6	4.4	58.8%	16.6	4.9
Worcester Street (S) entry Left Ahead Right	83.3%	149.3	4.4	72.2%	64.0	3.2
Gouda Way entry Right Ahead	88.8%	37.4	15.7	71.9%	24.0	3.1
PRC	1.0%			21.2%		
Total Delay (pch Hr)	23.39			11.12		

Junction Performance with GCP (with JCS DS7 Network)

A summary of the results for the GCP with JCS DS7 network scenario is presented in Table 7-8, and based on the same assumptions as the assessment with the JCS DM network.

The results show the junction is forecast to operate below capacity thresholds in both the AM and PM peak hours in 2031 with GCP and with the JCS DS7 network.

Table 7-8 - Linsig Results - A4031/A430/Bristol Road - with GCP (JCS DS7 Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Worcester Street (N) entry Ahead Right Left	80.3%	61.2	7.3	39.3%	17.3	1.9
Black Dog Way entry Left Ahead	84.4%	33.7	18.1	54.2%	16.9	4.5
Black Dog Way entry Right	16.9%	24.4	2.6	12.1%	14.6	0.8
Worcester Street (S) entry Left Ahead Right	83.3%	150.8	4.4	42.2%	39.4	1.8
Gouda Way entry Right Ahead	83.7%	34.7	15.1	56.1%	22.7	2.4
PRC	6.6%			60.5%		
Total Delay (pcuHr)	20.45			6.11		

Mitigation

As the junction is forecast to operate within capacity with the GCP and with the JCS DM and DS7 mitigation scenarios, no mitigation is required at this location.

7.4.2. Junction 4 – A430/A4302

Description of Junction

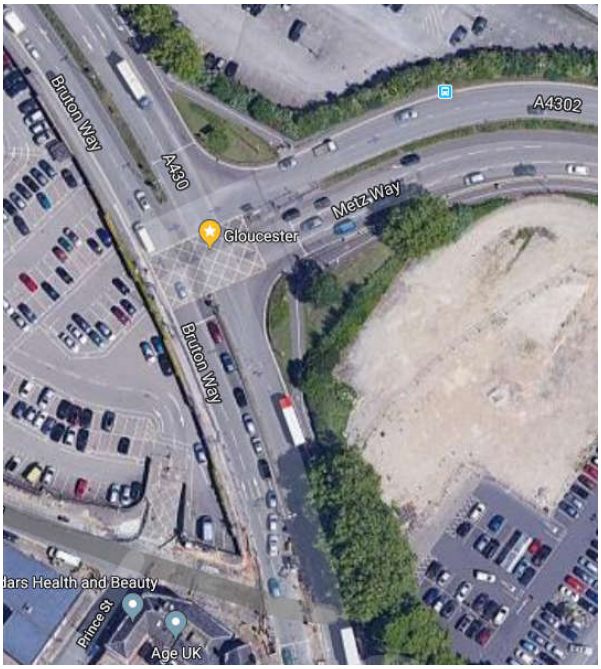
The A430/A4302 is a signal-controlled junction with three arms – as shown in Figure 7-6.

The junction is situated north-east of the city centre and The Docks, and south of Gloucester Railway Station and is located on the A430 around the city centre. Metz Way provides access to the east to the A38.

The junction layout is shown in Figure 7-6, and can be summarised as follows:

- **A430 (N) Bruton Way** is a dual carriageway road. On approach to the signals the A430 (N) flares out providing three lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A4302 Metz Way, Lanes 2&3: ahead towards A430 (S) Bruton Way. The exit from the junction has two lanes.
- **A4302 Metz Way (E)** is a dual carriageway road. On approach to the signals the A430 (N) flares out providing three lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A430 (S), Lanes 2&3: right turn to A430 (N).
- **A430 (S) Bruton Way** is a dual carriageway road. On approach to the signals the A430 (N) flares out providing three lanes at the stop line. The lane designation at the stop line is Lanes 1&2: ahead towards A430 (N), Lane 3: right turn on A4302 Metz Way.
- Pedestrian Crossings are provided on A4302 Metz Way (E) only.

Figure 7-6 - Junction Layout - A430/A4302 - Map data ©2019 Google



Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-9.

The results show the junction is forecast to operate below capacity thresholds in both the AM and the PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-9 - Linsig Results - A430/A4302 - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 Bruton Way - North Left Ahead	71.8%	43.7	9.4	87.6%	51.3	15.6
A430 Bruton Way - North Ahead	62.1%	40.8	8.9	80.1%	50.2	15.3
A4302 Metz Way Left	21.8%	12.3	3.2	49.0%	17.9	9.6
A4302 Metz Way Right	71.5%	36.7	10.8	86.9%	55.6	12.8
A430 Bruton Way - South Ahead	55.9%	15.6	11.3	41.6%	9.7	7.5
PRC	25.3%			2.7%		
Total Delay (pch Hr)	25.23			40.46		

Mitigation

As the junction is forecast to operate within capacity with the GCP with the JCS DM mitigation scenario, no mitigation is required at this location.

7.4.3. Junction 6 - A4031/A430/Bristol Road

Description of Junction

The A4031/A430/Bristol Road is a signal-controlled junction with four arms – as shown in Figure 7-7. The junction appears to have a MOVA controller.

The junction is situated south of the city centre and The Docks area, and is located on the A430 route around the city centre.

The junction layout is shown in Figure 7-7, and can be summarised as follows:

- **A4301 (N)** is a single carriageway road. On approach to the signals the A4301 (N) provides one lane at the stop line to turn left and ahead, the right turn to St Ann Way is permitted for bus and taxis only. The exit from the junction has one lane.
- **A430 (E) Trier Way** is a single carriageway road. On approach to the signals the A430 (E) flares out providing three lanes at the stop line. The lane designation at the stop line is Lane 1: left turn towards Bristol Road, Lane 2: ahead, and Lane 3: right turn to The Docks. The exit from the junction has one lane.
- **Bristol Road (S)** is a single carriageway road. On approach to the signals Bristol Road (S) flares out providing three lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to St Ann Way, Lane 2: ahead towards The Docks, Lane 3: right turn to Trier Way. The exit from the junction has two lanes.
- **A430 (W) St Ann Way** is a single carriageway road. On approach to the signals the A430 (W) flares out providing three lanes at the stop line. The lane designation at the stop line is: lane 1 left turn on A4301 (N) only, lane 2 ahead towards Trier Way, and lane 3 right turn onto Bristol Road. The exit from the junction has two lanes.
- Pedestrians crossings are provided on A4301 (N), A430 (E) Trier Way, across the left turn lane only on Bristol Road (S), and across A430 (W) St Ann Way. The crossings include near-side pedestrian detection.

Figure 7-7 - Junction Layout - A4031/A430/Bristol Road - Map data ©2019 Google

Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-10.

The results show the junction is forecast to operate below capacity thresholds in the AM and slightly above capacity thresholds in the PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-10 - Linsig Results - A4031/A430/Bristol Road - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A4301 Southgate St Left Ahead Right	88.3%	65.8	19.7	96.7%	113.4	20.3
A430 Trier Way Left Ahead	89.1%	62.2	17.1	97.9%	87.8	28.1
A430 Trier Way Right	50.5%	60.6	4.6	0.0%	0.0	0.0
Bristol Road South Left	69.1%	34.2	17.1	87.9%	60.6	20.7
Bristol Road South Ahead Right	87.1%	43.1	21.1	80.9%	52.7	17.6
St Ann Way Left Ahead	80.9%	70.4	10.1	97.2%	108.8	19.6
St Ann Way Right	86.5%	101.8	9.0	96.4%	111.9	19.1
PRC	1.0%			-8.8%		
Total Delay (pcuHr)	49.86			75.88		

Junction Performance with GCP (with JCS DS7 Network)

A summary of the results for the GCP with JCS DS7 network scenario is presented in Table 7-11, and based on the same assumptions as the assessment with the JCS DM network.

The results show the junction is forecast to operate marginally above capacity thresholds in the AM peak hours in 2031, and well below capacity thresholds in the PM peak, with the GCP and with the JCS DS7 network.

Table 7-11 - Linsig Results - A4031/A430/Bristol Road - with GCP (JCS DS7 network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A4301 South Gate Left Ahead Right	89.3%	67.5	20.4	81.1%	58.1	12.5
A430 Trier Way Left Ahead	84.2%	55.0	14.2	80.2%	45.1	11.0
A430 Trier Way Right	33.4%	57.2	2.7	0.0%	0.0	0.0
Bristol Road South Left	61.9%	31.1	14.7	61.3%	33.9	11.3
Bristol Road South Ahead Right	87.5%	39.6	16.5	48.4%	32.9	8.2
St Ann Way Left Ahead	91.5%	94.7	13.6	80.1%	64.8	8.7
St Ann Way Right	86.9%	106.7	8.7	80.2%	71.7	8.4
PRC	-1.6%			11.0%		
Total Delay (pcuHr)	47.63			36.27		

Mitigation

The junction is located in a built-up location with limited scope to widen. The junction appears to be under MOVA control with nearside pedestrian detection in operation. Without mitigation, the forecast queuing is not excessive with a max queue of 28.1 pcu on Trier Way.

The junction is forecast to operate better in the JCS DS7 mitigation scenario, than in the JCS DM scenario. The JCS DM scenario is an unlikely scenario as the DS7 mitigation is the agreed mitigation for the JCS, and therefore it is unlikely that the JCS developments would be implemented without the required DS7 mitigation. It is therefore considered that further mitigation over and above the JCS DS7 mitigation is not required at this junction.

7.4.4. Junction 7 - Bristol Road/Clifton Road

Description of Junction

The Bristol Road / Clifton Road is a signal-controlled junction with three arms – as shown in Figure 7-8.

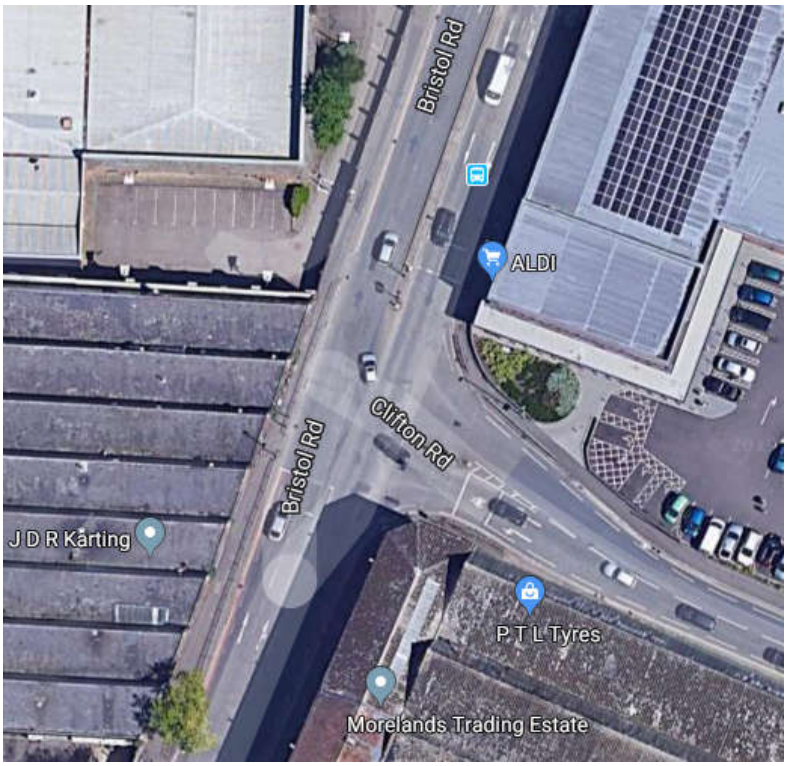
The junction is situated south of the Gloucester Docks and is located on Bristol Road which links with the A430 – route which links with A38 and M5 Junction 12 to the south, and with A417 to the north.

The junction layout is shown in Figure 7-8, and can be summarised as follows:

- **Bristol Road (N)** is a single carriageway road. On approach to the signals Bristol Road flares out and provides two lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to Clifton Road, Lane 2: ahead to Bristol Road (S). The junction exit has two lanes.

- **Clifton Road (E)** is a single carriageway road. On approach to the signals Clifton Road flares out and provides two lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to Bristol Road (S), Lane 2: right turn to Bristol Road (N).
- **Bristol Road (S)** is a single carriageway road. On approach to the signals Bristol Road flares out and provides two lanes at the stop line. The lane designation at the stop line is Lane 1: ahead on Bristol Road (N), Lane 2: ahead and right turn to Clifton Road.
- Pedestrian crossings are provided across Bristol Road (N) and Clifton Road (E) arms.

Figure 7-8 - Junction Layout - Bristol Road / Clifton Road - Map data ©2019 Google



Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-12.

The results show the junction is forecast to operate below capacity thresholds in the AM and fractionally above capacity thresholds in the PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-12 - Linsig Results - Bristol Road / Clifton Road - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Bristol Road (N) entry Left Ahead	64.7%	18.0	11.6	60.5%	11.8	10.7
Clifton Road entry Right Left	81.3%	35.3	16.3	99.8%	122.9	29.8
Bristol Road (S) entry Ahead Right	78.0%	31.5	12.2	99.4%	56.6	19.9
PRC	10.8%			-10.9%		
Total Delay (pcuHr)	16.40			33.87		

Junction Performance with GCP (DS7 Network)

A summary of the results for the GCP with JCS DS7 network scenario is presented in Table 7-13.

The results show the junction is forecast to operate well below capacity thresholds in both the AM and PM peak hours in 2031, with GCP and with the JCS DS7 network.

Table 7-13 - Linsig Results - Bristol Road/Clifton Road - with GCP (JCS DS7 Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Bristol Road (N) entry Left Ahead	57.8%	15.0	10.5	52.8%	11.7	11.0
Clifton Road entry Right Left	78.9%	37.0	13.5	71.9%	38.9	9.6
Bristol Road (S) entry Ahead Right	79.7%	30.3	13.9	72.4%	26.5	13.3
PRC	12.9%			24.3%		
Total Delay (pcuHr)	15.19			11.43		

Mitigation

Given the junction is only forecast to be very slightly above capacity thresholds with the GCP in one scenario - in the PM peak with JCS DM mitigation - it is considered that no mitigation is required at this location.

7.4.5. Junction 8 - A430 / Spinnaker Road

Description of Junction

The A430 / Spinnaker Road is a signal-controlled junction, with four arms – as shown in Figure 7-9.

The junction is situated to the west of Gloucester and is located on the A430 route which links with A38 and M5 Junction 12 to the south. St Ann Way provides access to the city centre and The Docks. Spinnaker Road provides access to an industrial estate, and is a no-through road.

The junction layout is shown in Figure 7-9, and can be summarised as follows:

- **A430 (N) Llanthony Road** is a single carriageway road. On approach to the signals the A430(N) flares out to provide four lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A430 (E) St Ann Way, Lanes 2&3: ahead to A430 (S) Hempsted Lane, Lane 4: right turn to Spinnaker Road. The exit from the junction has one lane.
- **A430 (E) St Ann Way** is a single carriageway road. On approach to the signals the A430(N) flares out to provide two lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A430 (S) Hempsted Lane, Lane 2: ahead to Spinnaker Road and right turn to A430 (N). The exit from the junction has 2 lanes.
- **A430 (S) Hempsted Ln** is a single carriageway road. On approach to the signals the A430(N) flares out to provide three lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to Spinnaker Road and ahead to A430 (N), Lane 2: ahead only, Lane 3: right turn to A430 (E) towards Gloucester Quays and city centre. The exit from the junction has two lanes.
- **Spinnaker Road (W)** is a single carriageway road providing a single lane at the stop line. The exit from the junction has one lane.
- Pedestrian crossings are provided on the left turn lane of the A430 (N) Llanthony Road, across A430 (E) St Ann Way and A430 (S) Hempsted Lane.

Figure 7-9 - Junction Layout - A430/Spinnaker Road - Map data ©2019 Google

Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-14.

The results show the junction is forecast to operate above capacity thresholds in both the AM and PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-14 - Linsig Results - A430/Spinnaker Road - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 Llanthony Road (N) entry Ahead Left	71.6%	33.0	16.6	87.9%	48.9	24.2
A430 Llanthony Road (N) entry Ahead Right	64.5%	33.2	15.4	82.9%	46.1	21.9
St Ann Way entry Left	8.7%	33.4	1.1	3.1%	28.8	0.4
St Ann Way entry Ahead Right	106.3%	184.3	38.1	101.9%	84.0	26.8
A430 Hempsted Lane (S) entry Left Ahead	107.4%	217.7	71.1	101.2%	123.1	41.5
A430 Hempsted Lane (S) entry Ahead	107.4%	217.5	73.0	101.7%	128.4	43.8
A430 Hempsted Lane (S) entry Right	106.1%	258.8	26.1	48.7%	63.3	4.1
Spinnaker Road (W) entry Right Left Ahead	48.4%	168.7	2.4	48.4%	168.7	2.4
PRC	-19.4%			-13.2%		
Total Delay (pcuHr)	193.38			140.97		

Junction Performance with GCP (DS7 Network)

A summary of the results for the GCP with JCS DS7 network scenario is presented in Table 7-15, and based on the same assumptions as the assessment with the JCS DM network.

The results show the junction is forecast to operate above capacity thresholds in the AM peak and well below capacity thresholds in the PM peak in 2031, with GCP and with the JCS DS7 network.

Table 7-15 - Linsig Results - A430/Spinnaker Road - with GCP (JCS DS7 network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 Llanthony Road (N) entry Ahead Left	72.4%	34.1	16.8	58.9%	25.4	13.3
A430 Llanthony Road (N) entry Ahead Right	66.0%	34.4	15.7	54.0%	26.0	12.5
St Ann Way entry Left	3.8%	32.4	0.5	3.6%	31.7	0.5
St Ann Way entry Ahead Right	104.1%	135.2	31.3	83.3%	41.0	14.3
A430 Hempsted Lane (S) entry Left Ahead	104.5%	168.9	56.9	67.6%	31.1	17.1
A430 Hempsted Lane (S) entry Ahead	104.6%	169.0	58.6	67.8%	31.1	17.6
A430 Hempsted Lane (S) entry Right	104.1%	223.0	22.9	59.8%	90.2	3.1
Spinnaker Road (W) entry Right Left Ahead	48.4%	168.7	2.4	48.4%	168.7	2.4
PRC	-16.2%			8.1%		
Total Delay (pcuHr)	151.81			35.01		

Mitigation

As the junction is forecast to operate above capacity thresholds with GCP in place for the JCS DM and DS7 network scenarios, a mitigation scheme has been proposed. This is considered further in Section 9.5.

7.4.6. Junction 19 - A430/Bristol Road/Goodridge Avenue

Description of Junction

A430/Bristol Road/Goodridge Avenue junction is a signal-controlled junction with four arms – as shown in Figure 7-10.

The junction is situated at the south-west of Gloucester and is located on the A430 route which links with A38 and M5 Junction 12 to the south, and with A417 and A40 to the north.

The junction layout is shown in Figure 7-10, and can be summarised as follows:

- **A430 (N)** is a single carriageway road. On approach to the signals the A430 (N) flares out to provide six lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to Bristol Road (E), Lanes 2&3: ahead towards A38, Lanes 4&5: ahead towards B4008, and Lane 6: right turn to Goodridge Avenue. The exit from the junction has two lanes.
- **Bristol Road (E)** is a single carriageway road. On approach to the signals Bristol Road (E) flares out to provide four lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to A430 (S),

Lanes 2&3: left turn to A430 Bristol Road (S) towards B4008, Lane 4: ahead to Goodridge Avenue and right turn on A430 (N). The exit from junction has two lanes.

- **A430 (S) Bristol Road** is a dual carriageway road. On approach to the signals A430 (S) Bristol Road flares out to provide five lanes at the stop line. The lane designation at the stop line is Lane 1: left turn to Goodridge Avenue, Lane 2&3: ahead to A430 (N), Lanes 4&5: right turn towards city centre via Bristol Road (E). The exit from junction has four lanes.
- **Goodridge Avenue** is a single-carriageway road providing one lane at the stop line. The exit from the junction has one lane.
- Pedestrian Crossings are provided across the A430 (N) arm only.

Figure 7-10 - Junction Layout - A30/Bristol Road/Goodridge Avenue - Map data ©2019 Google

Junction Performance with GCP (DM Network)

The junction has been modelled using Linsig 3. A summary of the results for the GCP with JCS DM network scenario is presented in Table 7-16.

The results show the junction is forecast to operate well below capacity thresholds in both the AM and PM peak hours in 2031 with GCP and with the JCS DM network.

Table 7-16 - Linsig Results - A430/Bristol Road/Goodridge Avenue - with GCP (JCS DM network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 (N) Entry Ahead Left	79.1%	72.4	8.9	77.0%	74.2	8.8
A430 (N) Entry Ahead	74.0%	71.7	8.2	75.7%	73.3	8.6
A430 (N) Entry Ahead	74.3%	71.9	8.3	75.7%	73.2	8.6
A430 (N) Entry Ahead Right	77.9%	74.2	8.5	75.6%	73.0	8.5
Bristol Road Entry Left	29.8%	12.9	5.9	51.5%	22.1	12.2
Bristol Road Entry Left Ahead Right	18.6%	17.5	2.2	46.4%	24.5	9.8
A430(S) Entry Left Ahead	73.0%	14.3	18.1	63.7%	20.9	14.4
A430(S) Entry Ahead	62.3%	16.9	15.4	59.1%	22.4	13.3
A430(S) Entry Right	80.3%	18.9	15.5	78.7%	25.1	13.1
Goodridge Avenue Entry Right Left Ahead	54.4%	84.8	2.8	76.5%	72.8	8.8
PRC	12.0%			14.3%		
Total Delay (pcuHr)	35.77			43.04		

Mitigation

As the junction is forecast to operate below capacity thresholds with the GCP with the JCS DM mitigation scenario, no mitigation is required at this location.

7.5. Summary

Table 7-17 provides a summary of the findings of the Stage 2 assessment.

Table 7-17 - Summary of Junctions and Scenarios Tested in Stage 2

Junction Ref	Location	Mitigation Required	Refer to Section
Junctions identified based on Node Thresholds			
9	A430 / Llanthony Road	✓	9.2
12	A417 / A430 Castle Meads Way	✓	9.3
20	A38/B4008/Cole Avenue	✓	9.4
22B	M5/A417 Jnc 11A (East of M5)	✗	-
Junctions identified on performance with GCP			
2	A430/Gouda Way/Worcester Street	✗	-
4	A430/A4302	✗	-
6	A4031/A430/Bristol Road	✗	-
7	Bristol Road/Clifton Road	✗	-
8	A430/Spinnaker Road	✓	9.5
19	A430/Bristol Road/Goodridge Avenue	✗	-

8. Sustainability Assessment

A sustainability assessment has been conducted for each of the GCP site allocations, in terms of access to local facilities using public transport, walking and cycling. This has been presented as a set of GIS plots for each site, and these are provided in Appendix C.

In terms of public transport, an assessment of accessibility was conducted for the AM peak (06:30 – 09:30) and PM peak (16:00 – 19:00). The outputs demonstrate journey times to each of the sites from the centre of Gloucester.

For access by walking and cycling, isochrones have been produced based on the existing highway network. It should be noted that no assessment of suitability of these routes has been conducted, although major A roads and motorways have been removed from the assessment. To assess accessibility, indicative site accesses were assumed to be in the middle of each section of highway each site bordered. The isochrones were provided in five minute increments based on standard walking and cycling speeds (1.4m/s for walking, 4.2m/s for cycling), from each of the sites.

The facilities included within the assessment were as follows:

- Schools – Local authority maintained primary schools;
- Healthcare facilities – taken from the NHS website;
- Retail – desk-based assessment of large supermarkets within the vicinity of the sites and local chain shops e.g. Tesco Express;
- Employment – desk-based assessment of large employers and business parks within the vicinity of the sites; and
- City Centre – area bounded by A4301, A417 and A430.

Each site has been assessed against a target of being within 20 minutes of the city centre by bus and within a 10 min walk or 20 minute cycle of at least two local amenities. The assessment is summarised in Table 8-1.

Table 8-1 - GCP Site Sustainability Assessment Summary

Site Ref	Site Name	Time to city centre by bus (mins)	Local amenities within 10-min walk	Local amenities with a 20-min cycle	All criteria met?	Comment
SA01	Land at the Wheatridge	20-40	3	5	No	**No mitigation required** – site has school, heath centre and local retail within a 10-minute walk. Bus journey time is a result of site location adjacent to the southern boundary of Gloucester, but is only just outside of the 20 minute isochrone
SA02	Land at Barnwood Manor	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA03	67-69 London Road - Prospect House	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA04	Wessex House, Great Western Road	<20	5	5	Yes	**No mitigation required** – site considered to be in a sustainable location

SA05	Great Western Road Sidings	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA06	Blackbridge Sports Hub (Sports)	<20	0	5	No	**No mitigation required** – site is a local facility itself and is located within a residential area, within 20-minute cycle of a large part of south Gloucester, and 20 mins from the city centre by bus
SA07	Lynton Fields - part of Land East of Waterwells	20-40	2	4	No	**No mitigation required** – site has heath centre and local employment within a 10-minute walk. Bus journey time is a result of site location adjacent to the southern boundary of Gloucester
SA08	King's Quarter	<20	5	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA09	Former Quayside House - Greater Blackfriars	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA10	Former Fleece Hotel and Longsmith Street Carpark	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA11	Land at St Oswalds	<20	2	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA12	Land at Rea Lane	<20	1	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA13	Former Colwell Youth & Community Centre	<20	3	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA14	Land at Blackbridge	<20	0	5	No	**No mitigation required** – Although the site has no local amenities within a 10 minute walk, the site is within 20 minutes cycle of 5 amenities and 20 minutes from the city centre by bus. The is site considered to be in a sustainable location
SA15	Land East of Sneedhams Road	20-40	0	5	No	**No mitigation required** – Although the site has no local amenities within a 10 minute walk, the site is within 20 minutes cycle of 5 amenities. Bus journey

						time is a result of site location however it falls just outside the 20 minute bus journey time.
SA16	Land off Eastgate Street	<20	5	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA17	Southern Railway Triangle	<20	2	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA18	Jordan's Brook House	<20	4	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA19	Land off Myers Road	<20	3	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA20	White City Replacement Community Facility	<20	1	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA21	Part of West Quay, the Docks	<20	2	5	Yes	**No mitigation required** – site considered to be in a sustainable location
SA22	Secunda Way Industrial Estate	<20	0	5	No	**No mitigation required –** Although the site has no local amenities within a 10-minute walk, the site is within 20 minutes cycle of 5 amenities and 20 minutes from the city centre by bus. The is site considered to be in a sustainable location

The above assessment of the GCP allocated sites shows that all sites have good bus connections to the city centre, with all but two sites having bus journey times less than 20 minutes, and all sites have good access by bicycle to local amenities. Most sites are within a 10-minute walk of local amenities, but where that is not the case the sites have good access to the city centre and to local amenities by bicycle. It is therefore considered all sites are in sustainable location and no mitigation is required, other than Travel Plans being produced to accompany planning applications for each site.

9. Proposed Mitigation

This section of the report considers the four junctions identified in Section 7 as requiring mitigation in order to mitigate the impacts of GCP, such that the road network has the capacity to accommodate traffic generated by the GCP. This section includes the following for each junction:

- A description of the proposed scheme;
- A summary of the results of updated junction capacity assessment with the mitigation scheme in place; and
- Budget cost estimates for the proposed scheme.

9.1. Assumptions

Scheme design

The mitigation schemes have been designed to minimise costs by not requiring acquisition of third party land, work to structures or relocating significant amounts of road side infrastructure. The designs produced represent high level indicative sketch layouts. Further work will be required to develop 2D preliminary design drawings and confirm that third party land, structures or significant road side infrastructure are not affected by the proposals.

Cost Estimates

The budget cost estimates are commensurate with the indicative nature of the proposed schemes. They include allowance for civils works, preliminaries, design work, contingency, and optimism bias, but exclude:

- VAT;
- Detailed survey;
- Service diversions;
- Planning approval;
- Legal fees; and
- Ecology costs

The estimates also assume:

- No contaminated ground;
- Existing on-site utility connections are adequate and conveniently located;
- No major earthworks are required;
- Unrestricted access for construction vehicles to the site; and
- No restrictions on hours of working.

9.2. A430 / Llanthony Road

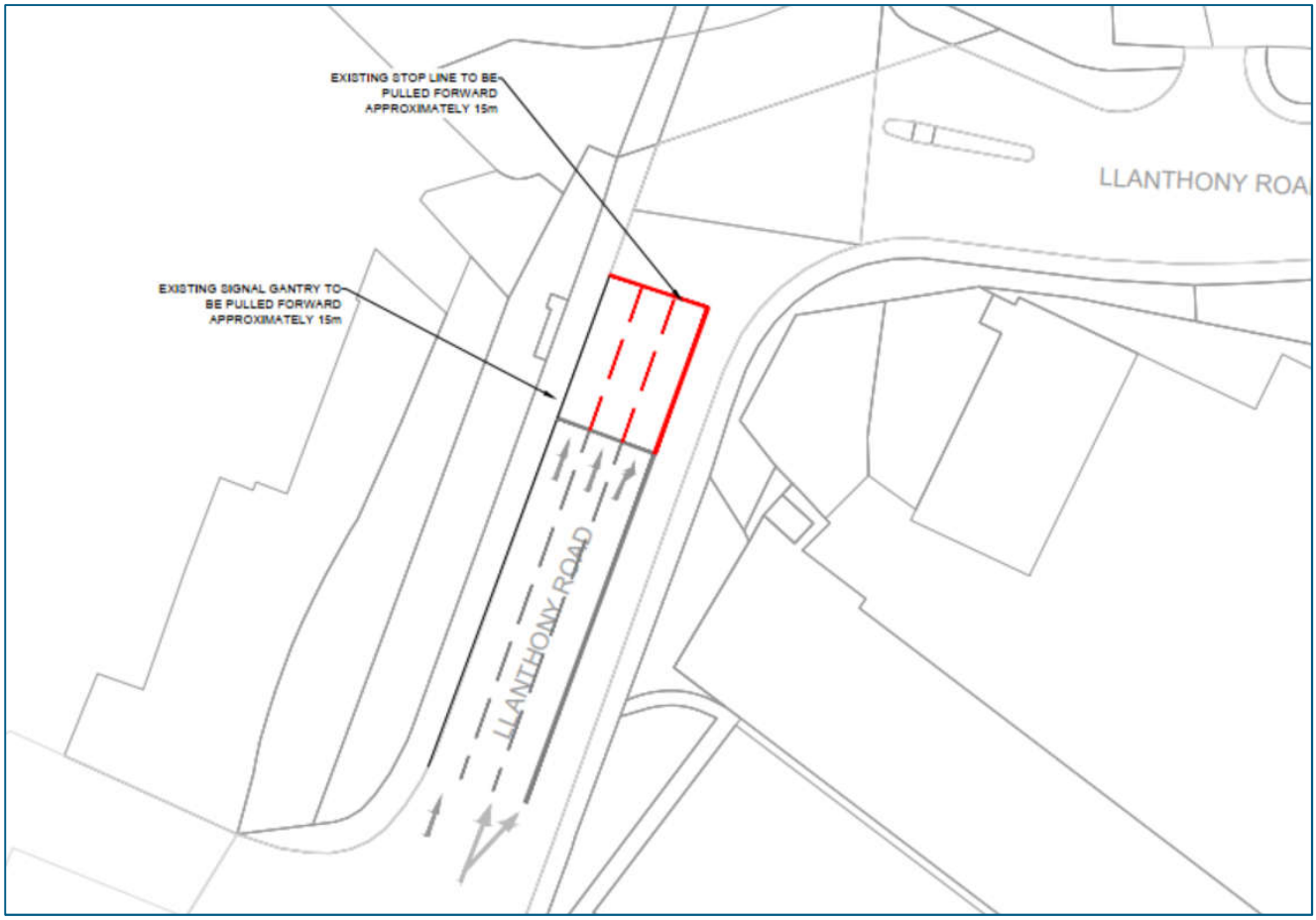
9.2.1. Proposed Mitigation

As identified in Section 7.3.1, the A430 / Llanthony Road junction is forecast to be over capacity with the GCP in place, and with both the JCS DM and DS7 network scenarios. As the JCS DS7 mitigation does not include mitigation for this junction, mitigation is considered as being in needed for both scenarios.

The proposed mitigation is to move the stop line c.15m north of its current location. This will mean intergreen times at the junction can be reduced and the junction capacity improved as a result. Moving the stop line forward will also necessitate the relocation of existing signals, however site investigations have shown this can be done within the verge and not impact on the river bridge structure.

An extract of the drawing of the proposed scheme is provided in Figure 9-1 and the full drawing, 5157942-001-ATK-HGN-GCC-SK-D-005, is included in Appendix D.

Figure 9-1 - A430 / Llantony Road - Proposed Mitigation (extract D-0005)



9.2.2. Assessment

Junction Performance with GCP (with JCS DM Network) – Mitigation Scheme

A summary of the results for the proposed mitigation for the GCP with JCS DM network scenario is presented in Table 9-1.

The results show the junction is forecast to operate below capacity thresholds in both the AM and PM peak hours in 2031 and with GCP and with the JCS DM network.

Table 9-1 - Linsig Results - A430 / Llanthony Road - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 (N) entry Left Ahead	87.8%	45.7	28.4	86.0%	42.5	27.6
Llanthony Road entry Right Left	57.2%	31.7	12.1	88.0%	49.2	20.5
A430 (S) entry Ahead	86.9%	18.6	43.2	88.4%	22.7	43.7
A430 (S) entry Ahead Right	87.9%	39.2	22.0	85.1%	34.9	16.8
PRC	2.4%			1.8%		
Total Delay (pcuHr)	29.42			34.13		

Junction Performance with GCP (with JCS DS7 Network)

A summary of the results for the proposed mitigation for the GCP with JCS DS7 network scenario is presented in Table 9-2.

The results show the junction is forecast to operate marginally above capacity thresholds in the AM peak hour in 2031, and well as being below capacity thresholds in the PM peak, with GCP and with the JCS DS7 network. This represents an improvement compared to the operation of the existing junction in the same scenario.

Table 9-2 - Linsig Results - A430 / Llanthony Road - with GCP (JCS DS7 network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 (N) entry Left Ahead	89.8%	46.1	31.4	60.3%	14.2	16.3
Llanthony Road entry Right Left	81.1%	46.6	10.7	59.7%	51.3	7.9
A430 (S) entry Ahead	85.2%	17.3	40.6	51.3%	7.9	12.9
A430 (S) entry Ahead Right	90.2%	47.4	23.0	55.4%	13.1	13.0
PRC	-0.2%			49.1%		
Total Delay (pcuHr)	32.21			12.58		

9.2.3. Summary of Mitigation Impacts

The assessment of the proposed mitigation represents an improvement compared to the operation of the existing junction in the same scenarios. The constrained nature of the junction means there are limited options for further improvement without significant additional costs. It is therefore considered the proposed layout will mitigate the impact of the GCP.

9.2.4. Costs

A budget cost estimate for the proposed scheme has been produced and the full estimate provided in Appendix E. A summary of the cost estimate is provided in Table 9-3.

Table 9-3 - A430 / Llantony Road - Budget Cost Estimate

Item	Budget Estimate
Civils Works	£11,500
Main Contractor Preliminaries @ 25%	£2,875
Sites Investigation @ 1.5%	£2,875
Design @ 8%	£3,450
Contingency @ 20%	£4,140
Optimism Bias @ 25%	£6,210
Total	**£31,050**

9.3. A417/A430 Castle Meads Way

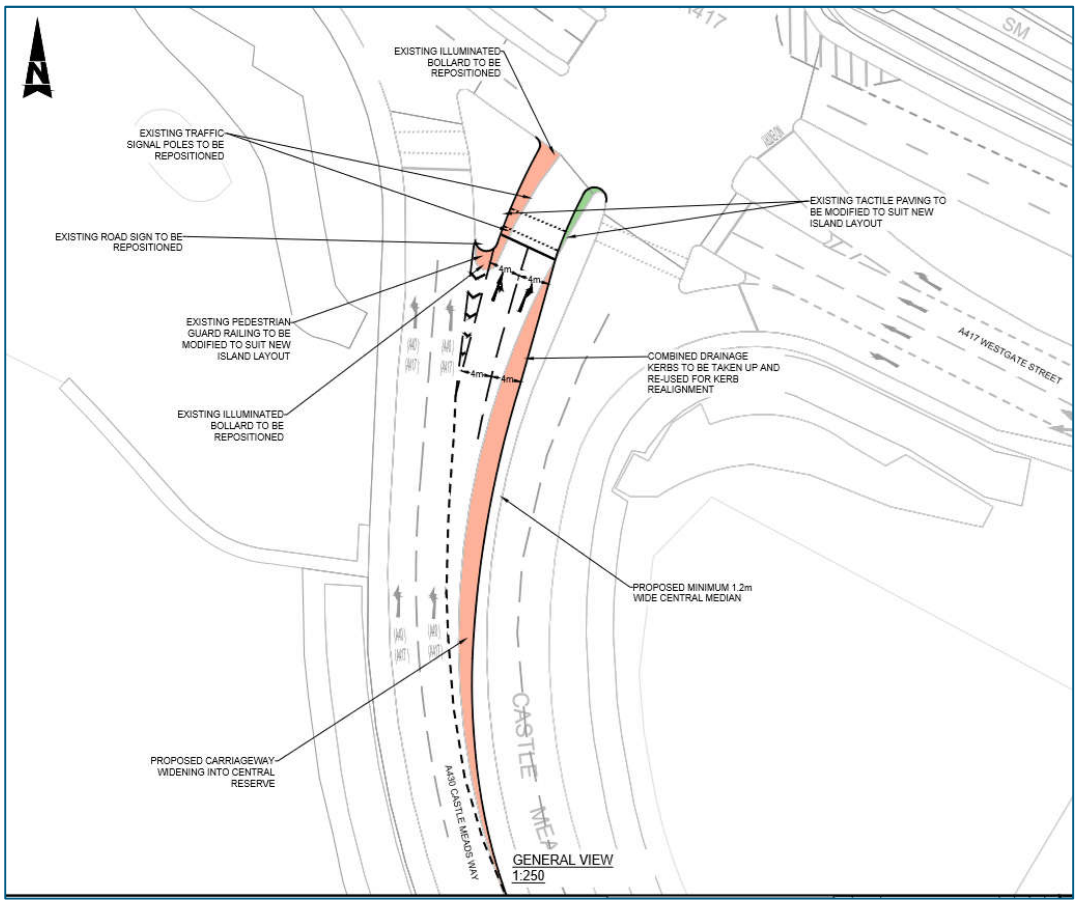
9.3.1. Proposed Mitigation

As identified in Section 7.3.2, A417/A430 Castle Meads Way junction is forecast to be over capacity with the GCP in place, and with JCS DM network scenarios.

The proposed mitigation is to provide two lanes for right turning traffic from Castle Meads Way to A417 (E). This can be achieved by utilising the existing hatched out area to the left of the existing right turn lane, however widening into the central reserve and splitter island is required accommodate the swept paths of two lanes of HGVs turning right simultaneously. Consequently, repositioning of existing street furniture such as an illuminated bollard, pedestrian guard railing, tactile crossings, and signal poles, is required to suit the proposed layout.

An extract of the drawing of the proposed scheme is provided in Figure 9-2 and the full drawing 5157942-001-ATK-HGN GCC-SK-D-0001, is included in Appendix D.

Figure 9-2 - A417/A430 Castle Meads Way - Proposed Mitigation (extract of D-0001)



9.3.2. Assessment

Junction Performance with GCP (with JCS DM Network) – Mitigation Scheme

A summary of the results for the proposed mitigation for the GCP with JCS DM network scenario is presented in Table 9-4.

The results show the junction is forecast to operate below capacity thresholds in the AM peak and slightly above capacity thresholds in the PM peak in 2031 and with GCP and with the JCS DM network. This represents an improvement compared to the operation of the existing junction in the same scenario.

Table 9-4 - Linsig Results - A417/A430 Castle Meads Way - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Westend Parade entry Ahead Right Left	13.7%	70.5	0.6	30.7%	75.5	1.4
A417 East entry Left Ahead	83.3%	59.4	15.9	94.2%	89.5	18.2
A417 East entry Ahead Right	83.0%	62.3	15.6	92.0%	90.1	16.6
A430 Castle Meads Way entry Left	82.3%	36.0	25.4	94.7%	49.8	39.8
A430 Castle Meads Way entry Left Ahead Right	82.6%	36.6	25.6	93.0%	77.2	14.4
A417 West entry Left Ahead	59.3%	19.2	15.1	87.8%	42.5	28.2
A417 West entry Right Ahead	68.1%	32.2	9.3	93.9%	56.4	23.8
PRC	8%			-5.2%		
Total Delay (pcuHr)	41.83			72.63		

9.3.3. Summary of Mitigation Impacts

The assessment of the proposed mitigation represents an improvement compared to the operation of the existing junction in the same scenarios. It is therefore considered the proposed layout will provide suitable mitigation for the GCP at this location.

It should be noted that the JCS DM scenario is an unlikely scenario, and the JCS DS7 mitigation included improvements at this junction, comprising of upgrading the signal controller to MOVA or SCOOT. Therefore it is considered a worst case scenario that mitigation would be needed to support the GCP.

9.3.4. Costs

A budget cost estimate for the proposed scheme has been produced and the full estimate provided in Appendix E. A summary of the cost estimate is provided in Table 9-5.

Table 9-5 - A417/A430 Castle Meads Way - Budget Cost Estimate

Item	Budget Estimate
Civils Works	£76,445
Main Contractor Preliminaries @ 25%	£19,111
Sites Investigation @ 1.5%	£1,433
Design @ 8%	£7,759
Contingency @ 20%	£20,950
Optimism Bias @ 25%	£31,425
Total	**£157,123**

9.4. A38/B4008/Cole Avenue

9.4.1. Proposed Mitigation

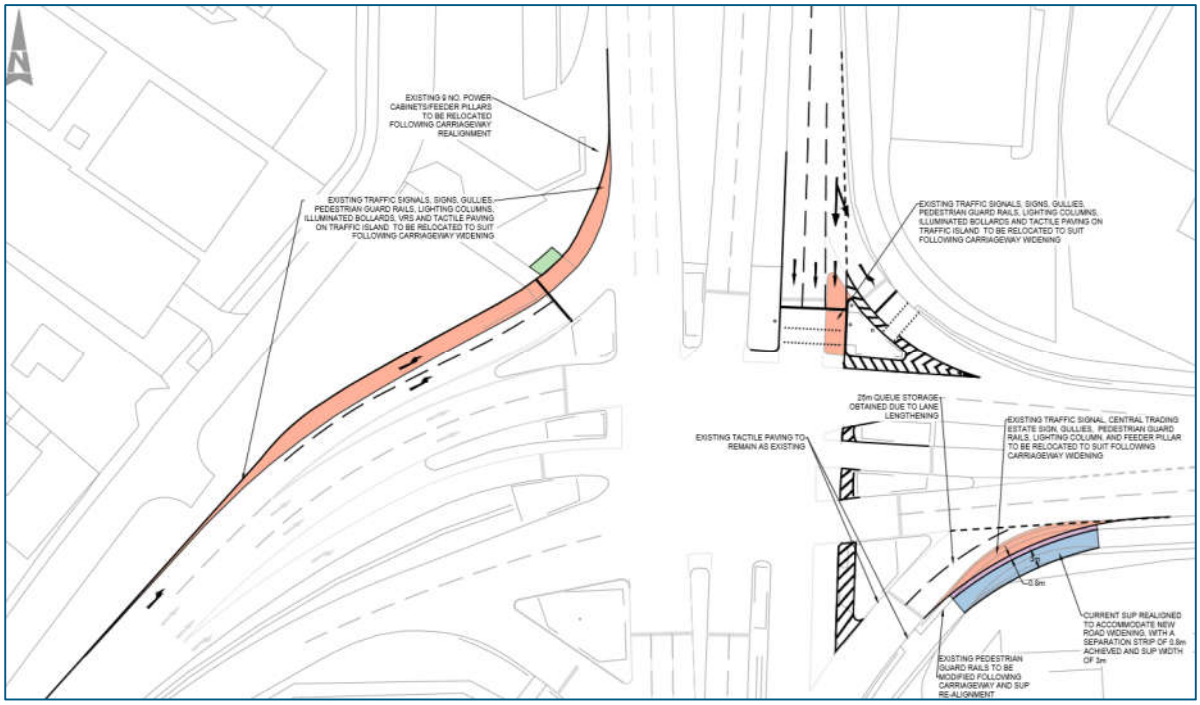
As identified in Section 7.3.3, A38 / B4008 / Cole Avenue junction is forecast to be over capacity with the GCP in place, and with JCS DM network scenarios.

The proposed scheme is to:

- Widen A430(N) approach to provide 3 no. ahead by utilising existing hatch areas through the junction provide an additional lane. Existing street furniture, such as traffic signals, signs, pedestrian guard rails, lighting columns, illuminated bollards and tactile paving, and drainage gullies to be relocated to suit following carriageway widening.
- Widen B4009 (W) left turn carriageway to provide two lanes for the left turn. Existing street furniture and drainage gullies to be relocated accordingly.
- Widen A38 Cole Avenue (E) left turn carriageway to extend queue storage for the left turn movement. Existing street furniture and drainage gullies will need to be relocated accordingly. Current shared use path (SUP) will need to be realigned to accommodate the widening, with a separation strip of 0.8m achieved and SUP width of 3m. The extent of the widening has been limited to avoid the need for third party land acquisition.

An extract of the drawing of the proposed scheme is provided in Table 9-3 and the full drawing 5157942-001-ATK-HGN GCC-SK-D-0004, is included in Appendix D.

Figure 9-3 - A38/B4008/Cole Avenue - Proposed Mitigation (extract D-0004)



9.4.2. Assessment

Junction Performance with GCP (with JCS DM Network) – Mitigation Scheme

A summary of the results for the proposed mitigation for the GCP with JCS DM network scenario is presented in Table 9-6.

The results show the junction is forecast to operate above capacity thresholds in the AM and in the PM peak hours in 2031 and with GCP and with the JCS DM network. However the results represent an improvement compared to the operation of the existing junction in the same scenario.

Table 9-6 - Linsig Results - A38/B4008/Cole Avenue - with GCP (JCS DM Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
Westend Parade entry Ahead Left	85.0%	71.1	13.5	101.3%	152.7	24.6
Westend Parade entry Ahead	84.8%	72.3	13.7	101.5%	156.0	25.1
Westend Parade entry Ahead	84.5%	71.9	13.6	101.3%	153.0	24.7
Westend Parade entry Right	30.8%	37.8	4.6	66.1%	49.6	10.7
Westend Parade entry Right	30.8%	37.8	4.6	66.1%	49.6	10.7
A417 East entry Left Ahead	100.0%	99.6	28.3	100.0%	102.1	28.0
A417 East entry Ahead Right	97.7%	118.2	17.1	89.3%	94.5	8.3
A430 Castle Meads Way entry Left Ahead	100.6%	119.1	31.8	87.8%	56.7	17.6
A430 Castle Meads Way entry Ahead	100.1%	122.2	29.8	84.0%	61.8	16.3
A430 Castle Meads Way entry Ahead	100.1%	122.2	29.8	84.2%	62.1	16.3
A430 Castle Meads Way entry Right	99.2%	96.7	31.5	100.7%	114.9	33.1
A417 West entry Left	85.7%	33.7	20.9	59.7%	21.6	8.2
A417 West entry Ahead	67.2%	60.4	8.6	61.5%	50.2	9.5
A417 West entry Right Ahead	94.6%	151.6	10.0	100.4%	161.3	18.5
PRC	-11.8%			-12.8%		
Total Delay (pcuHr)	156.91			156.45		

9.4.3. Summary of Mitigation Impacts

The assessment of the proposed mitigation provides an improvement in performance compared to the operation of the existing junction in the same scenarios. It is therefore considered the proposed layout provides appropriate mitigation for the GCP at this location.

Further improvement in the forecast performance for this scheme could be achieved through further widening the left turn lane from A38 (E), but this would require a strip of third party land to the south, which has not been included at this stage.

The JCS DS7 mitigation proposed grade separation at this location. This is likely to be a long term scheme, and the Cotswold Local Plan scheme, with the addition of increased queue storage for the left turn from A38 (E) to A38 (S), would provide a suitable mitigation for the medium term, prior to the DS7 scheme being implemented.

9.4.4. Costs

A budget cost estimate for the proposed scheme has been produced and the full estimate provided in Appendix E. A summary of the cost estimate is provided in Table 9-7. Note this estimate includes the elements of the scheme which form part of the agreed mitigation for the Cotswold Local Plan.

Table 9-7 - A38/B4008/Cole Avenue - Budget Cost Estimate

Item	Budget Estimate
Civils Works	£129,350
Main Contractor Preliminaries @ 25%	£32,338
Sites Investigation @ 1.5%	£2,425
Design @ 8%	£13,129
Contingency @ 20%	£35,448
Optimism Bias @ 25%	£53,173
Total	**£265,863**

9.5. A430 / Spinnaker Road

9.5.1. Proposed Mitigation

As identified in Section 7.4.5, A430 / Spinnaker Road junction is forecast to be over capacity with the GCP in place, and with JCS DM network scenarios.

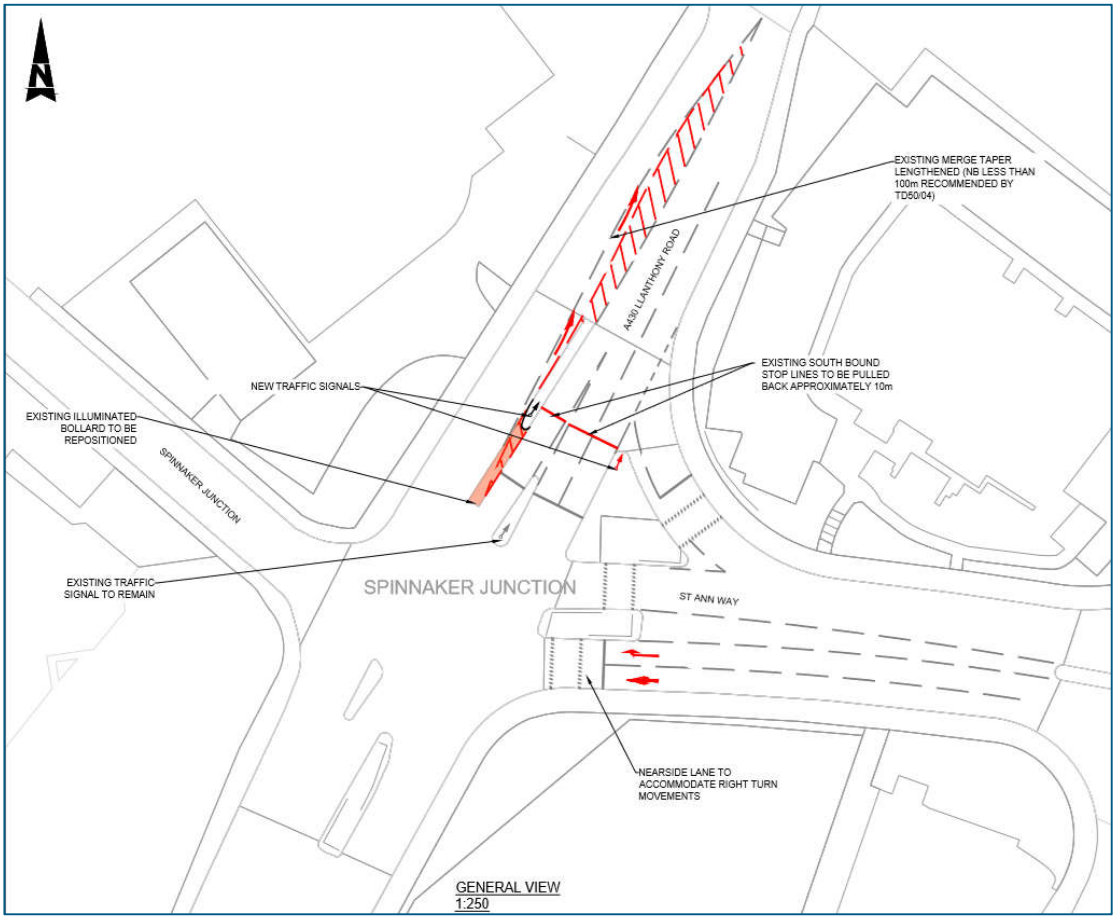
The proposed mitigation is to enable two lanes for the right turn movements from A430 (E) St Ann Way to A430 (N). This will be achieved by:

- Lengthening the existing merge taper on A430 (N), and relocating the existing A430 southbound stop line by approximately 10m back from their current position.
- Improvements will also include new traffic signs and the reposition of the existing illuminated bollard.

An extract of the drawing of the proposed scheme is provided in Figure 9-4 and the full drawing 5157942-001-ATK-HGN GCC-SK-D-0003 is included in Appendix D.

It should be noted that Gloucestershire County Council have developed a scheme for the A430 known as the Gloucester Southwest Bypass scheme, which includes improvements at the A430 / Spinnaker Road junction. The scheme includes a two-lane right turn from Spinnaker Road but also widening of the junction through the purchase of third-party land. Planning permission has been granted for the scheme and the county council is in the process of acquiring the land necessary for the works. The proposed works are planned to commence in Autumn 2020. However, the scheme assessed below is the city plan scheme shown in drawing 5157942-001-ATK-HGN GCC-SK-D-0003.

Figure 9-4 - A430/Spinnaker Road - Proposed Mitigation (extract D-0003)



9.5.2. Assessment

Junction Performance with GCP (with JCS DM Network) – Mitigation Scheme

A summary of the results for the proposed mitigation for the GCP with JCS DM network scenario is presented in Table 9-8.

The results show the junction is forecast to operate slightly above capacity thresholds in the AM peak hours in 2031 and with GCP and with the JCS DM network. This represents an improvement compared to the operation of the existing junction in the same scenario.

Table 9-8 - Linsig Results – A430/Spinnaker Road - with GCP (JCS DM network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 Llanthony Road (N) entry Ahead Left	70.7%	31.9	16.2	79.1%	36.3	20.2
A430 Llanthony Road (N) entry Ahead Right	62.8%	32.1	15.0	74.3%	36.4	19.3
St Ann Way entry Left Right	27.8%	35.9	3.6	26.7%	31.7	4.0
St Ann Way entry Ahead Right	91.6%	43.6	14.5	79.5%	38.3	13.3
A430 Hempsted Lane (S) entry Left Ahead	91.4%	49.4	31.1	78.4%	35.0	21.8
A430 Hempsted Lane (S) entry Ahead	91.7%	49.4	32.2	78.7%	34.9	22.6
A430 Hempsted Lane (S) entry Right	92.1%	107.3	13.0	58.0%	72.3	4.5
Spinnaker Road (W) entry Right Left Ahead	48.4%	168.7	2.4	48.4%	168.7	2.4
PRC	-2.4%			13.2%		
Total Delay (pcuHr)	50.21			38.12		

Junction Performance with GCP (with JCS DS7 Network) – Mitigation Scheme

A summary of the results for the proposed mitigation for the GCP with JCS DS7 work scenario is presented in Table 9-9.

The results show the junction is forecast to operate below capacity thresholds in 2031 and with GCP and with the JCS DS7 network. This represents an improvement compared to the operation of the existing junction in the same scenario.

Table 9-9 - Linsig Results – A430/Spinnaker Road - with GCP (JCS DS7 Network)

	AM Peak			PM Peak		
Lane	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**	**Degree of Saturation**	**Average Delay per PCU (s/PCU)**	**Mean Max Queue (pcu)**
A430 Llanthony Road (N) entry Ahead Left	72.0%	33.6	16.3	62.1%	28.5	13.9
A430 Llanthony Road (N) entry Ahead Right	64.9%	33.8	15.2	57.6%	29.1	13.3
St Ann Way entry Left Right	22.7%	35.1	3.0	21.5%	32.8	3.0
St Ann Way entry Ahead Right	89.0%	43.1	14.5	63.0%	37.5	9.4
A430 Hempsted Road (S) entry Left Ahead	89.5%	47.0	28.1	63.0%	26.9	15.4
A430 Hempsted Road (S) entry Ahead	89.7%	47.0	29.2	63.4%	26.9	15.9
A430 Hempsted Road (S) entry Right	88.5%	92.3	12.0	36.8%	64.1	2.6
Spinnaker Road (W) entry Right Left Ahead	48.4%	168.7	2.4	48.4%	168.7	2.4
PRC	0.3%			41.9%		
Total Delay (pcuHr)	47.13			25.42		

9.5.3. Summary of Mitigation Impacts

The assessment of the proposed mitigation represents an improvement compared to the operation of the existing junction in the same scenarios and is forecast to be slightly over capacity with the JCS DM scenario but within capacity in the JCS DS7 scenario. It is therefore considered the proposed layout will provide suitable mitigation for the GCP at this location. However, the Gloucester Southwest Bypass scheme, developed by the county council, provided further improvements and is due to be implemented from 2020.

9.5.4. Costs

A budget cost estimate for the proposed city plan mitigation scheme has been produced and the full estimate provided in Appendix E. A summary of the cost estimate is provided in Table 9-10:

Table 9-10 - A430/Spinnaker Road - Budget Cost Estimate

Item	Budget Estimate
Civils Works	£33,200
Main Contractor Preliminaries @ 25%	£8,300
Sites Investigation @ 1.5%	£623
Design @ 8%	£3,370
Contingency @ 20%	£9,098
Optimism Bias @ 25%	£13,648
Total	**£68,238**

10. Summary and Conclusions

10.1. Summary

An assessment of the GCP allocated sites and impact of the GCP on the local highway network is required to understand the impacts of the GCP. The assessment presented in this report provides a robust evidence base to assess of the transport impacts, and to identify any measures required to mitigate any significant impacts forecast to arise from the GCP.

The assessment approach has been agreed with Gloucestershire County Council, the local highway authority, and has been undertaken in two stages:

- The Stage 1 assessment utilised the 2031 Central Severn Vale (CSV) SATURN strategic highway model, which was developed on behalf of the county council, and was previously used to assess the impacts of the JCS. This model was used to assess the GCP proposals and identify which junctions needed to be considered in further detail in Stage 2; and
- The Stage 2 assessment assessed the junctions identified at Stage 1, using standalone junction capacity models to identify if the junctions were forecast to operate above capacity thresholds with the GCP, and where required, assess mitigation measures to reduce any significant impacts forecast to arise from the GCP.

The assessments concluded that a total of ten junctions were identified either where the impact with the GCP was greater than in the JCS scenarios, based on performance criteria agreed with the county council, or where the junction is forecast to operate above capacity thresholds with the GCP, which may detrimentally affect the success of the GCP.

The ten junctions were considered in Stage 2 and mitigation schemes identified as being required at four junctions:

- A430 / Spinnaker Road;
- A430 / Llanthony Road;
- A417 / A430 / Castle Meads Way; and
- A38 / B4008 / Cole Avenue.

A sustainable transport assessment has been undertaken for the GCP allocated sites. The assessment identified that all allocated sites have good bus connections to the city centre, with all but two sites having bus journey times less than 20 minutes, and all sites have good access by bicycle to local amenities. Most sites are within a 10-minute walk of local amenities, but where that is not the case the sites have good access to the city centre and to local amenities by bicycle. It is therefore considered all sites are in sustainable location and no mitigation is required, other than Travel Plans being produced to accompany planning applications for each site.

10.2. Conclusions

Table 10-1 summarises the proposed junction mitigation which is as been identified to support the GCP, which is proposed at a total of four junctions. All junctions are on the A430 / A38 corridor to the west of Gloucester.

The proposed GCP mitigation schemes complement the agreed JCS DS7 mitigation package. The DS7 mitigation includes improvements at two of the four junctions. At these locations, the GCP mitigation should be considered as a short-term measure to mitigate the impact of GCP prior to the implementation of the DS7 mitigation.

In summary the junctions at which GCP mitigation has been proposed are:

- **A430 / Spinnaker Road** – mitigation required for the GCP and no mitigation is included in DS7 mitigation. However, the county council's southwest bypass scheme includes capacity improvements at this junction, and will replace the GCP mitigation scheme proposed in this report;
- **A430 / Llanthony Road** - mitigation required for the GCP and no mitigation included in DS7 mitigation. Therefore, the GCP mitigation should be considered as a permanent improvement;
- **A417 / A430 / Castle Meads Way** – mitigation required for the GCP but improvements proposed as part of DS7 mitigation to upgrade the signal controller to MOVA or SCOOT. The proposed GCP

mitigation could complement the JCS mitigation scheme and is considered to provide a permanent improvement; and

- **A38 / B4008 / Cole Avenue** - mitigation required for the GCP but improvements proposed as part of DS7 mitigation to grade separate the junction. The proposed scheme for GCP mitigation, is considered to be required as an interim scheme prior to the DS7 grade separation scheme.

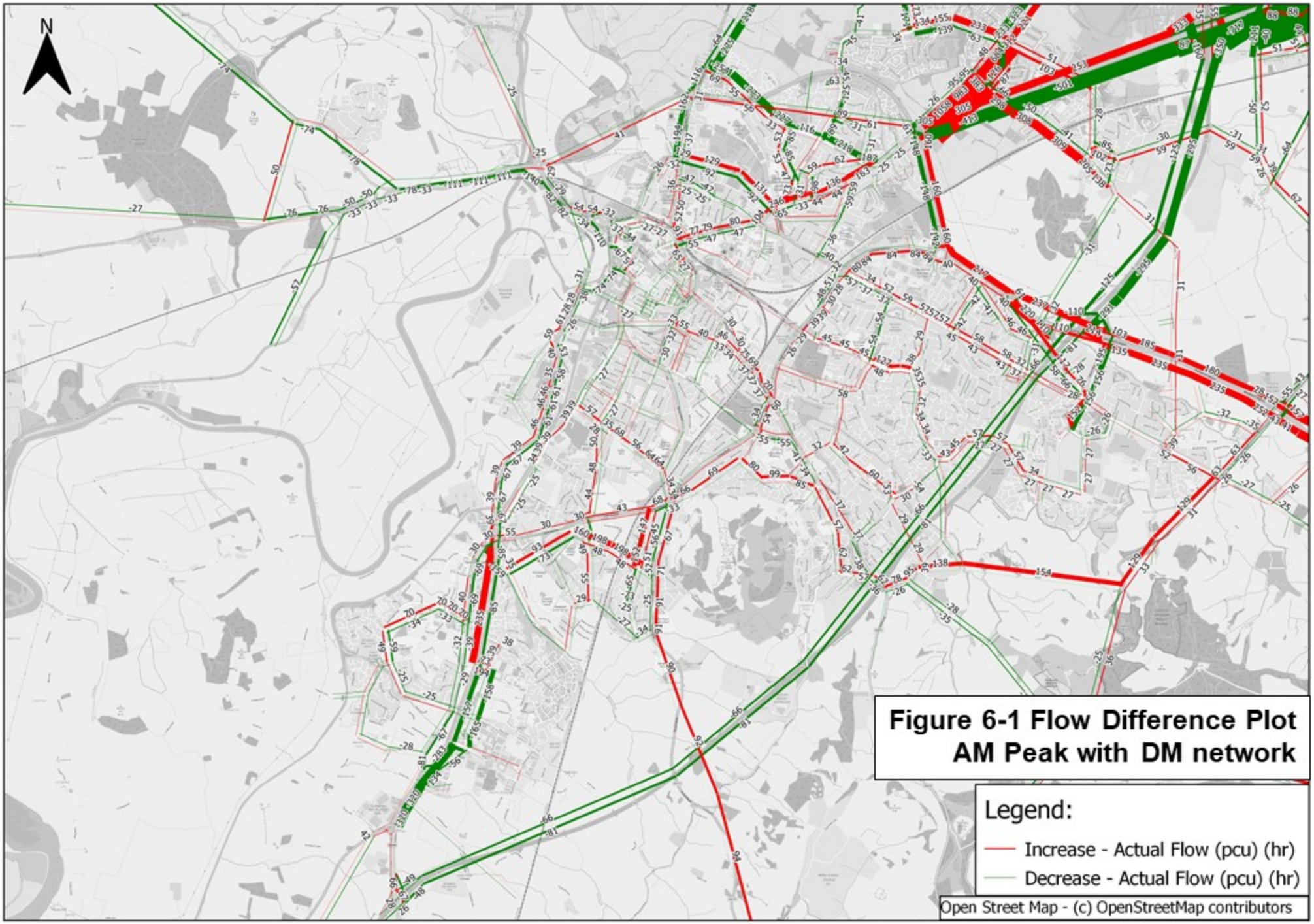
Table 10-1 - Summary of Proposed GCP Mitigation

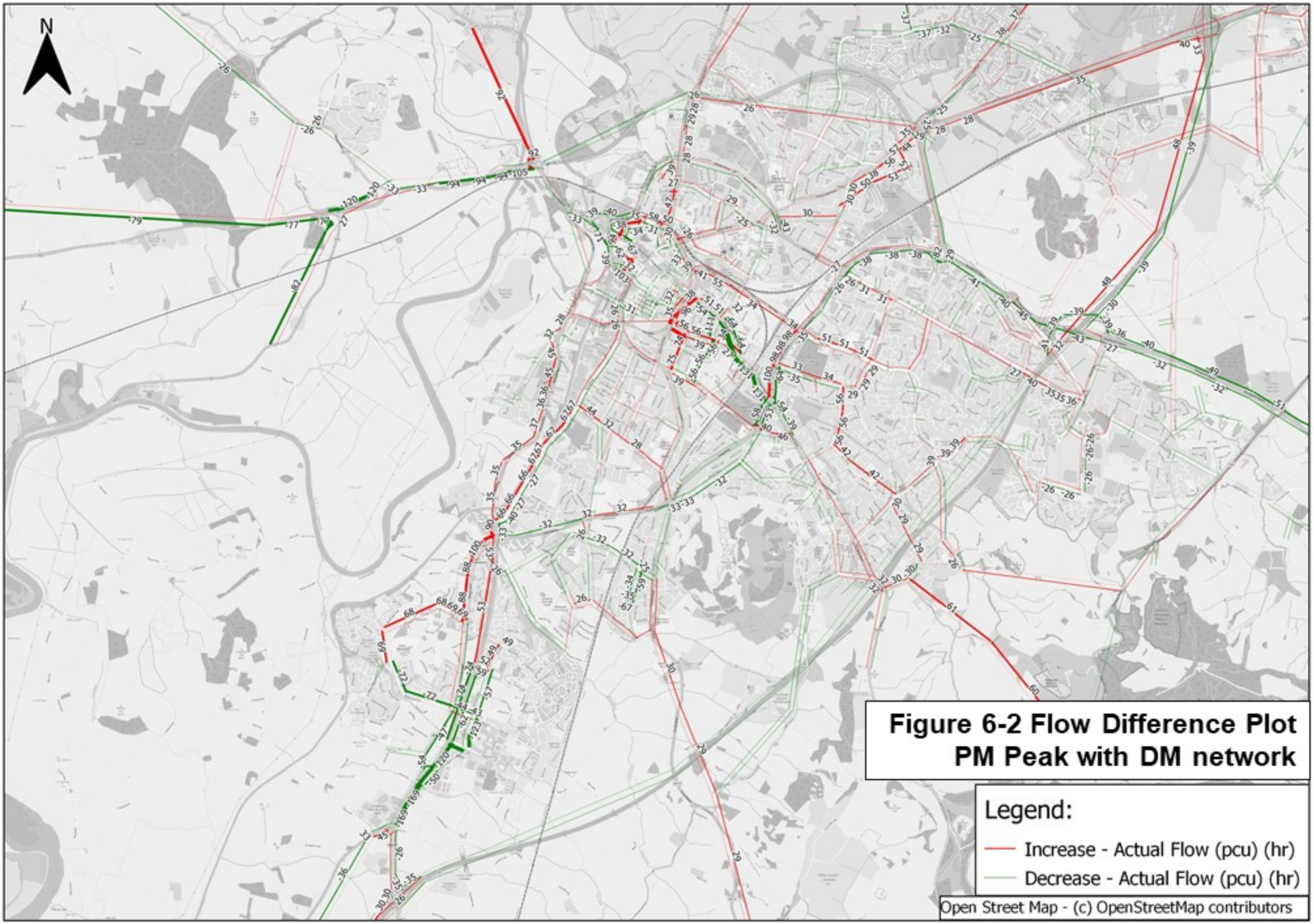
Junction	Proposed City Plan Mitigation	Estimated Costs	Interim or permanent scheme
A430/Spinnaker Road	Minor changes to permit a two lane right turn from Spinnaker Road	£68.2K	Permanent - no mitigation proposed at this location as part of JCS, however the county council's proposed Gloucester Southwest Bypass scheme will replace this scheme.
A430 / Llanthony Road	Minor changes to move the A430(S) stopline and associated signal heads forward, to reduce intergreen times and make the junction operate more efficiently	£31.1K	Permanent - no mitigation proposed at this location as part of JCS
A417 / A430 Castle Meads Way	Minor changes to permit a two lane right turn from Castle Meads Way	£157.1K	Permanent - JCS includes mitigation, proposed scheme required prior to that but would complement the JCS mitigation
A38/B4008/Cole Avenue	Capacity improvements, needed prior to the JCS mitigation (grade separation)	£265.8K	Interim - JCS includes mitigation, proposed scheme required prior to that, but would be replaced by JCS scheme
	Total Costs	**£522.2K ***	

* **Note**: £522.2K includes the A430 / Spinnaker Road city plan scheme, which will be replaced by the county council's Gloucester Southwest Bypass scheme.

A full summary of the assessment is provided in Appendix F.

Appendix A. SATURN Model Flow Difference Plots


N
Figure 6-1 Flow Difference Plot
AM Peak with DM network
Legend:
Increase - Actual Flow (pcu) (hr)
Decrease - Actual Flow (pcu) (hr)
Open Street Map - (c) OpenStreetMap contributors


N
Figure 6-2 Flow Difference Plot
PM Peak with DM network
Legend:
Increase - Actual Flow (pcu) (hr)
Decrease - Actual Flow (pcu) (hr)
Open Street Map - (c) OpenStreetMap contributors

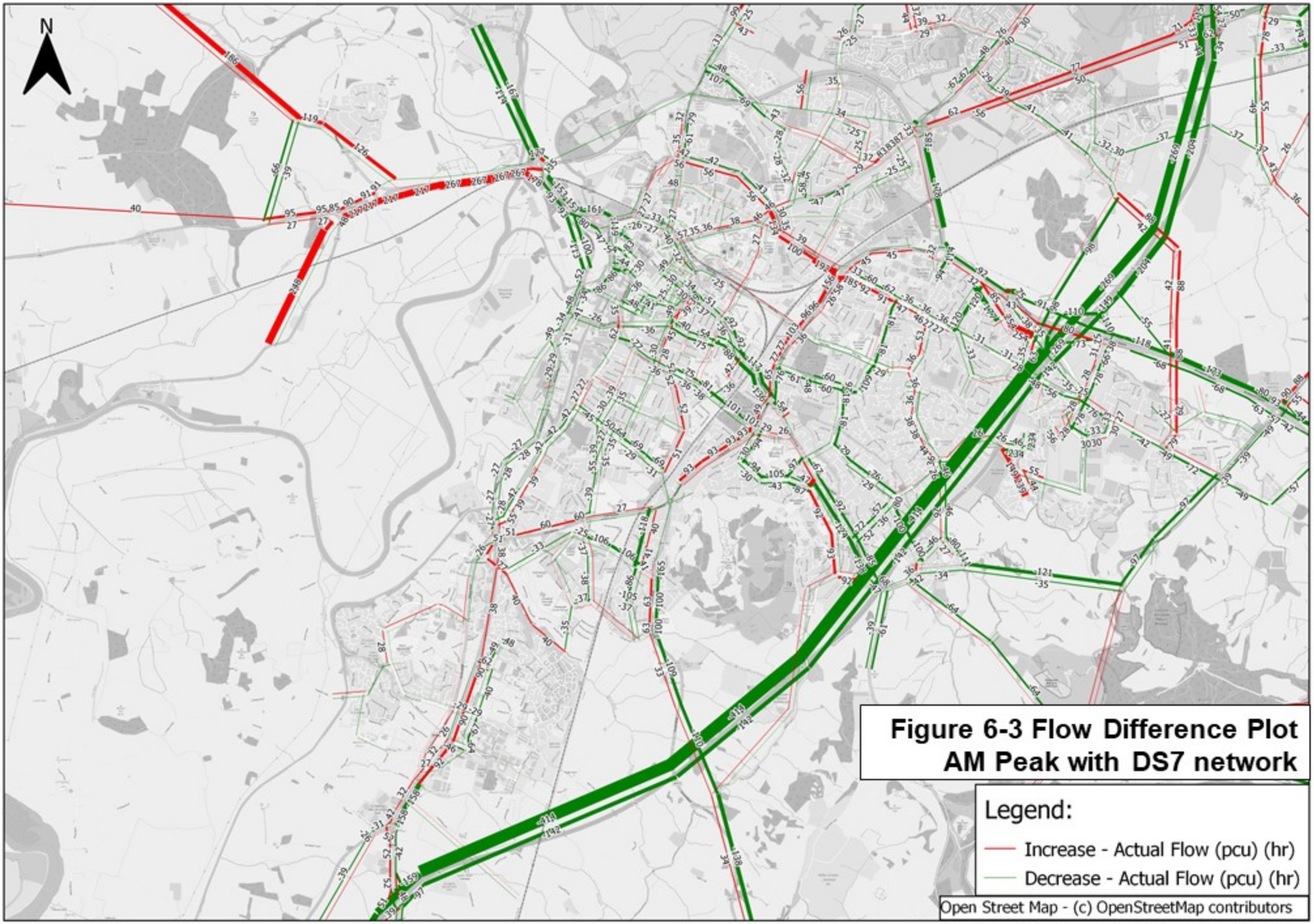

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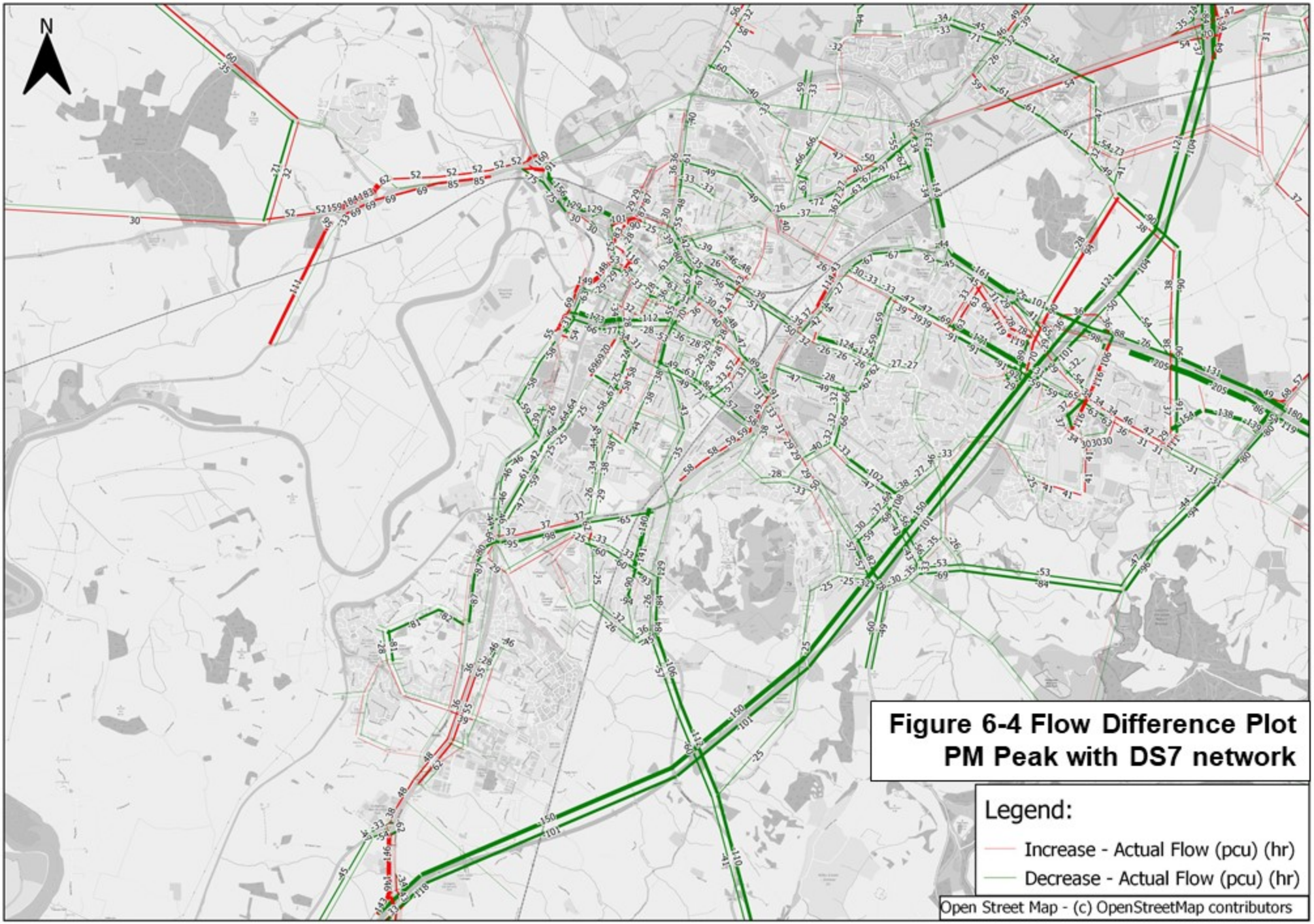
Figure 6-3 Flow Difference Plot
AM Peak with DS7 network
Legend:
Increase - Actual Flow (pcu) (hr)
Decrease - Actual Flow (pcu) (hr)
Open Street Map - (c) OpenStreetMap contributors


N
Figure 6-4 Flow Difference Plot
PM Peak with DS7 network
Legend:
Increase - Actual Flow (pcu) (hr)
Decrease - Actual Flow (pcu) (hr)
Open Street Map - (c) OpenStreetMap contributors

Appendix B. Stage 1 Assessment Results

Stage 1 Model Outputs

Junction Totals
Where thresholds exceeded

Junction Ref	Junction	SCENARIO COMPARISONS - WITH DM NETWORK								SCENARIO COMPARISONS - WITH DS7 NETWORK ASSUMPTIONS							
		JCS DM vs GCP DM				JCS DM vs GCP DM				JCS DS7 vs GCP DS7				JCS DS7 vs GCP DS7			
		DMAM vs DM2AM				DMPM vs DM2PM				DS7AM vs DS7_2_AM				DS7PM vs DS7_2_PM			
		Actual Flow (pcu/hr)	V/C Ratio increase is above 20%	Delay (total) (sec)	Comments	Actual Flow (pcu/hr)	V/C Ratio increase is above 20%	Delay (total) (sec)	Comments	Actual Flow (pcu/hr)	V/C Ratio increase is above 20%	Delay (total) (sec)	Comments	Actual Flow (pcu/hr)	V/C Ratio increase is above 20%	Delay (total) (sec)	Comments
1	A38/A430/A417/Tewkesbury Road	-3%	-2%	-0.03	Thresholds not exceeded	0%	1%	0.44	Thresholds not exceeded	0%	-3%	-0.11	Thresholds not exceeded	-22%	-25%	-0.83	Thresholds not exceeded
2	A430/Gouda Way/Worcester Street	3%	2%	-26.03	Thresholds not exceeded	-1%	1%	7.75	Thresholds not exceeded	-3%	-2%	-3.25	Thresholds not exceeded	-37%	-37%	-26.59	Thresholds not exceeded
3	A430/B4063/Northgate Street	3%	-1%	5.38	Thresholds not exceeded	1%	1%	1.87	Thresholds not exceeded	-1%	0%	3.39	Thresholds not exceeded	-37%	-35%	-10.78	Thresholds not exceeded
4	A430/A4302	1%	1%	-0.40	Thresholds not exceeded	1%	1%	1.16	Thresholds not exceeded	-2%	-2%	-1.12	Thresholds not exceeded	-29%	-24%	-29.16	Thresholds not exceeded
5	A430/B4073/Eastgate Street	1%	1%	-0.23	Thresholds not exceeded	1%	2%	4.29	Thresholds not exceeded	-4%	-6%	-6.84	Thresholds not exceeded	-34%	-34%	-50.72	Thresholds not exceeded
6	A4031/A430/Bristol Road	0%	0%	-6.39	Thresholds not exceeded	1%	1%	14.51	Thresholds not exceeded	1%	2%	4.61	Thresholds not exceeded	-21%	-14%	-176.00	Thresholds not exceeded
7	Bristol Road/Clifton Road	-1%	1%	17.52	Thresholds not exceeded	1%	-3%	-0.55	Thresholds not exceeded	-1%	-5%	-2.24	Thresholds not exceeded	-18%	-26%	-47.65	Thresholds not exceeded
8	A430/Spinnaker Road	0%	2%	0.43	Thresholds not exceeded	1%	1%	2.74	Thresholds not exceeded	-2%	-3%	-24.52	Thresholds not exceeded	-14%	-13%	-32.24	Thresholds not exceeded
9	A430/Lanthony Road	-2%	26%	4.84	**V/C thresholds exceeded**	0%	0%	15.91	Thresholds not exceeded	-3%	-2%	-57.96	Thresholds not exceeded	-15%	-33%	-325.30	Thresholds not exceeded
10	A417/A4301 - St Oswalds Rd approach	-1%	-2%	-0.03	Thresholds not exceeded	-3%	-2%	0.01	Thresholds not exceeded	0%	-3%	-0.08	Thresholds not exceeded	-3%	-10%	-0.07	Thresholds not exceeded
11	A4301/A417 - Westgate St approach	-15%	-22%	-3.94	Thresholds not exceeded	-7%	-7%	-2.32	Thresholds not exceeded	-7%	-20%	-0.85	Thresholds not exceeded	-27%	-28%	-2.45	Thresholds not exceeded
12	A417/A430 Castle Meads Way	-1%	-2%	-16.31	Thresholds not exceeded	-1%	0%	43.35	**Delay threshold exceeded**	-7%	-8%	-84.59	Thresholds not exceeded	-8%	-13%	-610.06	Thresholds not exceeded
13	A40/A417/B4063	6%	-1%	16.40	Thresholds not exceeded	0%	0%	-1.18	Thresholds not exceeded	-3%	-10%	-0.76	Thresholds not exceeded	-13%	-14%	-1.91	Thresholds not exceeded
14	A417/Corinium Avenue/Barnett way	3%	4%	0.80	Thresholds not exceeded	-1%	-1%	-0.51	Thresholds not exceeded	-2%	-7%	0.13	Thresholds not exceeded	-17%	-24%	-3.65	Thresholds not exceeded
15	Corinium Avenue/Barnwood Road/Eastern Avenue	-2%	0%	0.39	Thresholds not exceeded	0%	-2%	-1.52	Thresholds not exceeded	10%	4%	0.51	Thresholds not exceeded	-11%	-19%	-2.87	Thresholds not exceeded
16	A38/A4302/Metz Way	1%	1%	-5.73	Thresholds not exceeded	1%	1%	15.36	Thresholds not exceeded	3%	4%	-8.58	Thresholds not exceeded	-16%	-20%	-98.44	Thresholds not exceeded
17	A38/B4073 Painswick Road	2%	1%	0.00	Thresholds not exceeded	-5%	-3%	0.00	Thresholds not exceeded	-4%	-6%	0.00	Thresholds not exceeded	-18%	-25%	0.00	Thresholds not exceeded
18	A38/A4173/B4672/Reservoir Road	1%	2%	-0.72	Thresholds not exceeded	-1%	0%	-0.29	Thresholds not exceeded	-1%	-2%	-157.93	Thresholds not exceeded	-13%	-13%	-287.24	Thresholds not exceeded
19	A430/Bristol Road/Goodridge Avenue	0%	0%	-0.35	Thresholds not exceeded	2%	1%	13.45	Thresholds not exceeded	-1%	-2%	-1.24	Thresholds not exceeded	-27%	-27%	-198.47	Thresholds not exceeded
20	A38/B4008/Cole Avenue	2%	3%	78.47	**Delay threshold exceeded**	2%	1%	31.28	**Delay threshold exceeded**	2%	2%	-30.18	Thresholds not exceeded	-20%	-18%	-233.46	Thresholds not exceeded
22A	M5/A417 Jnc 11A (West of M5)	9%	12%	-32.88	Thresholds not exceeded	-1%	-2%	-1.41	Thresholds not exceeded	-4%	-6%	1.84	Thresholds not exceeded	-12%	-29%	-6.96	Thresholds not exceeded
22B	M5/A417 Jnc 11A (East of M5)	7%	18%	158.28	**Delay threshold exceeded**	-1%	0%	1.04	Thresholds not exceeded	-1%	0%	1.87	Thresholds not exceeded	-17%	-44%	-118.33	Thresholds not exceeded
23	M5/A40 Jnc 11	-12%	-9%	-5.78	Thresholds not exceeded	1%	1%	0.36	Thresholds not exceeded	3%	2%	0.89	Thresholds not exceeded	-3%	7%	2.55	Thresholds not exceeded
24	M5/B4008 Jnc 12	1%	3%	2.66	Thresholds not exceeded	-1%	-1%	-1.07	Thresholds not exceeded	-4%	-2%	-0.37	Thresholds not exceeded	-4%	4%	-0.89	Thresholds not exceeded

Stage 1 Model Outputs

Junction Totals
Where thresholds exceeded

Junction Ref	Junction	Junction Type	GCP SCENARIO RESULTS											
			GCP - DM			GCP - DM			GCP - DS7			GCP DS7		
			DM2AM			DM2PM			DS7_2_AM			DS7_2_PM		
			Actual Flow (pcu/hr)	V/C Ratio (%)	Delay (total) (sec)	Actual Flow (pcu/hr)	V/C Ratio (%)	Delay (total) (sec)	Actual Flow (pcu/hr)	V/C Ratio (%)	Delay (total) (sec)	Actual Flow (pcu/hr)	V/C Ratio (%)	Delay (total) (sec)
1	A38/A430/A417/Tewkesbury Road	Roundabout	862.41	44.1	12.32	1125.11	56.5	12.15	1225.93	62.5	11.38	849.29	38.9	10.48
			665.57	36.1	10.46	823.52	48.6	11.14	600.19	32.0	10.22	615.25	29.2	10.63
			683.91	51.1	11.58	777.6	63.5	12.92	484.02	34.0	10.01	363.42	24.5	9.7
			1129.91	50.4	10.09	1251.92	58.7	10.08	1115.31	46.3	10.01	873.96	36.8	9.52
1	A38/A430/A417/Tewkesbury Road	Roundabout	3341.8	46.1	44.45	3978.15	56.9	46.29	3425.45	47.9	41.62	2701.92	34.1	40.33
2	A430/Gouda Way/Worcester Street	Signals	630.74	59.0	41.74	371.28	32.9	33.7	632.96	59.3	41.8	313.12	27.7	33.02
			271.09	100.9	170.99	570.92	68.2	51.26	279.63	92.6	109.74	262.65	30.2	41.37
			872.29	52.9	34.25	832.24	80.9	61.45	716.86	43.5	30.58	399.64	38.8	41.97
			78.16	44.0	76.82	124.29	83.1	111.72	76.13	42.2	75.95	95.2	59.0	77.4
2	A430/Gouda Way/Worcester Street	Signals	1852.28	61.6	323.8	1898.73	67.8	258.13	1705.58	57.3	258.07	1070.61	35.3	193.76
3	A430/B4063/Northgate Street	Signals	705.09	41.2	34.16	752.14	37.2	26.99	714.23	41.8	34.43	452.11	22.4	28.05
			708.43	53.1	32.82	622.85	45.8	18.03	577.33	43.2	26.29	422.75	31.1	14.91
			1366.97	37.6	18.66	1393.83	43.8	26.36	1141.39	31.4	16.06	660.11	20.7	15.01
3	A430/B4063/Northgate Street	Signals	2780.49	42.5	85.64	2768.82	42.4	71.38	2432.95	37.3	76.78	1534.97	24.1	57.97
4	A430/A4302	Signals	752.1	54.8	48.45	1207.24	91.2	108.24	754.99	55.0	48.94	888.26	66.9	89.97
			973.65	42.8	31.45	1170.77	62.1	40.98	936.42	41.1	29.47	677.27	35.9	25.22
			981.8	38.8	27.4	1061.83	33.8	23.2	830.3	32.8	26.86	639.34	20.3	23.97
4	A430/A4302	Signals	2707.55	44.7	107.3	3439.84	63.6	172.42	2521.71	42.5	105.27	2204.87	43.9	139.16
5	A430/B4073/Eastgate Street	Signals	657.54	33.5	21.43	1281.06	69.7	32.53	681.73	34.9	21.6	838.99	45.7	25.41
			253.49	67.0	58.69	167.55	52.5	49.85	233.71	62.0	56.01	112.29	33.3	45.71
			896.7	45.5	22.76	1151.99	61.9	31.52	734.77	37.3	21	689.03	37.0	25.82
			234.17	51.9	47.19	360.16	83.1	63	198.54	42.2	44.48	289.14	58.3	46.42
5	A430/B4073/Eastgate Street		2041.9	45.1	150.07	2960.76	67.3	176.9	1848.75	40.0	143.09	1929.45	43.8	143.36
6	A4031/A430/Bristol Road	Signals	516.87	93.5	74.82	388.51	107.1	323.95	521.76	92.4	71.77	382.76	102.8	195.45
			746.71	70.1	66.54	789.58	53.2	43.14	677.71	63.6	59.42	660.05	43.5	39.9
			1382.16	73.8	39.88	1129.73	90.3	98.55	1271	67.8	40.56	829.83	66.3	53.12
			516.73	48.9	74.45	841.9	52.0	82.88	515.18	48.8	69.09	540.51	33.4	47.84
6	A4031/A430/Bristol Road	Signals	3162.47	72.1	255.69	3149.72	72.8	548.52	2985.65	67.9	240.84	2413.15	58.5	336.31
7	Bristol Road/Clifton Road	Signals	570.79	32.5	16.47	664	37.8	19.05	557.29	31.8	16.18	580.28	33.1	16.69
			592.79	100.9	111.57	538.06	91.7	50.6	524.36	89.3	45.13	389.34	66.7	27.06
			867.21	45.7	13.25	843.09	59.2	18.33	881.73	48.7	14.18	720.26	48.5	16.3
7	Bristol Road/Clifton Road	Signals	2030.79	58.1	141.29	2045.15	60.8	87.98	1963.38	54.8	75.49	1689.88	47.4	60.05
8	A430/Spinnaker Road	Signals	0	0.0	157.33	0	0.0	157.33	0	0.0	157.33	0	0.0	157.33
			1191.4	64.8	27.19	1359.65	72.5	31	1185.31	64.5	27.07	1090.73	57.5	25.52
			561.53	43.2	59.44	589.07	45.5	70.19	533.98	41.1	60.34	437.51	33.8	53.57
			1968.06	93.2	70.22	1575.27	74.6	31.94	1891.74	89.6	71.33	1298.94	61.5	27.38
8	A430/Spinnaker Road	Signals	3720.99	76.6	314.18	3523.99	68.9	290.46	3611.03	74.2	316.07	2827.18	55.6	263.8
9	A430/Lanthony Road	Signals	776.05	92.3	51.52	780.38	92.8	54.87	840.34	99.9	92.08	799.53	95.1	62.8
			525.26	60.6	39.73	734.11	86.7	135.85	460.14	47.2	36.92	326.62	33.5	34.54
			2064.45	93.8	54.99	1977.61	99.0	114.9	1992.34	61.3	47.88	1621.98	49.9	8.25
9	A430/Lanthony Road	Signals	3365.76	88.3	146.24	3492.1	95.0	305.62	3292.82	69.2	176.88	2748.13	61.1	105.59
10	A417/A4301 - St Oswalds Rd approach	Free flow gyratory	1581.28	42.1	1.75	1491.69	41.3	2.01	1465.54	40.6	2.09	1066.36	29.3	2.05
11	A4301/A417 - Westgate St approach	Free flow gyratory	646.38	58.6	12.22	988.54	34.6	8.43	577.83	49.5	10.7	613.1	21.0	3.38
12	A417/A430 Castle Meads Way	Signals	1717.81	68.6	42.84	1364.46	53.8	41.3	2093.81	79.0	46.26	1560.41	59.2	40.79
			35.39	26.7	79.15	15.83	12.0	75.37	33.53	46.4	110.83	10.94	15.2	93.82
			841.64	83.5	209.91	879.02	85.7	621.23	866.84	70.0	180.02	764.03	68.6	174.16
			1638.66	59.6	44.33	1640	59.6	21.26	1522.45	56.1	71.76	1608.63	56.4	19.37
12	A417/A430 Castle Meads Way	Signals	4233.5	67.7	376.23	3899.31	63.3	759.16	4516.63	69.3	408.87	3944.01	59.7	328.14
13	A40/A417/B4063	Signalised Roundabout	1131.88	82.0	18.94	880.34	63.8	11.22	0	0.0	0	0	0.0	0
			2344.13	63.0	3.35	2415.29	64.9	3.56	1251.6	24.5	1.84	1312.98	25.5	1.91
			16.61	19.1	104.27	32.28	27.7	206.96	0	0.0	0	0	0.0	0
			1507.04	40.5	4.37	2080.42	55.9	9.02	1224.81	32.9	2.75	1866.69	50.2	7.07
			1380	34.5	0	1220.44	30.5	0	1380	34.5	0	815.46	20.4	0
			2059.19	55.4	13.56	1466.42	39.4	6.41	1355.06	36.4	3.46	727.78	19.6	1.29
13	A40/A417/B4063	Signalised Roundabout	8438.85	54.9	144.49	8095.19	52.5	237.17	5211.47	32.2	8.05	4722.91	33.5	10.27
14	A417/Corinium Avenue/Barnett way	Signalised Roundabout	1468.98	39.5	0.47	1657.29	44.6	0.62	1470.83	26.2	1.76	1710.62	29.9	2.22
			2414.03	64.9	2.45	2197.22	59.1	1.98	2096.11	57.7	1.86	1190.47	32.5	1
			2203.66	67.2	12.18	2081.4	63.5	10.94	2471.34	75.4	15.61	1881.9	57.4	8.66
			252.49	4.2	0	816.69	13.6	0	241.75	4.0	0	595.36	9.9	0
14	A417/Corinium Avenue/Barnett way	Signalised Roundabout	6339.16	57.4	15.1	6752.6	51.4	13.54	6280.03	55.2	19.23	5378.35	37.9	11.88
15	Corinium Avenue/Barnwood Road/Eastern Avenue	Signalised Roundabout	1262.3	31.6	0	1150.68	28.8	0	1162.29	29.1	0	1056.75	26.4	0
			1318.41	44.6	13.08	2119.62	71.7	19.77	1581.92	53.5	15.34	1602.04	54.2	13.98
			638.45	31.9	0	480.04	24.0	0	512.37	25.6	0	306.64	15.3	0
			1252.1	20.9	0	1169.22	19.5	0	1101.14	18.4	0	1296.95	21.6	0
15	Corinium Avenue/Barnwood Road/Eastern Avenue	Signalised Roundabout	4471.26	32.5	13.08	4919.56	44.6	19.77	4357.72	34.8	15.34	4262.38	34.6	13.98
16	A38/A4302/Metz Way	Signals	667.71	38.9	110.85	916.73	47.7	131.56	651.71	37.4	74.2	850.01	45.0	50.21
			903.79	35.1	58.66	1415.6	54.8	77.7	959.3	37.1	60.31	1159.37	41.8	64.54
			937.49	31.5	44.7	728.96	25.9	37.16	927.49	30.9	42.29	468.04	15.9	30.85
			1585.74	52.2	47.28	1235.42	40.1	44.38	1443.81	47.3	48.18	950.84	29.5	39.51
16	A38/A4302/Metz Way	Signals	4094.73	41.5	261.49	4296.71	44.2	290.8	3982.31	39.4	224.98	3428.26	35.6	185.11
17	A38/B4073 Painswick Road	Roundabout	454.02	22.7	0	984.93	49.3	0	724.74	36.2	0	792.2	39.6	0
			1243.47	31.1	0	1446.69	36.2	0	1202.65	30.1	0	1283.67	32.1	0
			753.84	37.7	0	440.34	22.0	0	707.92	35.4	0	454.52	22.7	0
			1066.93	26.7	0	929.1	23.2	0	887.34	22.2	0	942.7	23.6	0
17	A38/B4073 Painswick Road	Roundabout	3518.26	30.1	0	3801.06	34.8	0	3522.65	30.4	0	3473.09	30.3	0
18	A38/A4173/B4672/Reservoir Road		1034.39	51.7	0	704.89	35.2	0	920.34	98.4	107.08	685.55	87.1	78.27
			730.9	72.4	12.99	836.58	82.8	16.59	409.53	96.3	133.9	385.07	82.3	90.67
		Roundabout (in DM), Signalised Junction in (DS7)	743.05	37.2	0	746.98	37.4	0	871.16	99.9	122.33	855.51	89.4	73.71
			217.34	21.5	1.56	334.37	33.1	3.34	0	0.0	0	0	0.0	0
			1006.72	54.1	16.07	914.7	49.2	13.54	460.55	103.1	214.11	407.13	87.0	95.31
18	A38/A4173/B4672/Reservoir Road	Roundabout (in DM), Signalised Junctio	3732.4	51.8	30.62	3537.52	50.3	33.47	2661.58	99.4	577.42	2333.26	87.1	337.96
19	A430/Bristol Road/Goodridge Avenue	Signals	2525.76	53.0	29.4	1996.78	44.1	32.82	2634.5	55.2	29.87	1727.65	38.2	30.12
			69.84	51.4	79.71	220.61	89.1	98.92	71.04	52.6	80.5	143.74	58.7	65.34
			965.53	51.5	43.53	895.5	55.4	57.88	956.47	51.0	44.42	765.38	47.4	48.01
			532.94	32.8	26.29	1013.76	65.5	35.4	588.85	36.3	26.55	894.87	57.8	31.94
19	A430/Bristol Road/Goodridge Avenue	Signals	4094.07	50.0	178.93	4126.65	54.2	225.02	4250.86	51.6	181.34	3531.64	46.0	175.41
20	A38/B4008/Cole Avenue	Signals	1406.18	78.1	109.28	1318.07	55.2	147.67	1313.87	49.5	148.74	895.18	30.9	194.01
			1383.82	46.5	55.93	1859.78	68.9	136.35	328.59	20.1	50.06	323.95	19.2	46.02
			1190.39	107.1	278.92	1022.16	99.1	168.49	1350.69	51.2	37.12	808.97	34.4	35.91
			2434.42	85.2	179.55	2124.58	78.7	116.73	799.24	62.0	60.01	803.98	55.8	52.86
20	A38/B4008/Cole Avenue	Signals	6414.81	79.3	623.68	6324.59	74.2	569.24	3792.39	50.2	295.93	2832.08	37.6	328.8
22A	M5/A417 Jnc 11A (West of M5)	Motorway interchange	1147.17	27.0	3.74	1274.7	33.1	3.92	1071.55	24.6	3.58	1284.07	29.5	3.43
			2040.53	76.8	137.16	1619.47	58.2	20.68	2137.45	69.2	36.01	1404.29	39.7	16.16
			621.72	15.5	0.08	744.97	18.6	0.14	478.16	12.0	0.04	623.79	15.6	0.08
22A	M5/A417 Jnc 11A (West of M5)	Motorway interchange	3809.42	51.8	140.98	3639.14	41.3	24.74	3687.16	48.8	39.63	3312.15	31.2	19.67
22B	M5/A417 Jnc 11A (East of M5)	Motorway interchange	883.75	58.3	5.87	506.93	34.4	5.11	868.19	68.0	7.41	472.65	29.9	4.8
			745.28	77.6	13.19	985.43	64.5	8.06	781.68	73.6	11.22	745.28	47.2	6.36
			497.62	78.0	44.02	657.96	68.0	22.14	527.82	71.5	26.67	381.85	32.3	10.35
			1184.98	106.0	144.09	693.5	69.9	10.24	772.01	74.5	10.73	674.85	51.8	6.54
22B	M5/A417 Jnc 11A (East of M5)	Motorway interchange	3311.63	82.7	207.17	2843.82	61.2	45.55	2949.7	71.8	56.03	2274.63	42.5	28.05
23	M5/A40 Jnc 11	Grade separated junction	1050.72	54.3	8.79	768.77	50.2	10.46	781.47	39.3	6.73	870.79	42.7	7.23
			975.35	48.1	10.05	942.48	40.6	6.59	813.5	67.8	32.7	982.41	81.9	37.96
			765.44	25.5	4.38	1826.43	64.8	7.7	344.74	9.8	3.71	471.23	18.5	4.64
			963.51	72.3	31.71	813.18	61.0	28.9	1084.86	54.2	30.13	448.56	22.4	24.09
23	M5/A40 Jnc 11	Grade separated junction	3755.02	51.4	54.93	4350.86	56.3	53.65	3024.57	49.0	73.27	2772.99	49.2	73.92
24	M5/B4008 Jnc 12	Grade separated junction	458.87	22.9	0	597.92	29.9	0	570.27	28.5	0	368.25	18.4	0
			35.88	6.3	16.99	8.6	5.7	31.31	34.51	6.1	16.97	7.99	1.4	16.6
			714.08	83.5	25.18	517.45	46.9	7.15	639.21	74.7	20.18	598.75	70.0	18.49
			1086.44	61.7	24.93	858.77	47.2	20.94	1035.61	58.8	21.79	699.59	38.5	16.63
24	M5/B4008 Jnc 12	Grade separated junction	2295.27	59.9	67.1	1982.74	41.7	59.4	2279.6	54.9	58.94	1674.58	45.1	51.72

Appendix C. Sustainability Assessment

Land at the Wheatridge

SA01

20 minutes
40 minutes
60 minutes

40 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

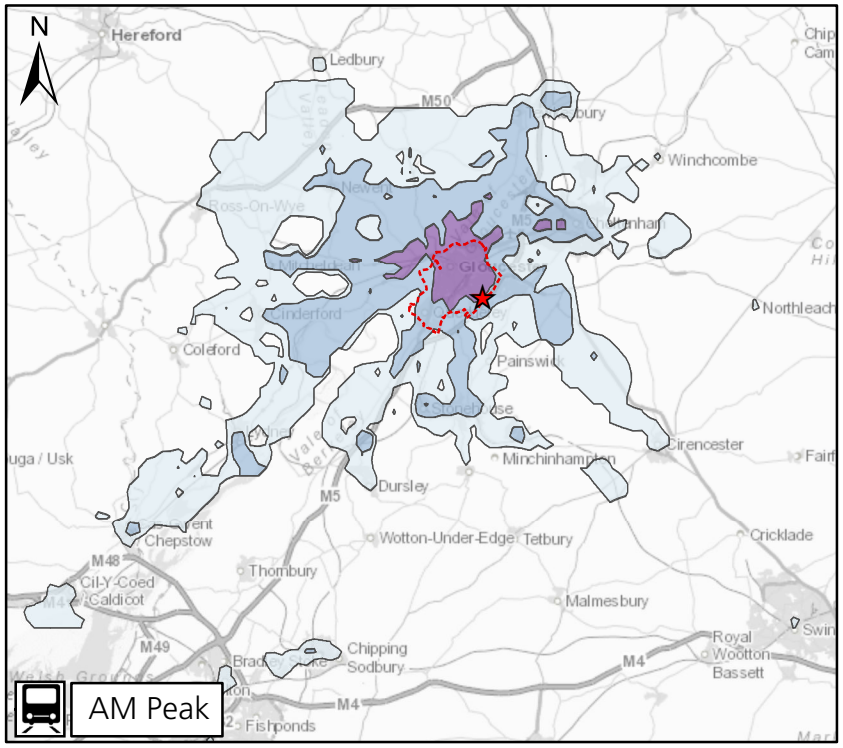
10 minutes **5 minutes** to a primary school

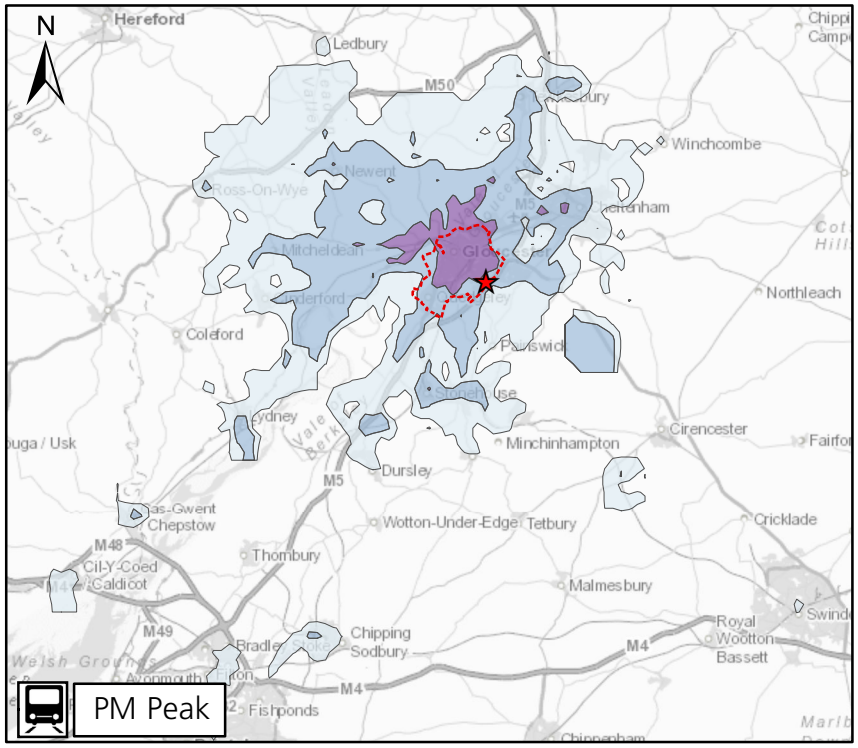
30+ minutes **20 minutes** to Gloucester city centre

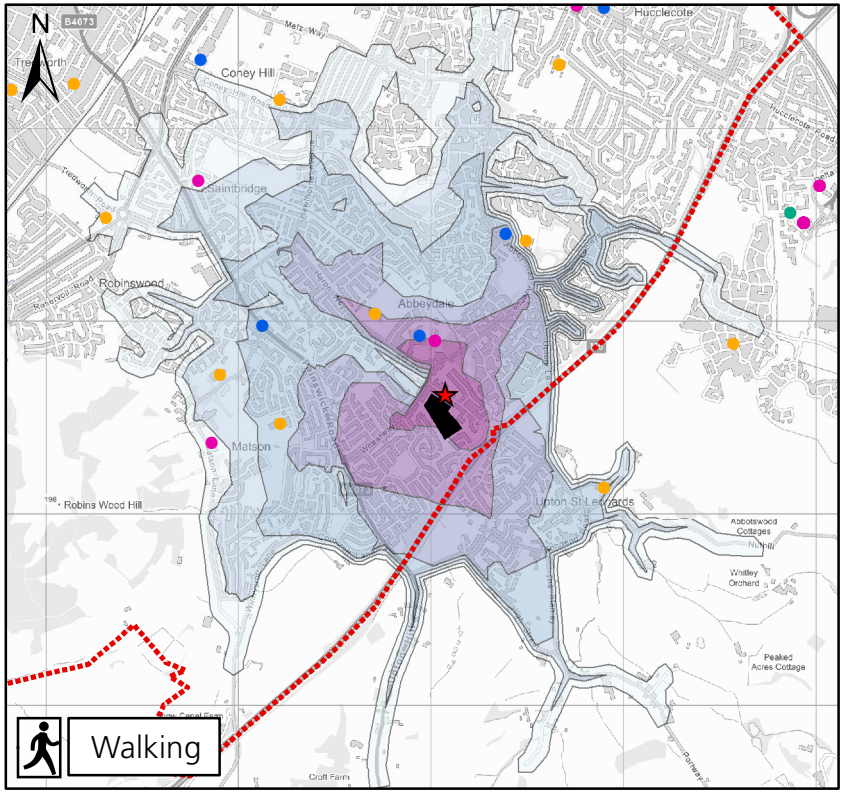
30+ minutes **15 minutes** to other local centres of employment

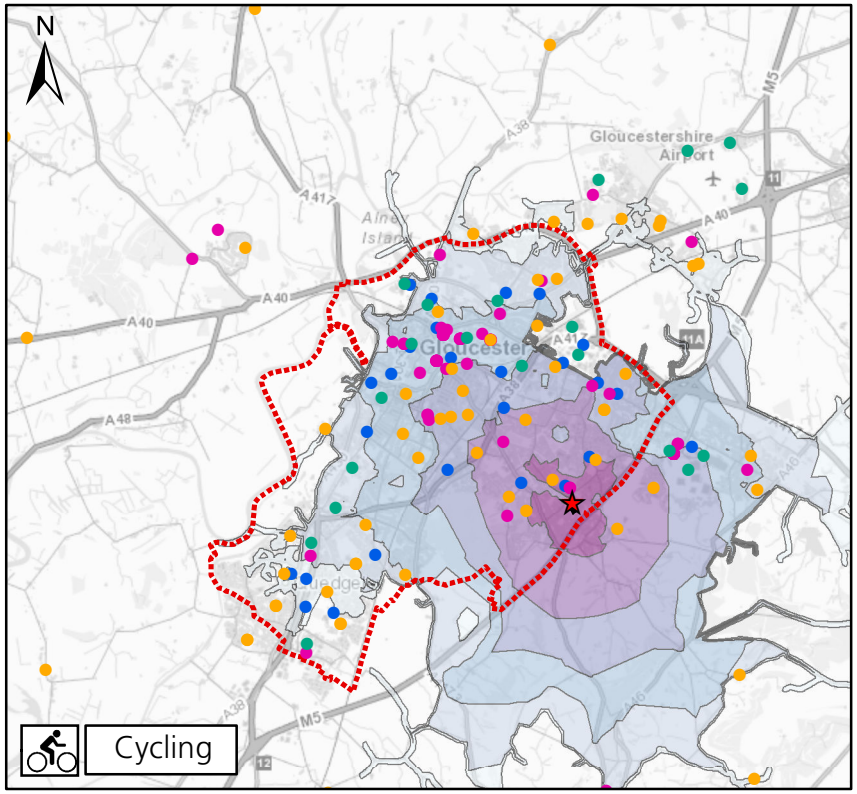
5 minutes **5 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Barnwood Manor

SA02

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

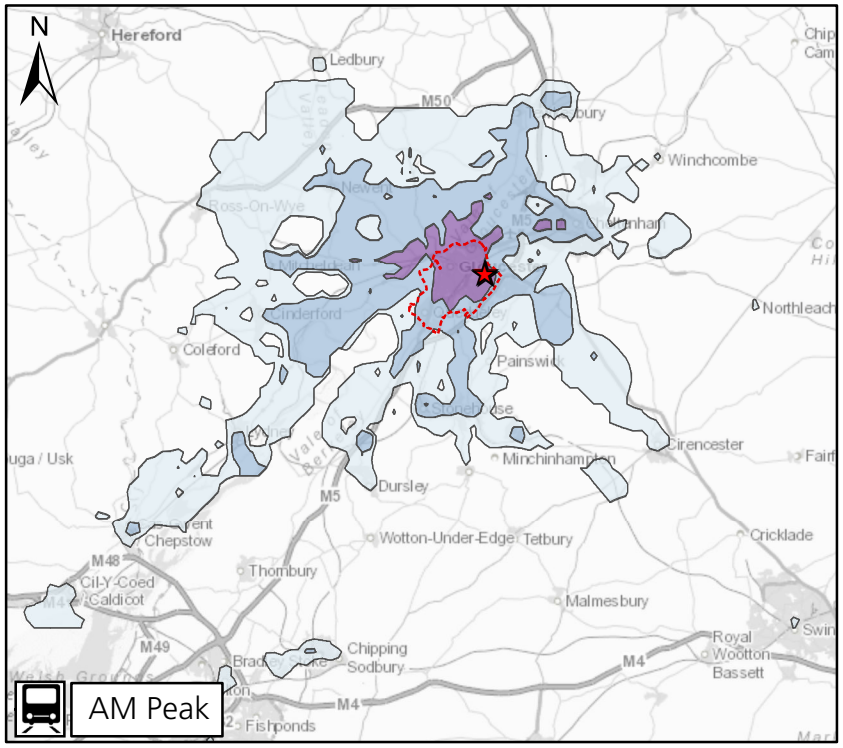
10 minutes **5 minutes** to a primary school

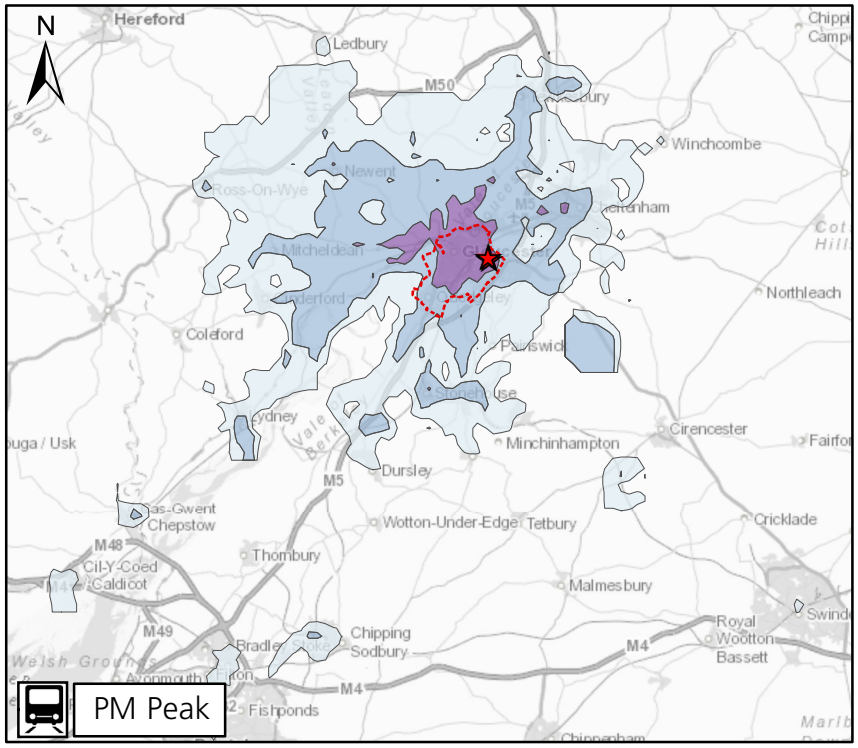
30+ minutes **5 minutes** to Gloucester city centre

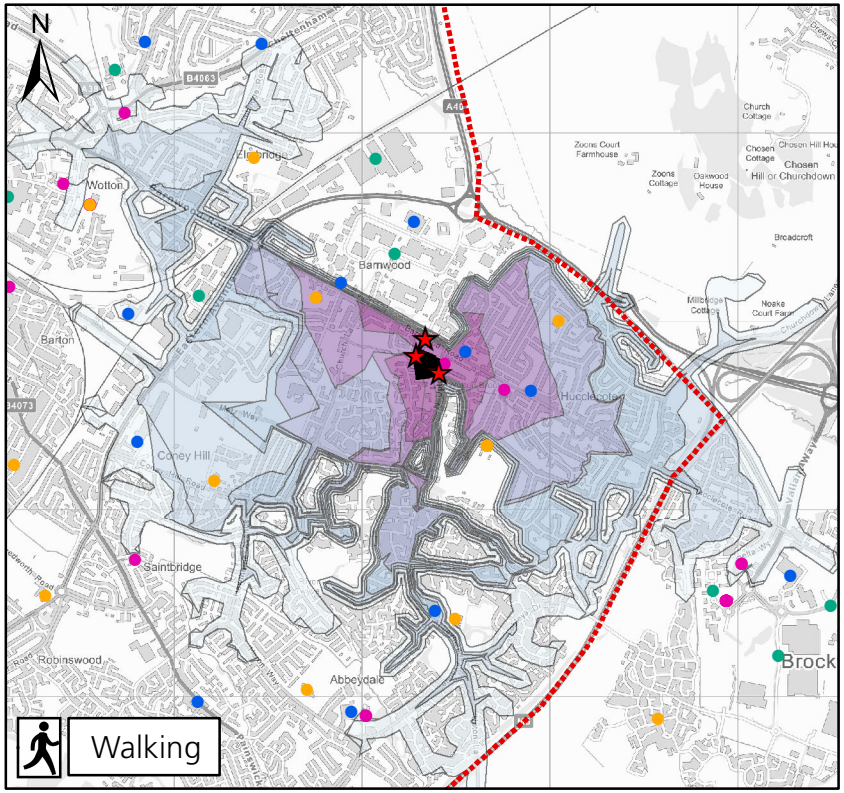
10 minutes **5 minutes** to other local centres of employment

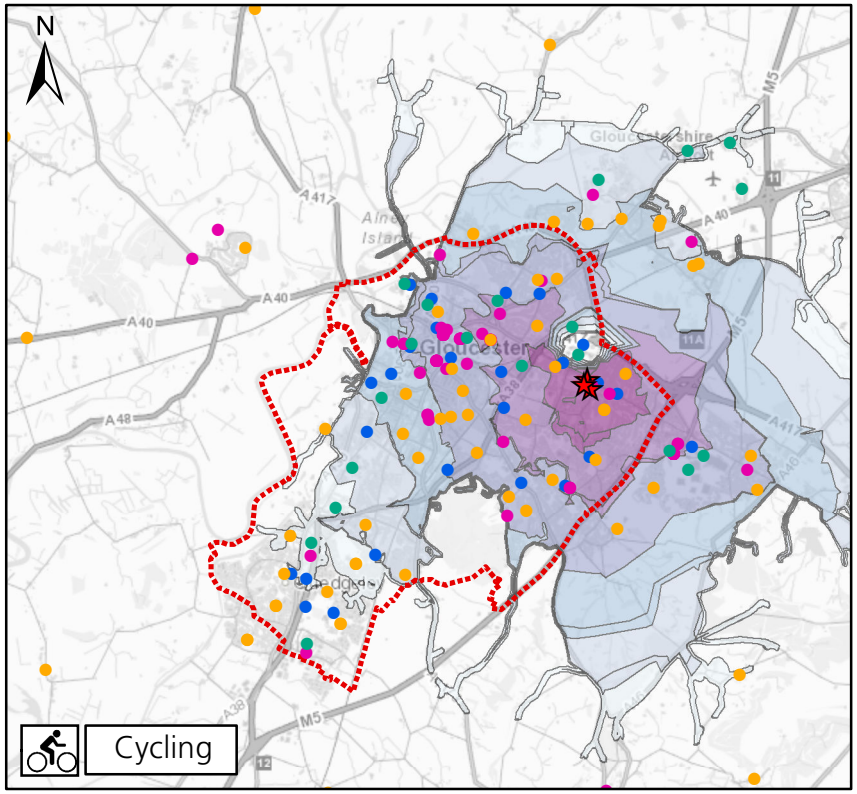
5 minutes **5 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









67-69 London Road, Prospect House

SA03

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes, 5 minutes to healthcare provision

10 minutes, 5 minutes to a primary school

15 minutes, 5 minutes to Gloucester city centre

10 minutes, 5 minutes to other local centres of employment

5 minutes, 5 minutes to local retail provision

Indicative Site Access

City Plan Allocations

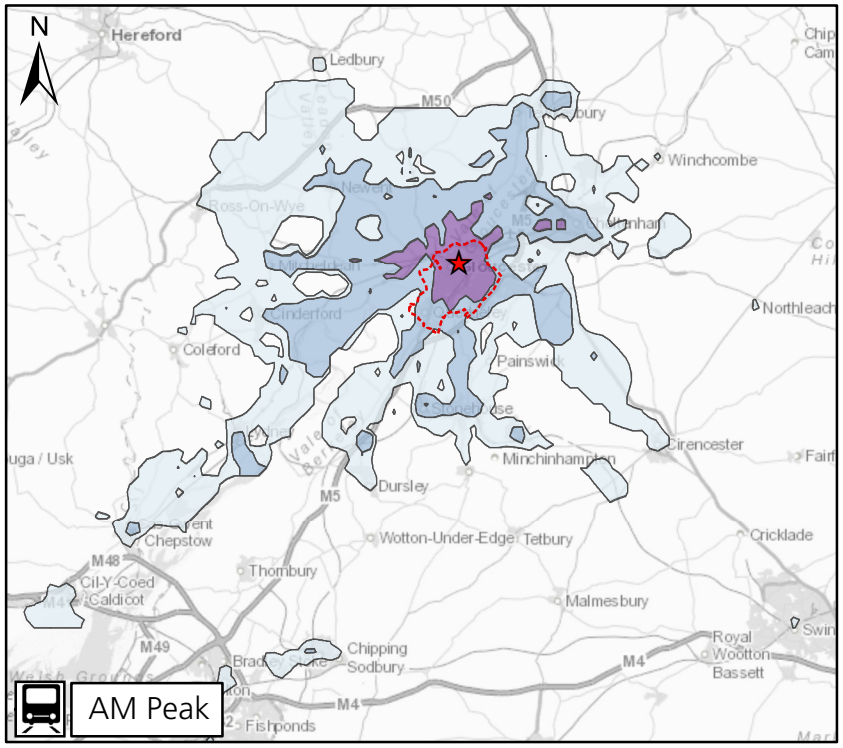
Local retail provision

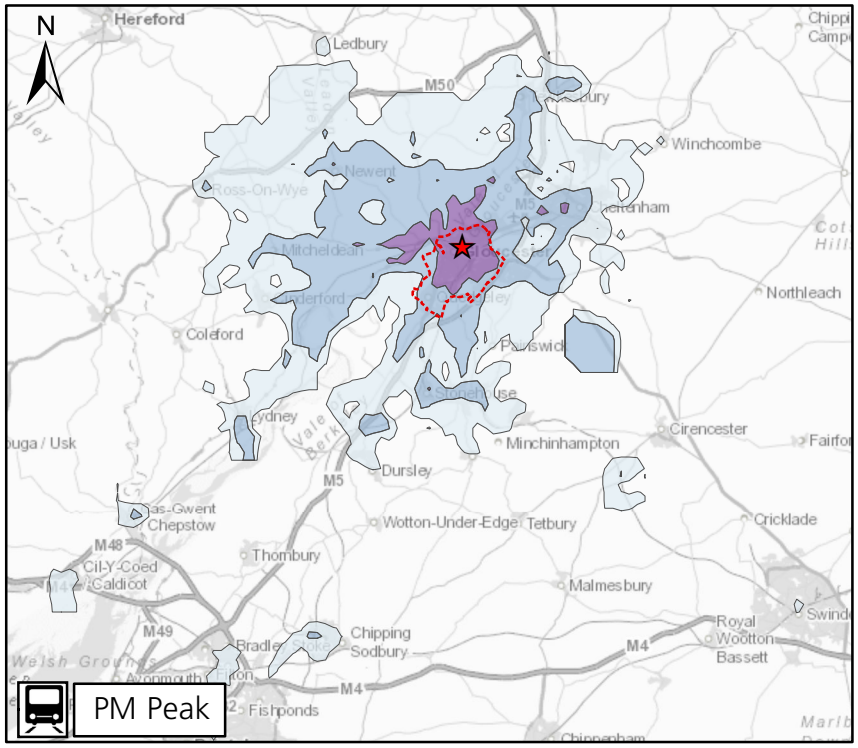
Employment sites

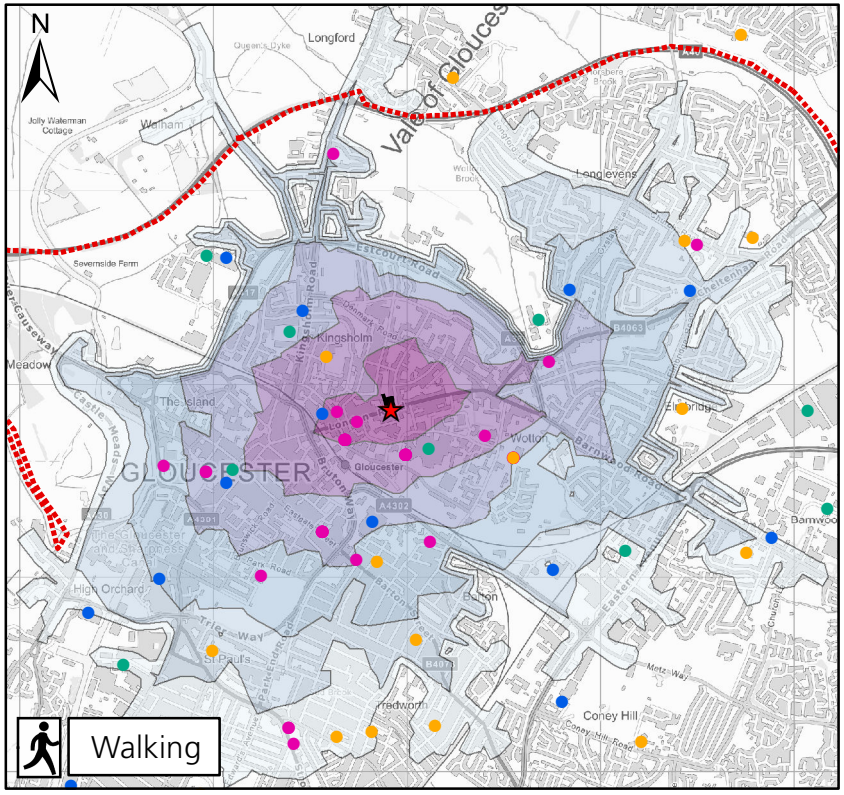
Primary School

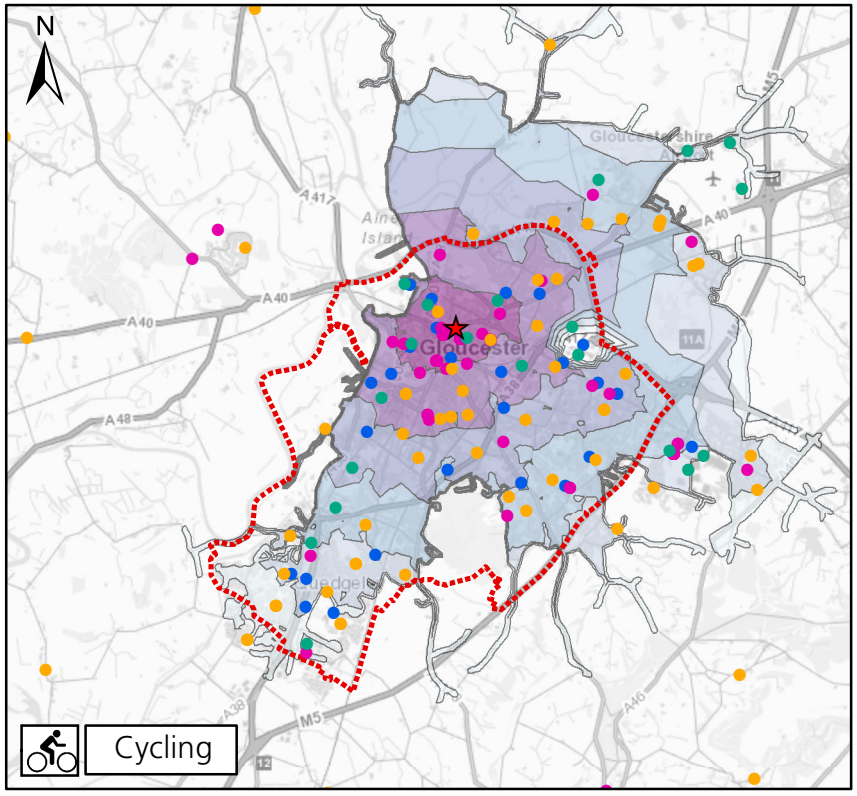
Healthcare provision

Gloucester City Boundary









Wessex House, Great Western Road

SA04

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes, 5 minutes to healthcare provision

10 minutes, 5 minutes to a primary school

10 minutes, 5 minutes to Gloucester city centre

10 minutes, 5 minutes to other local centres of employment

5 minutes, 5 minutes to local retail provision

Indicative Site Access

City Plan Allocations

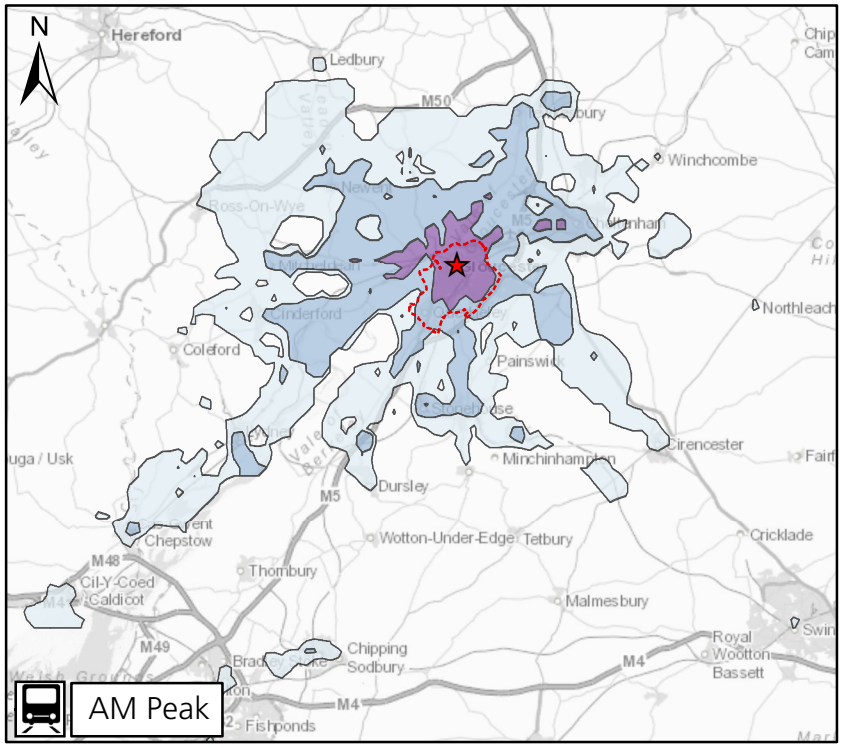
Local retail provision

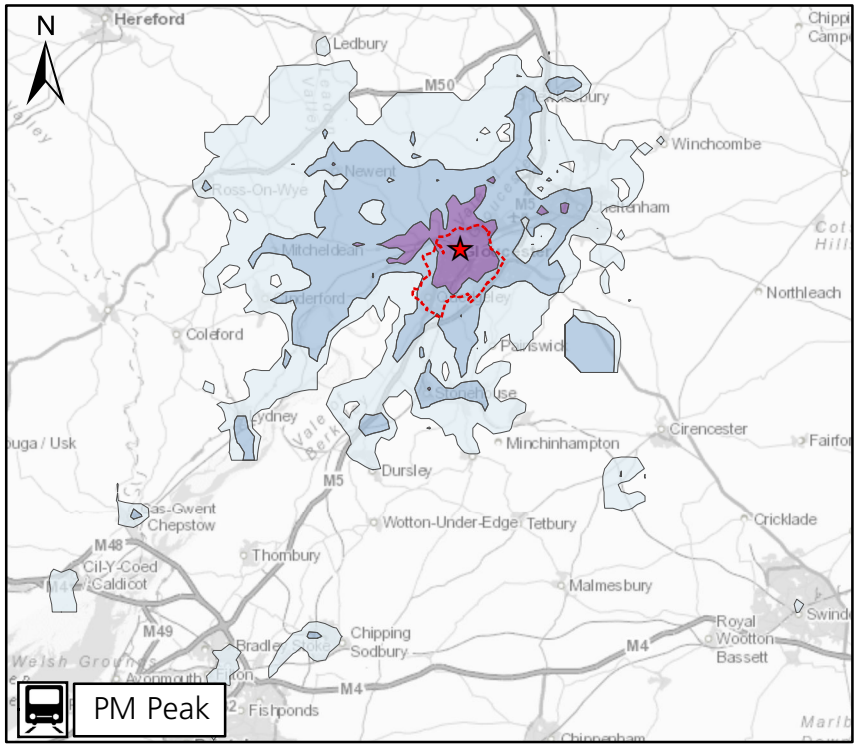
Employment sites

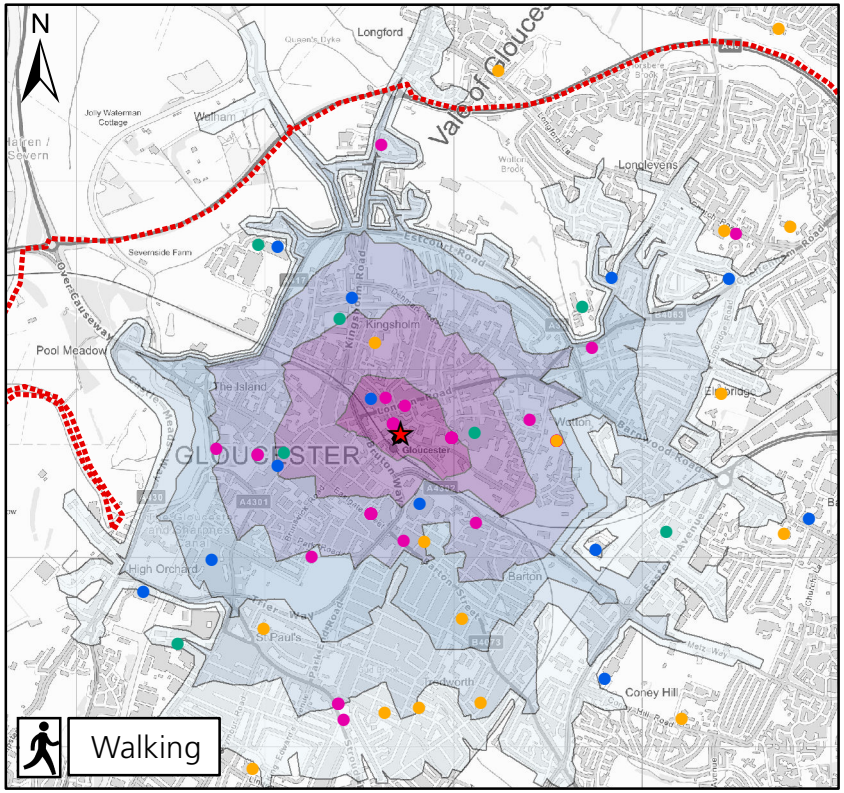
Primary School

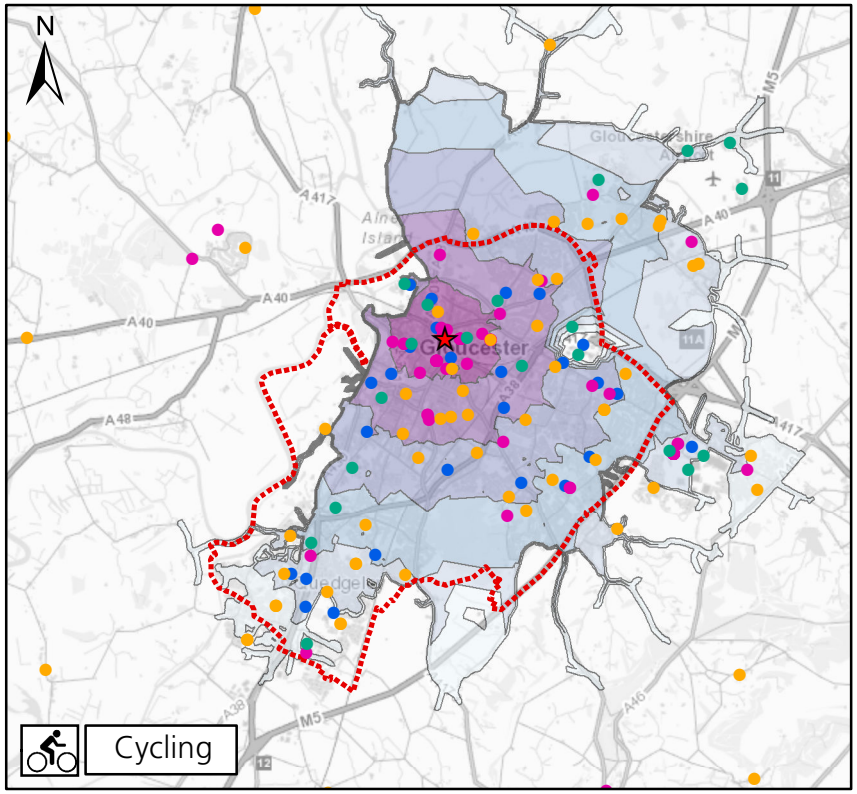
Healthcare provision

Gloucester City Boundary









Great Western Road Sidings

SA05

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

10 minutes **5 minutes** to a primary school

15 minutes **5 minutes** to Gloucester city centre

5 minutes **5 minutes** to other local centres of employment

10 minutes **5 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

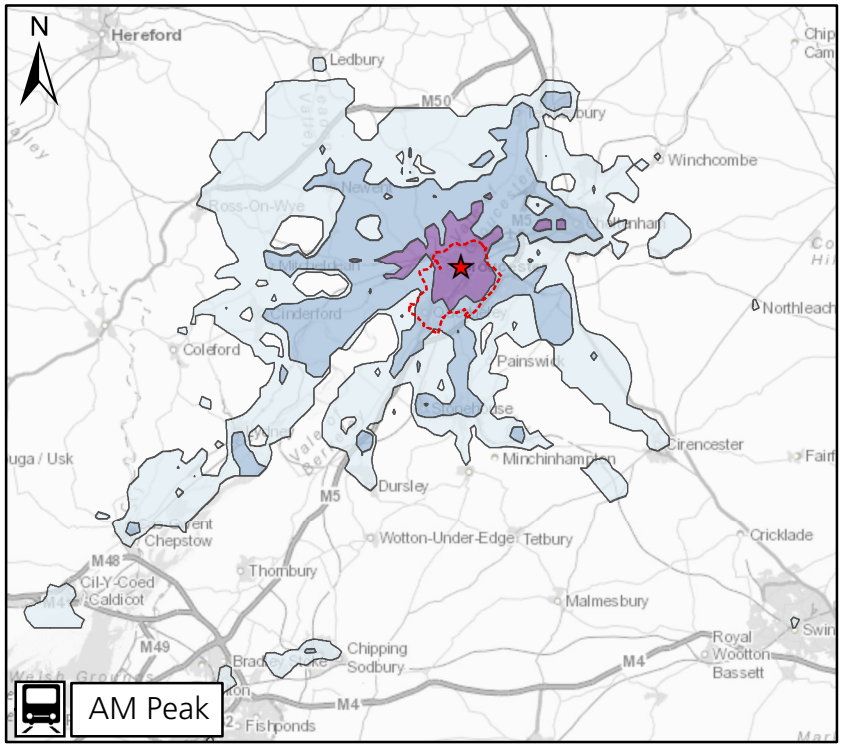
Local retail provision

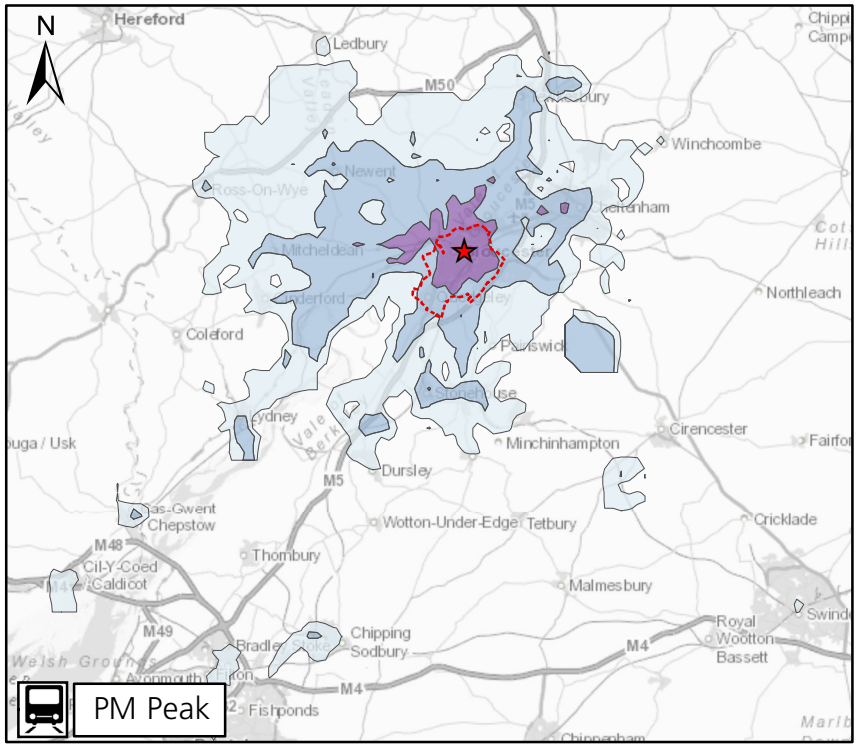
Employment sites

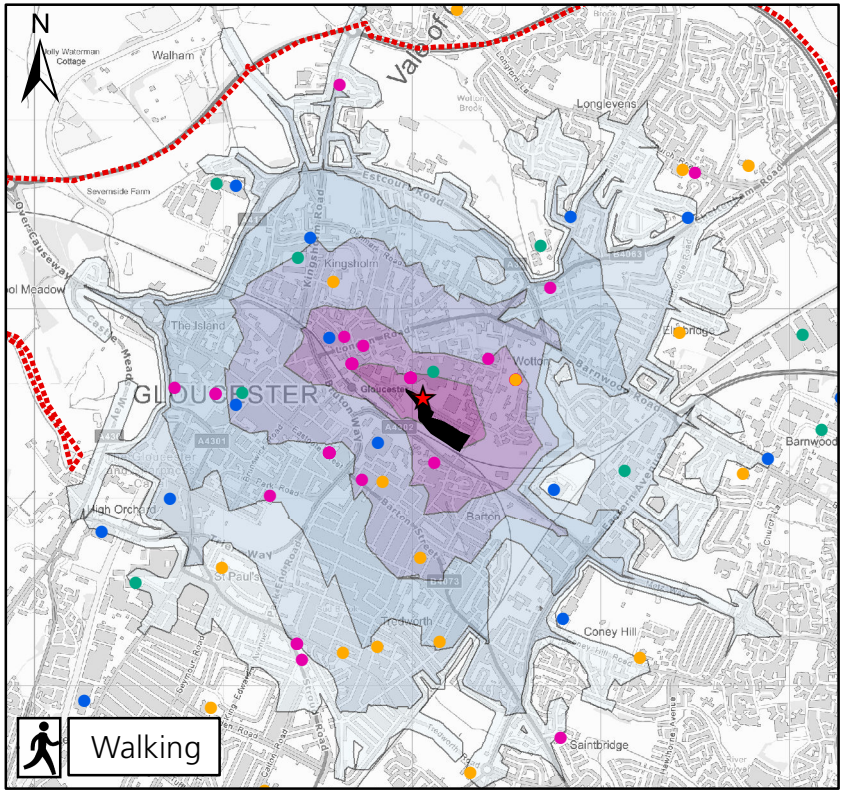
Primary School

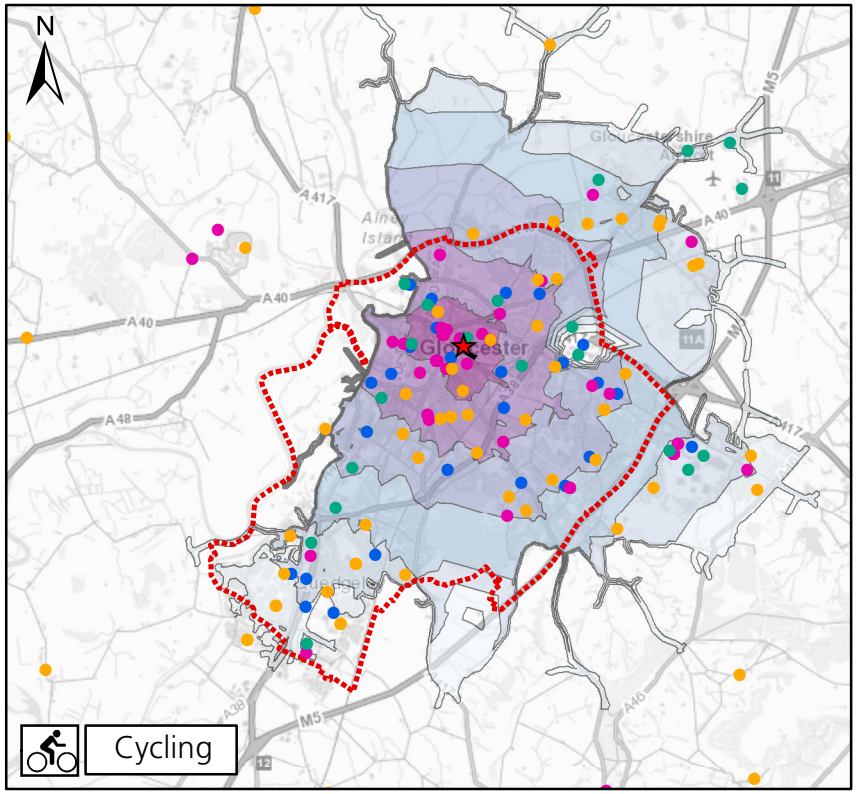
Healthcare provision

Gloucester City Boundary









Blackbridge Sports Hub (Sports)

SA06

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

25 minutes **10 minutes** to healthcare provision

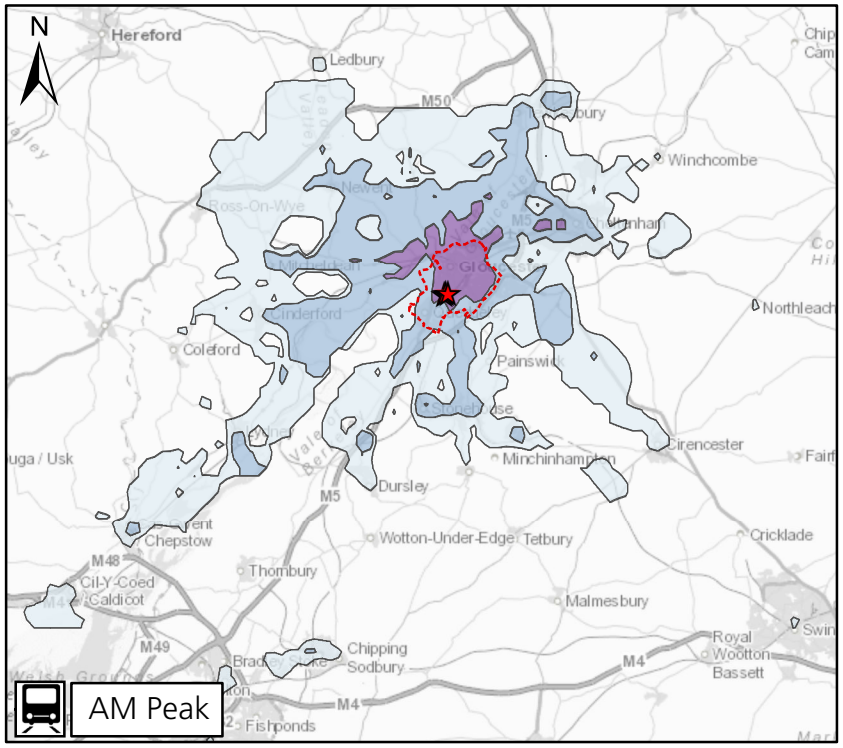
15 minutes **5 minutes** to a primary school

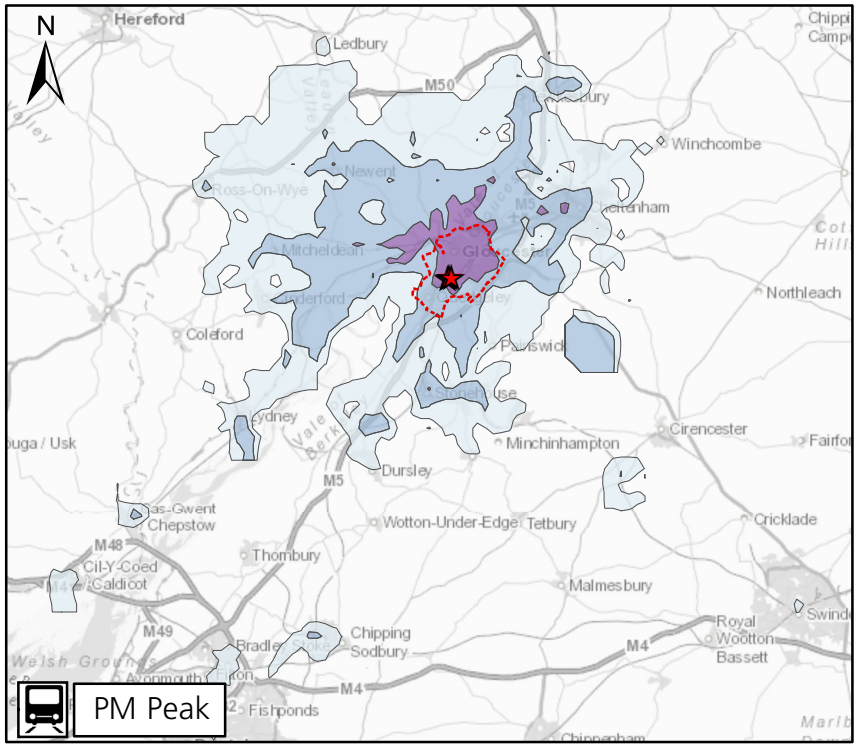
30+ minutes **15 minutes** to Gloucester city centre

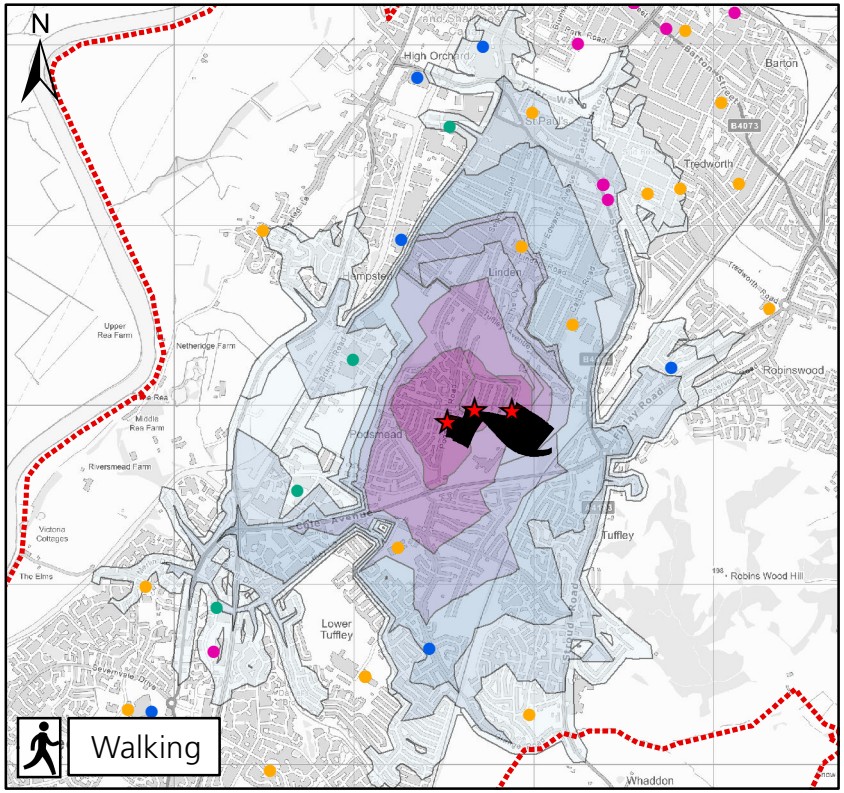
25 minutes **10 minutes** to other local centres of employment

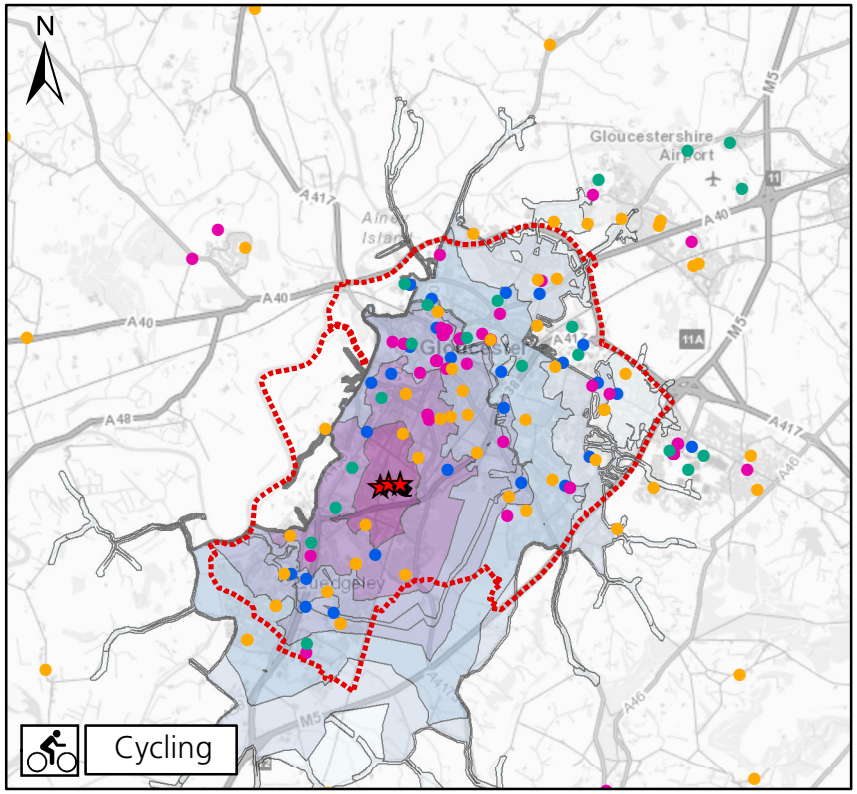
15 minutes **10 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Land East of Waterwells

SA07

20 minutes
40 minutes
60 minutes

40 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

30 minutes **10 minutes** to a primary school

30+ minutes **30 minutes** to Gloucester city centre

5 minutes **5 minutes** to other local centres of employment

20 minutes **10 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

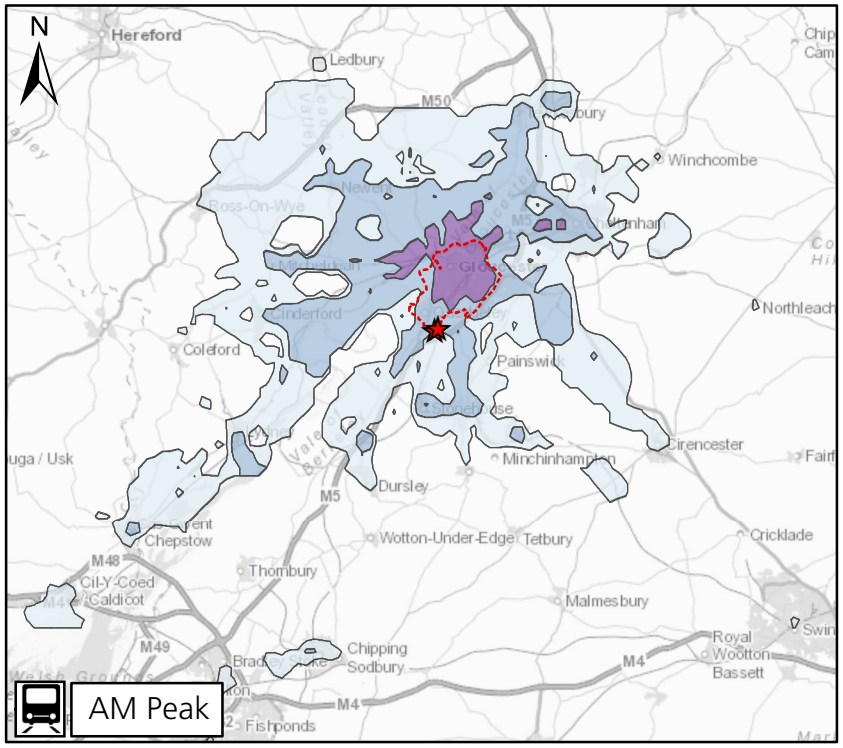
Local retail provision

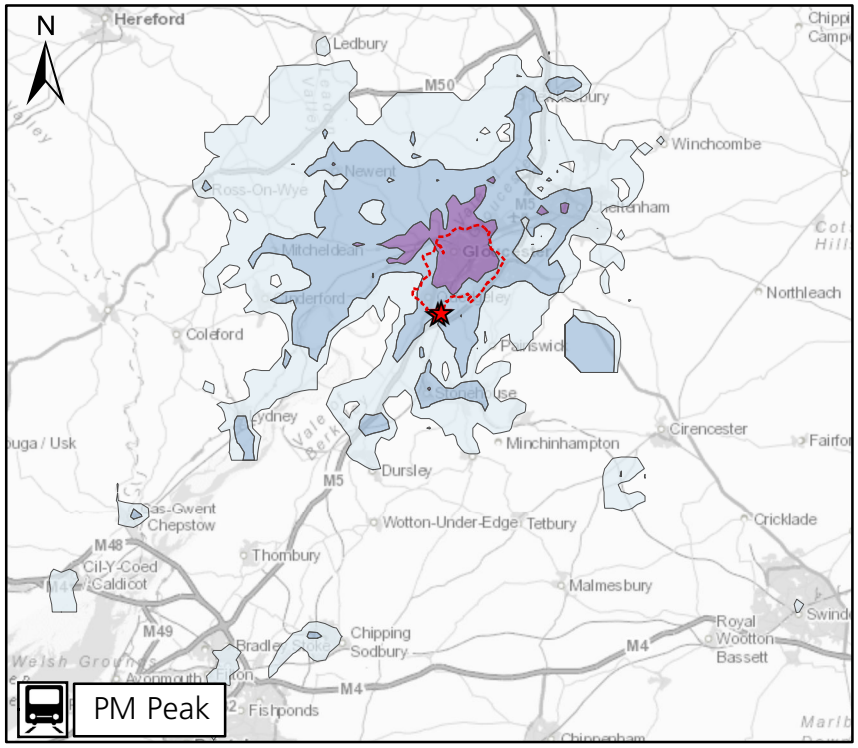
Employment sites

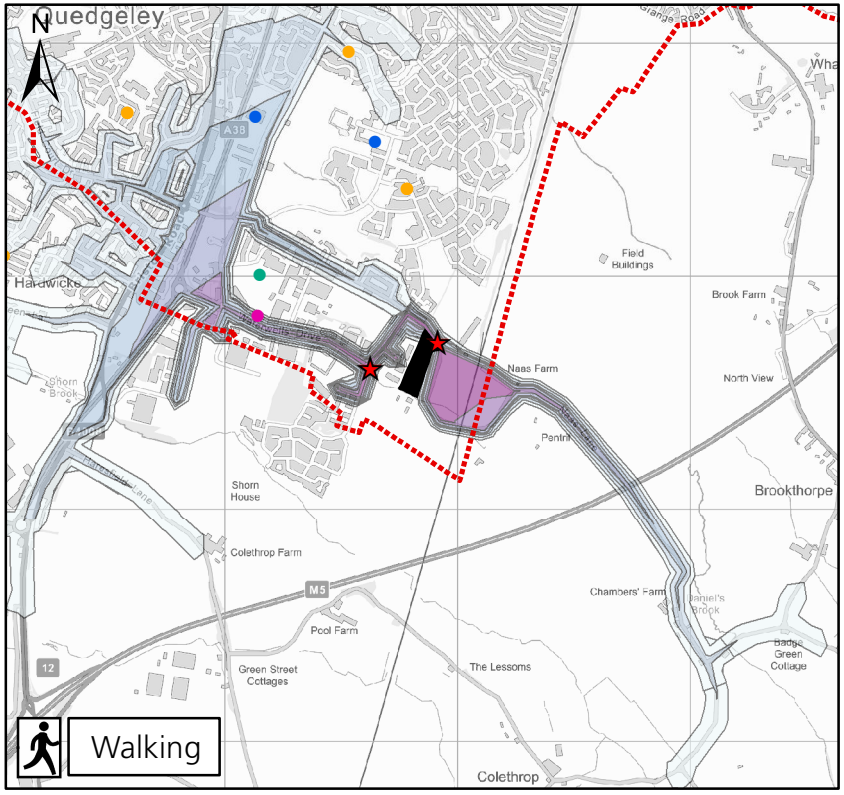
Primary School

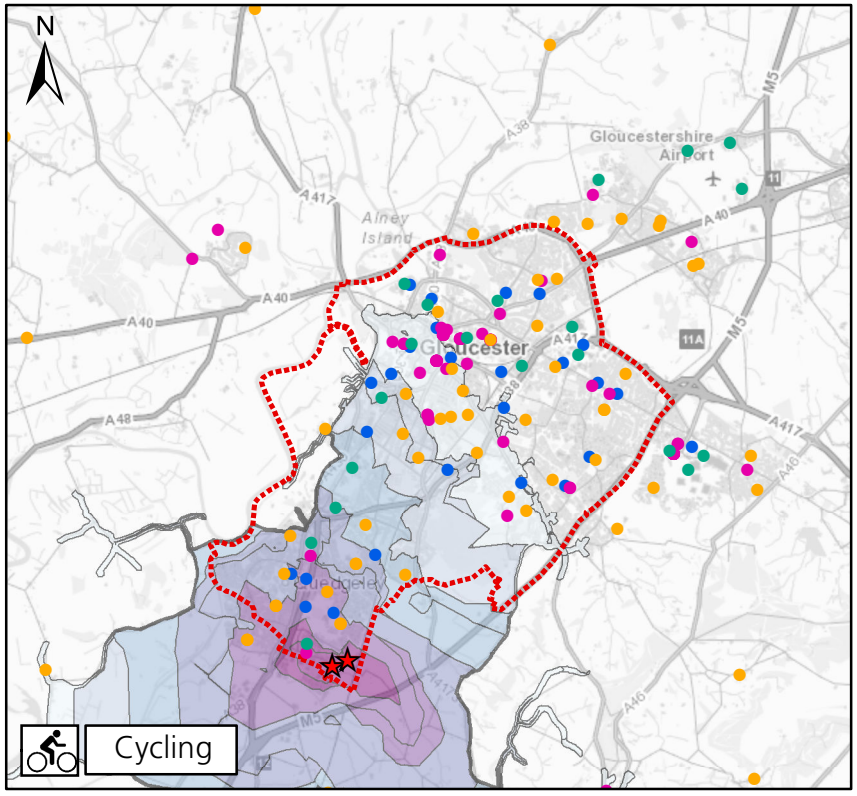
Healthcare provision

Gloucester City Boundary









Kings Quarter

SA08

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

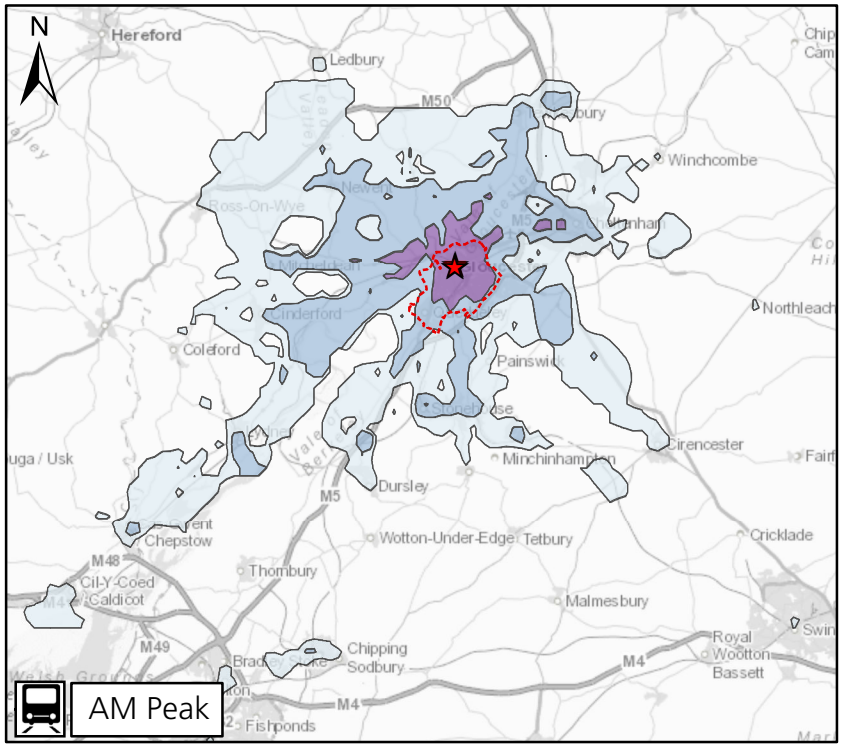
10 minutes **5 minutes** to a primary school

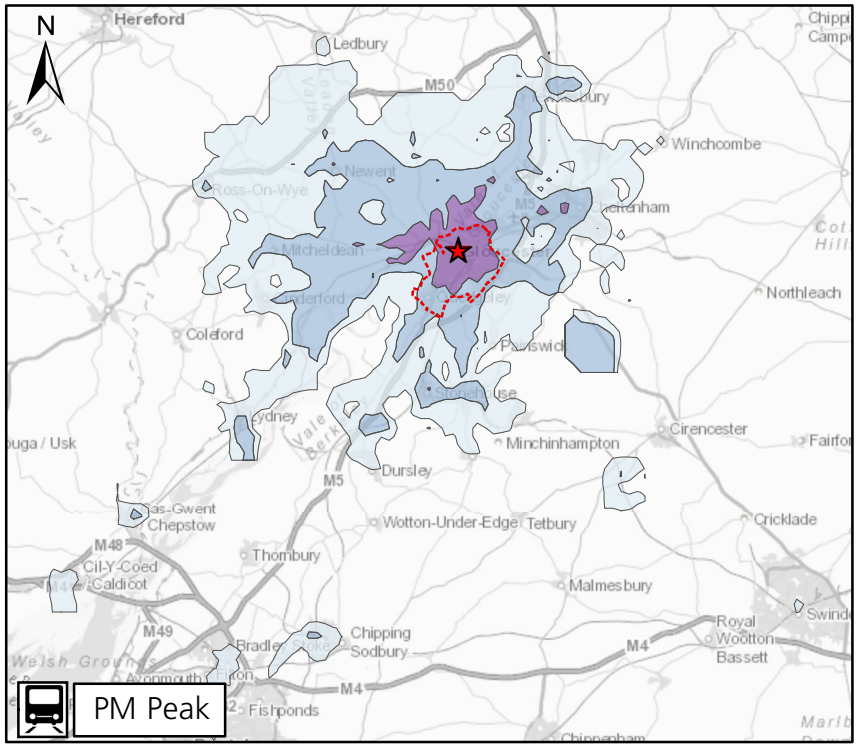
10 minutes **5 minutes** to Gloucester city centre

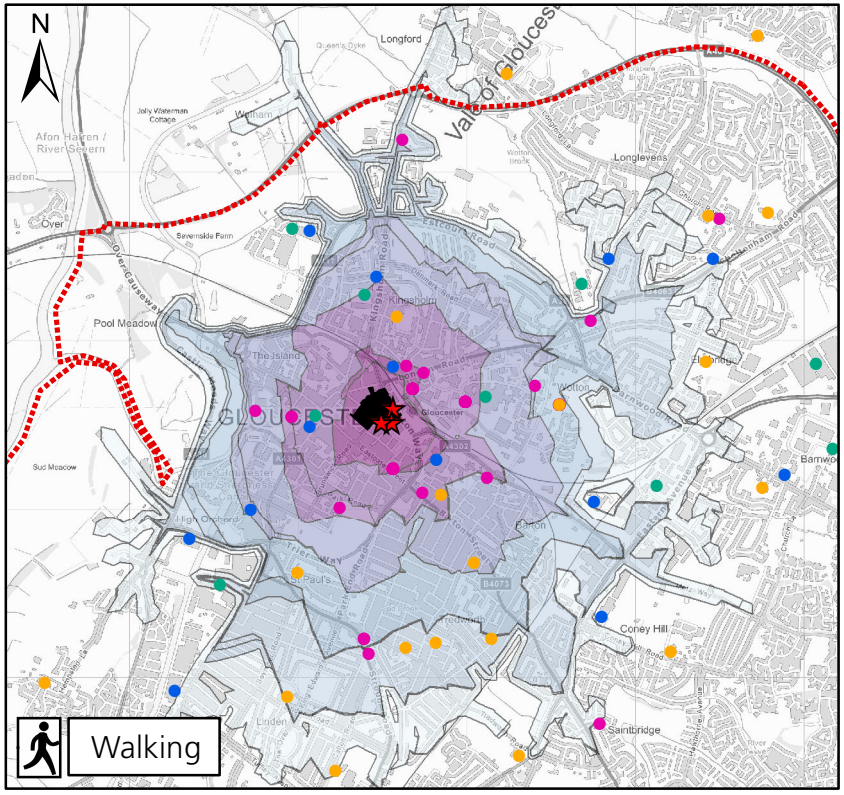
10 minutes **5 minutes** to other local centres of employment

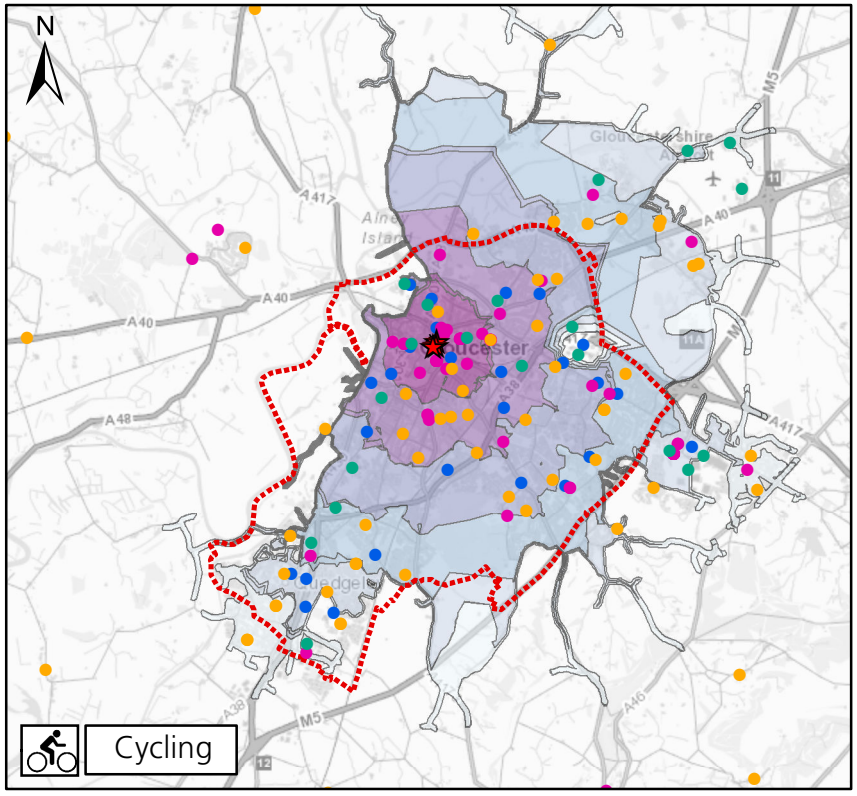
5 minutes **5 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Greater Blackfriars

SA09

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

15 minutes **5 minutes** to a primary school

5 minutes **5 minutes** to Gloucester city centre

5 minutes **5 minutes** to other local centres of employment

5 minutes **5 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

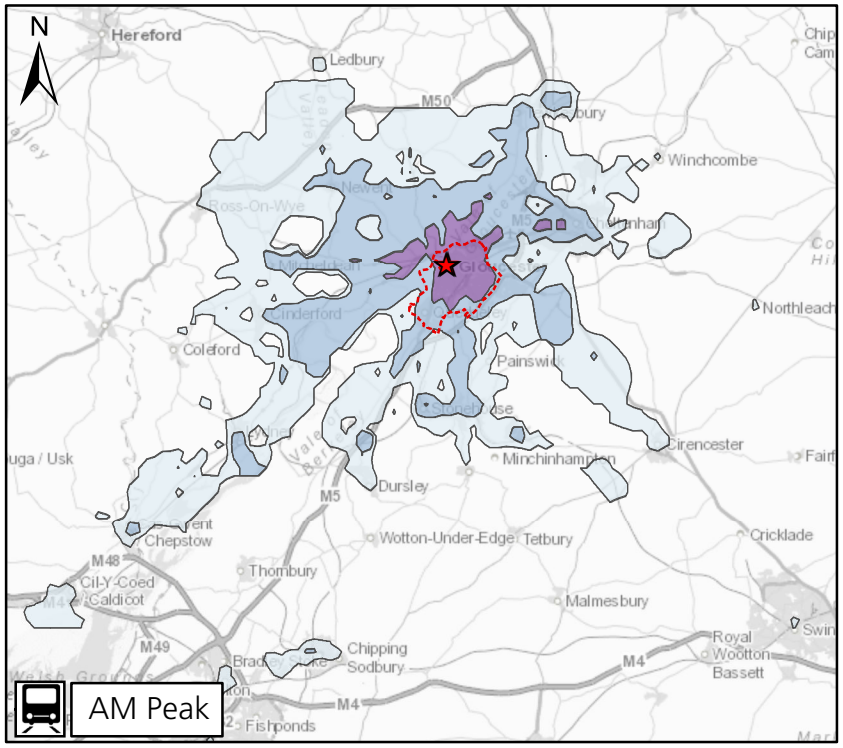
Local retail provision

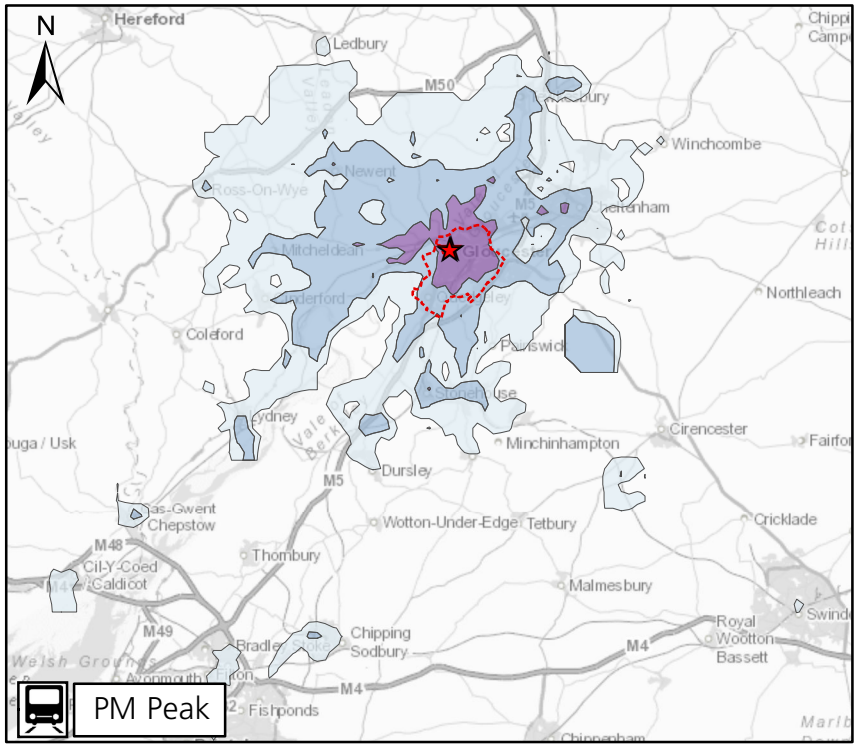
Employment sites

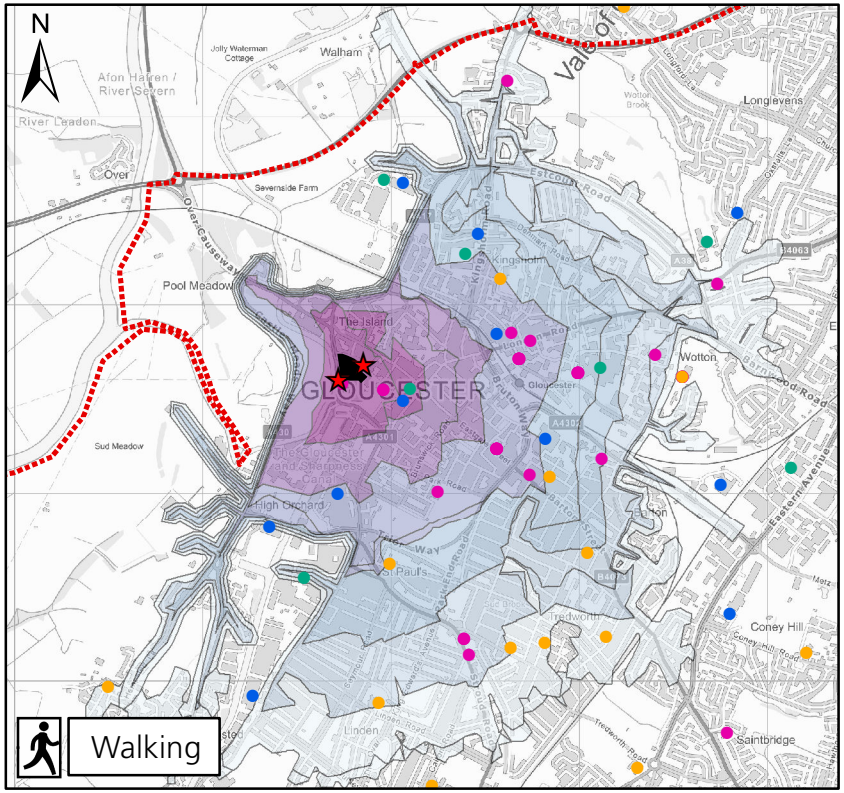
Primary School

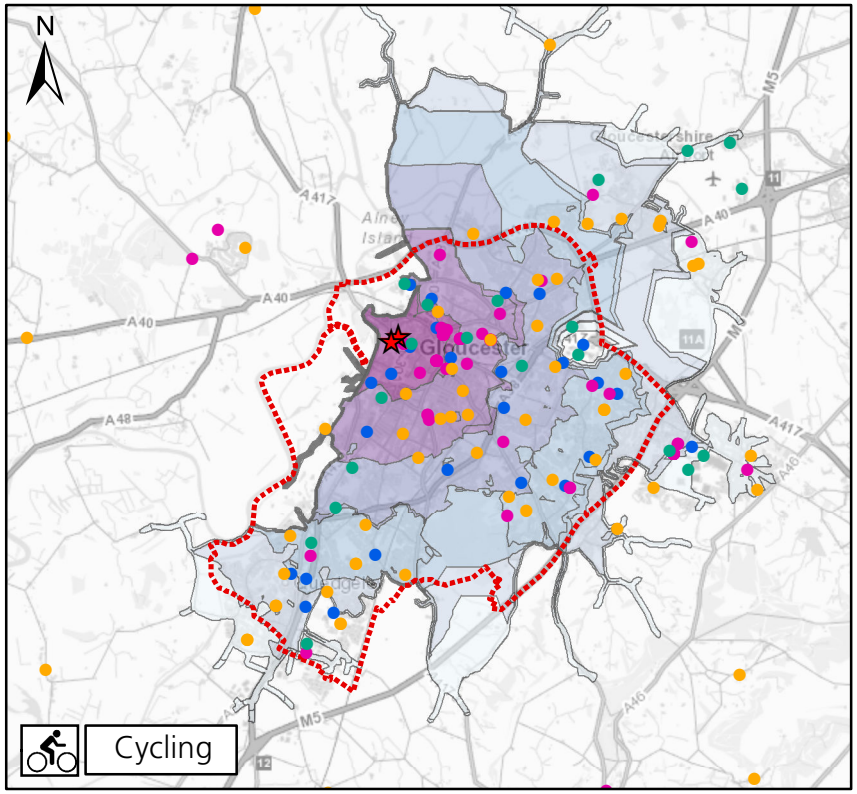
Healthcare provision

Gloucester City Boundary









Fleece Hotel and Longsmith Street Car Park

SA10

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes, 5 minutes to healthcare provision

15 minutes, 5 minutes to a primary school

5 minutes, 5 minutes to Gloucester city centre

5 minutes, 5 minutes to other local centres of employment

5 minutes, 5 minutes to local retail provision

Indicative Site Access

City Plan Allocations

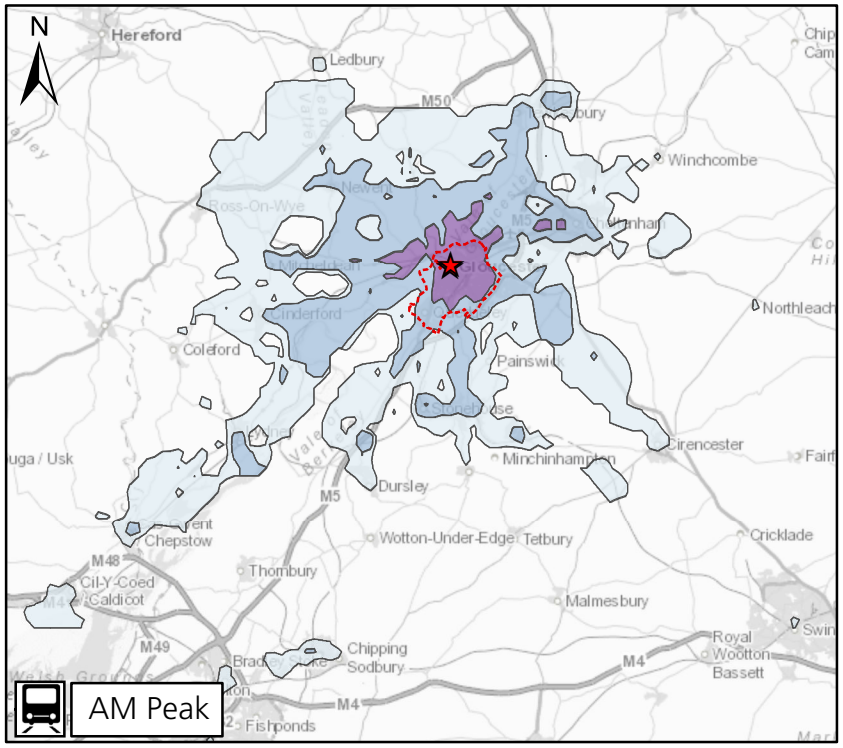
Local retail provision

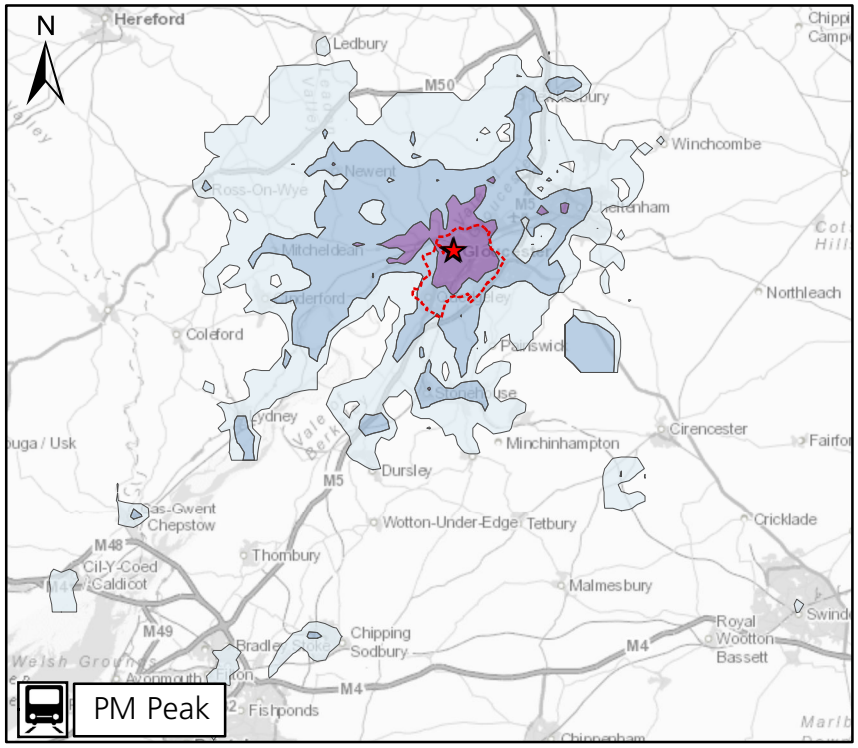
Employment sites

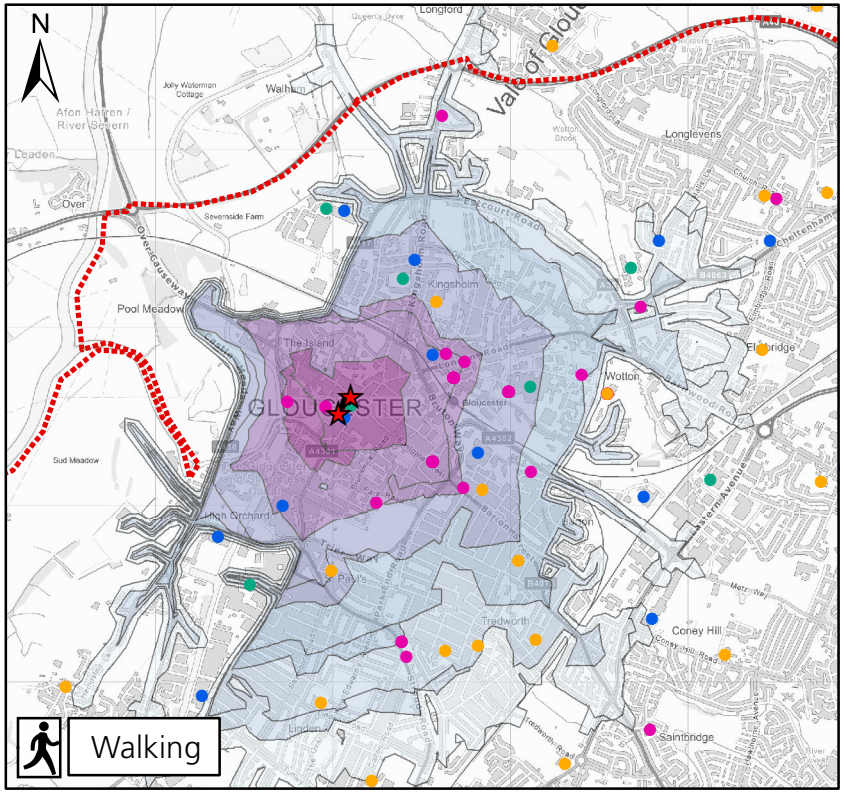
Primary School

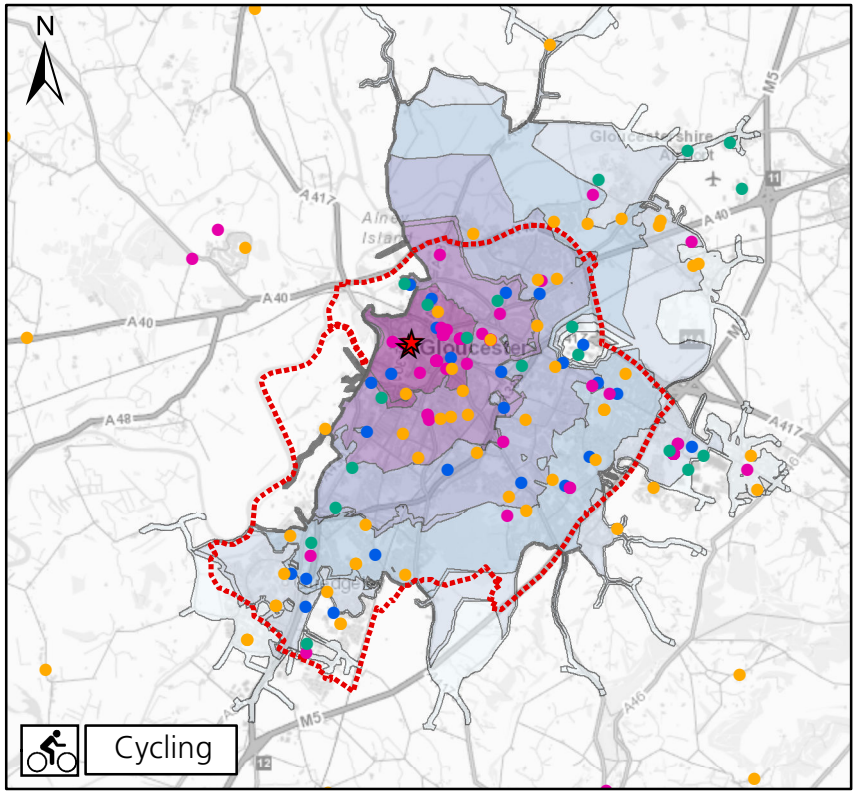
Healthcare provision

Gloucester City Boundary









Land at St Oswalds

SA11

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

15 minutes / **5 minutes** to healthcare provision

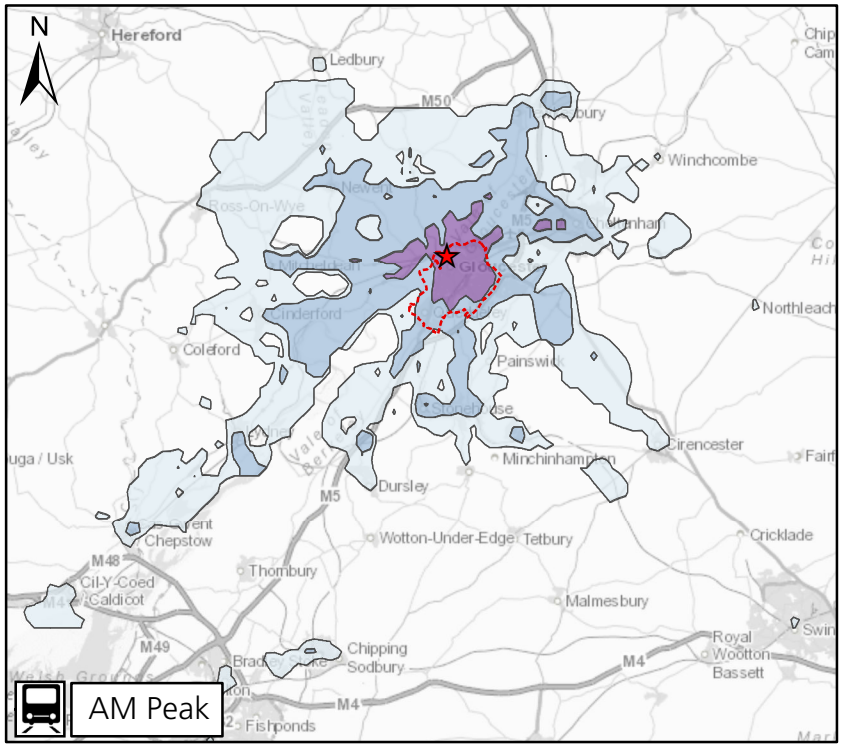
20 minutes / **10 minutes** to a primary school

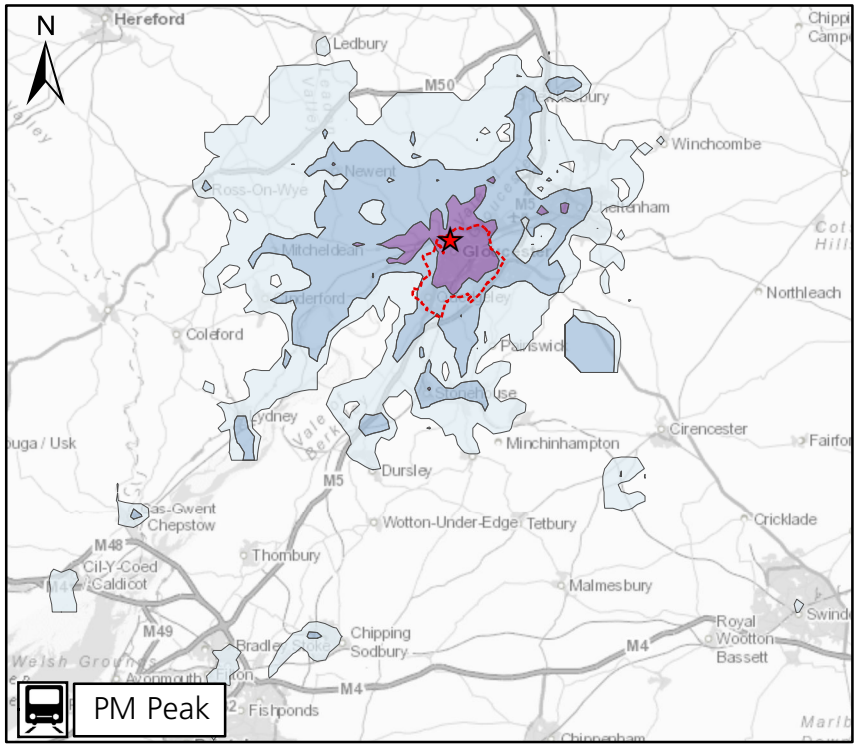
25 minutes / **10 minutes** to Gloucester city centre

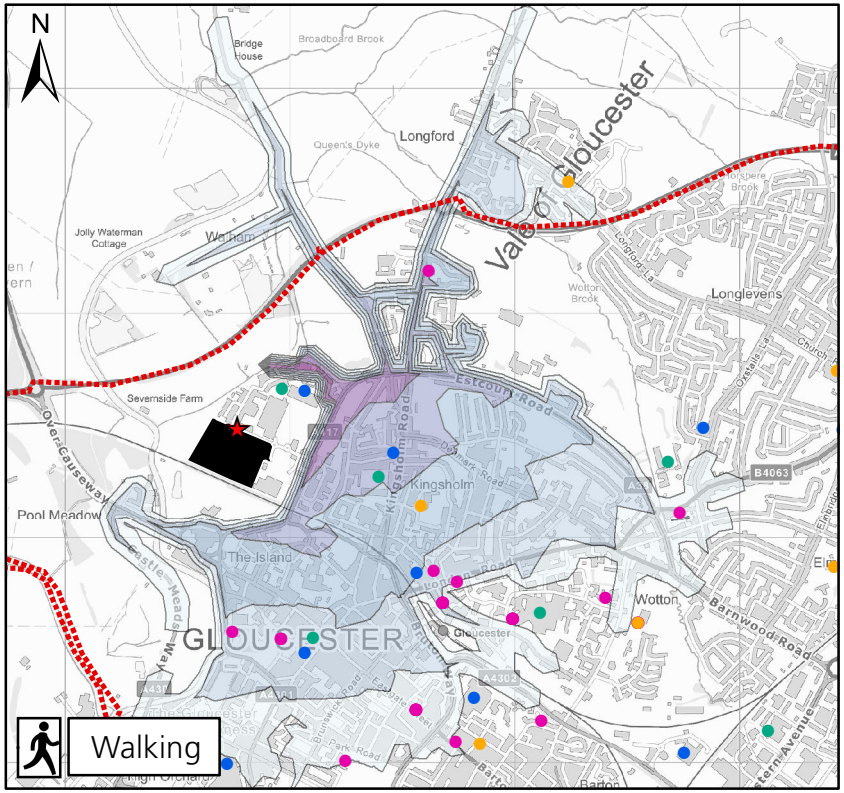
5 minutes / **5 minutes** to other local centres of employment

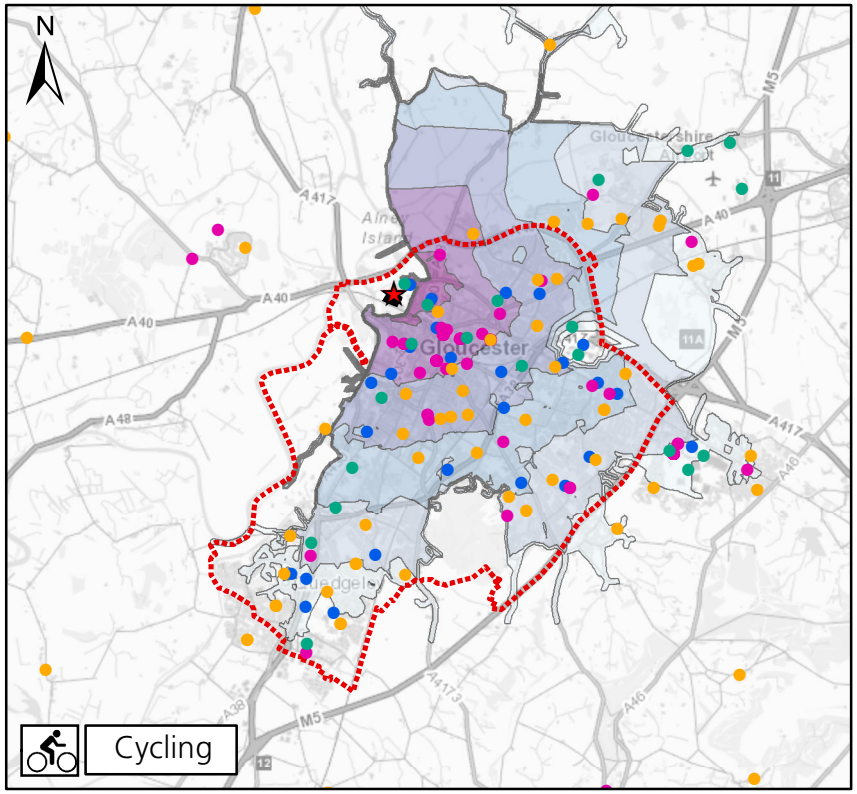
5 minutes / **5 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Land at Rea Lane

SA12

20 minutes
40 minutes
60 minutes

20 minutes — from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

30 minutes / 10 minutes — to healthcare provision

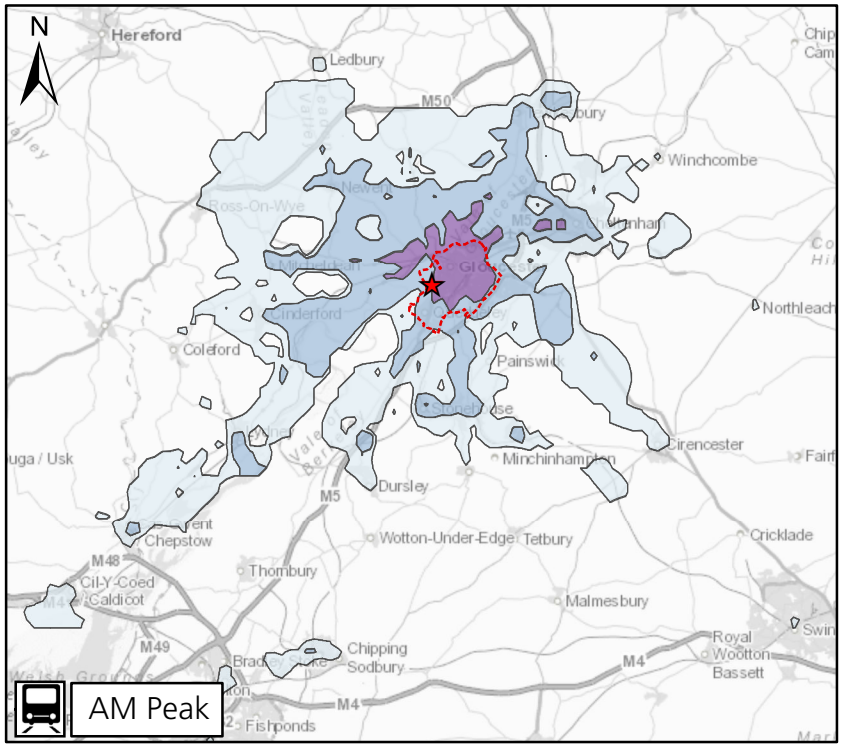
5 minutes / 5 minutes — to a primary school

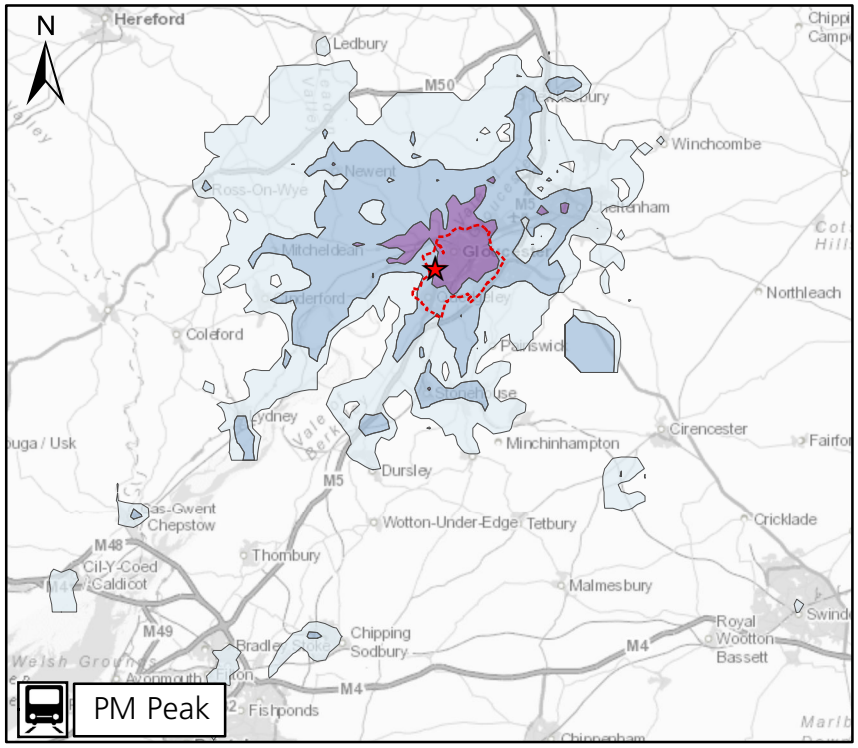
30+ minutes / 15 minutes — to Gloucester city centre

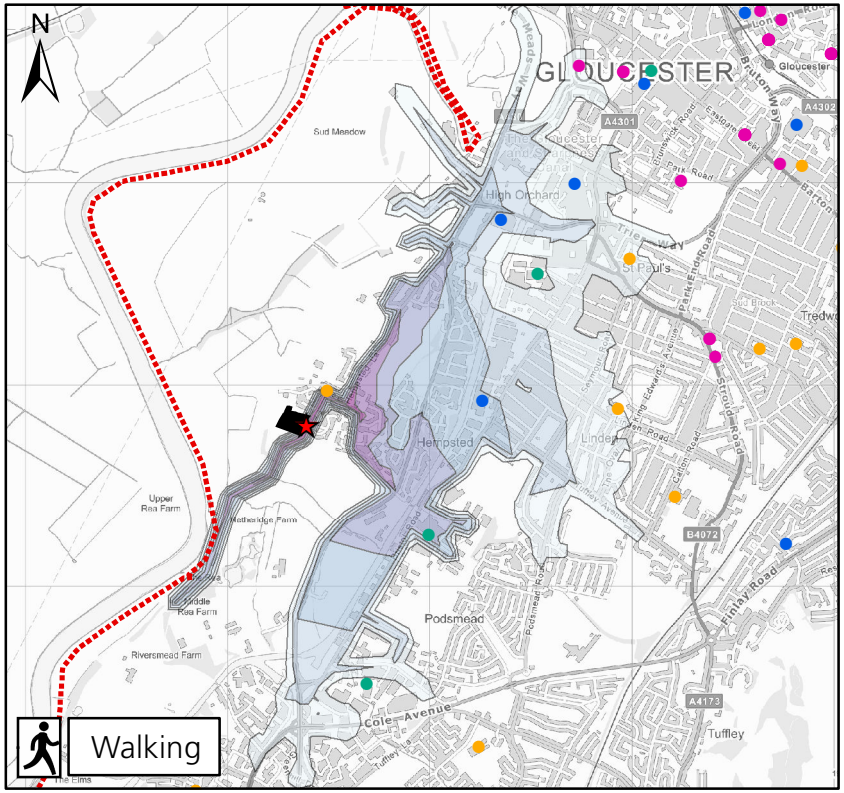
15 minutes / 5 minutes — to other local centres of employment

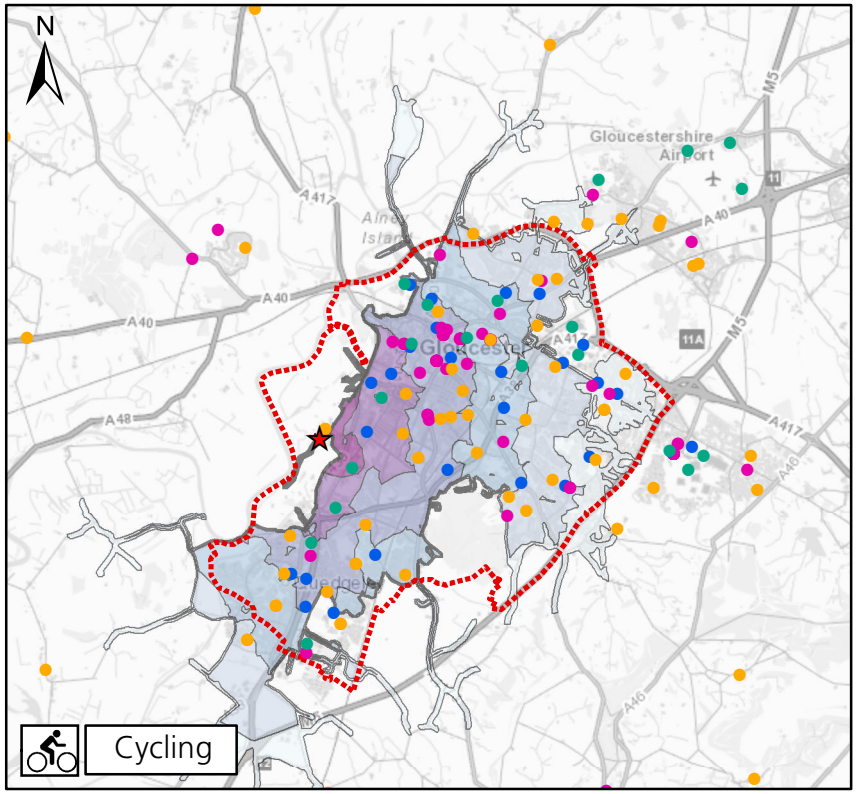
20 minutes / 10 minutes — to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Former Colwell Youth & Community Centre

SA13

20 minutes
40 minutes
60 minutes

20 minutes — from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes, 5 minutes — to healthcare provision

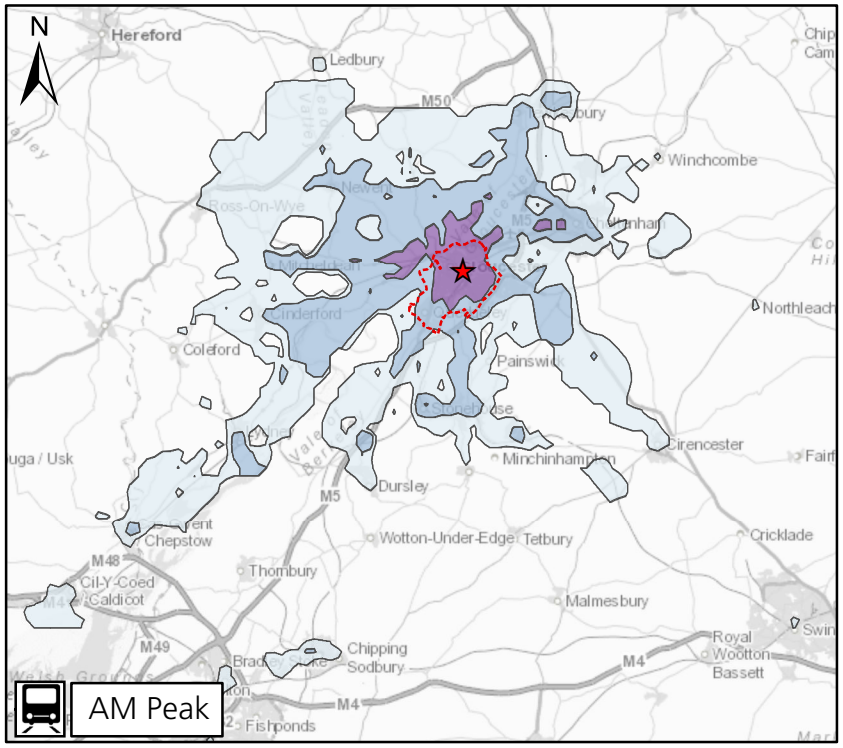
10 minutes, 5 minutes — to a primary school

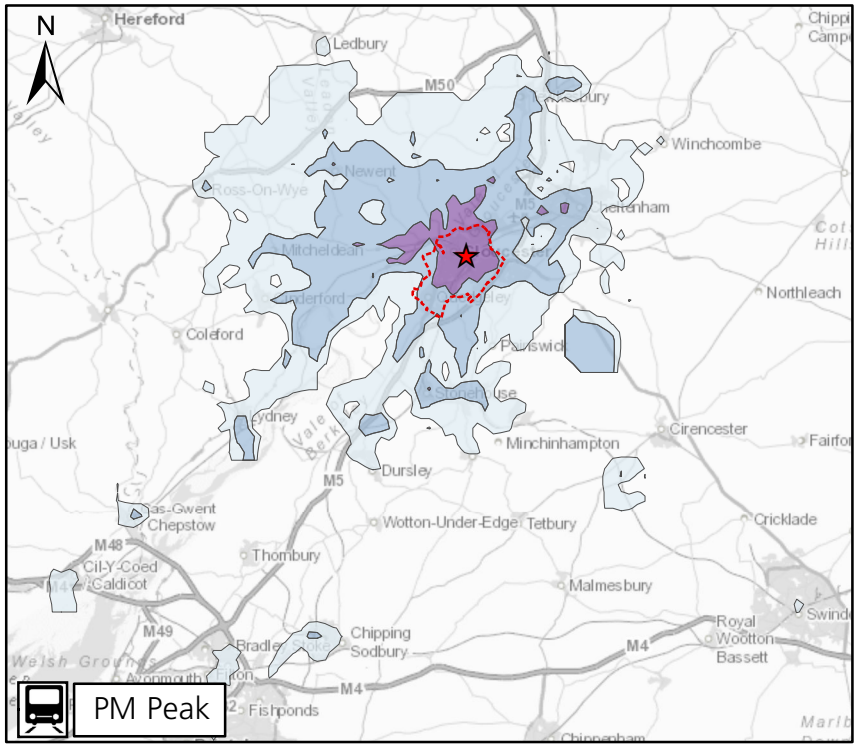
20 minutes, 5 minutes — to Gloucester city centre

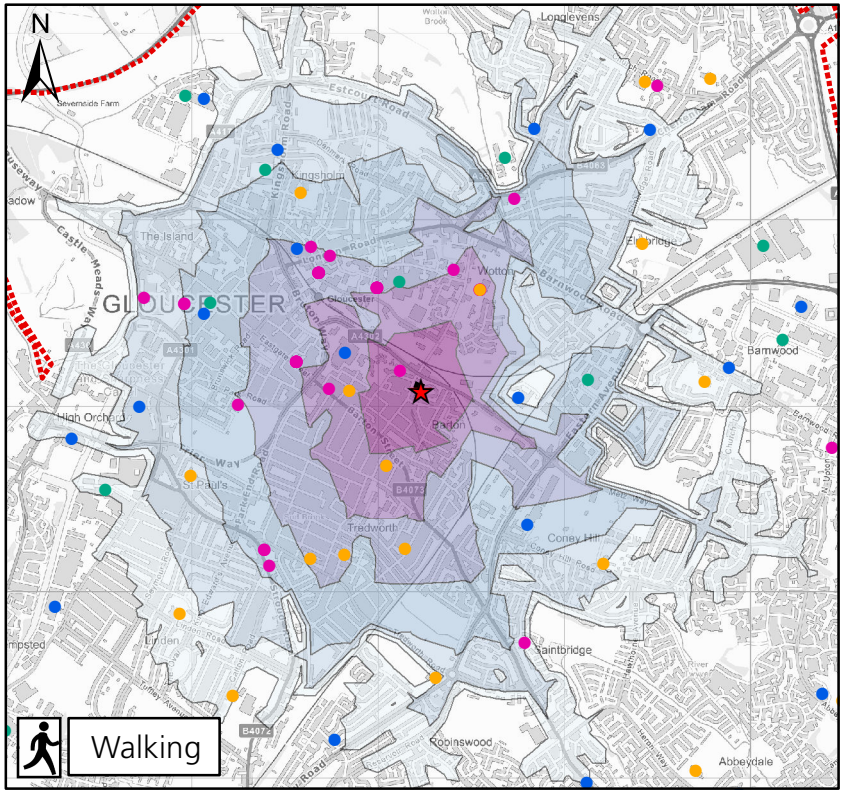
15 minutes, 5 minutes — to other local centres of employment

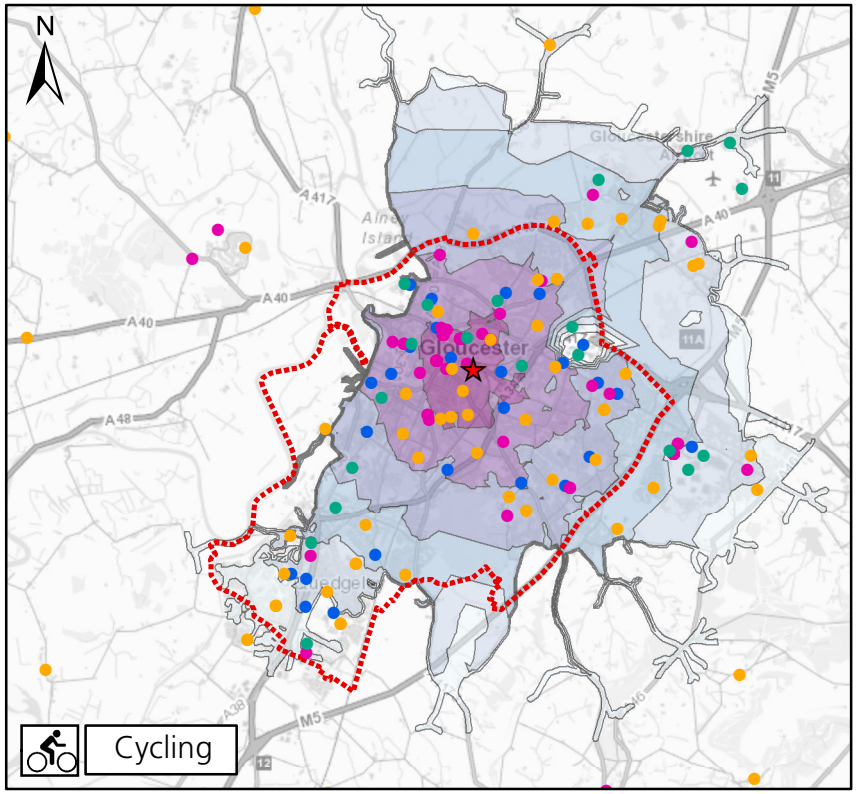
10 minutes, 5 minutes — to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Land at Blackbridge

SA14

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

25 minutes **10 minutes** to healthcare provision

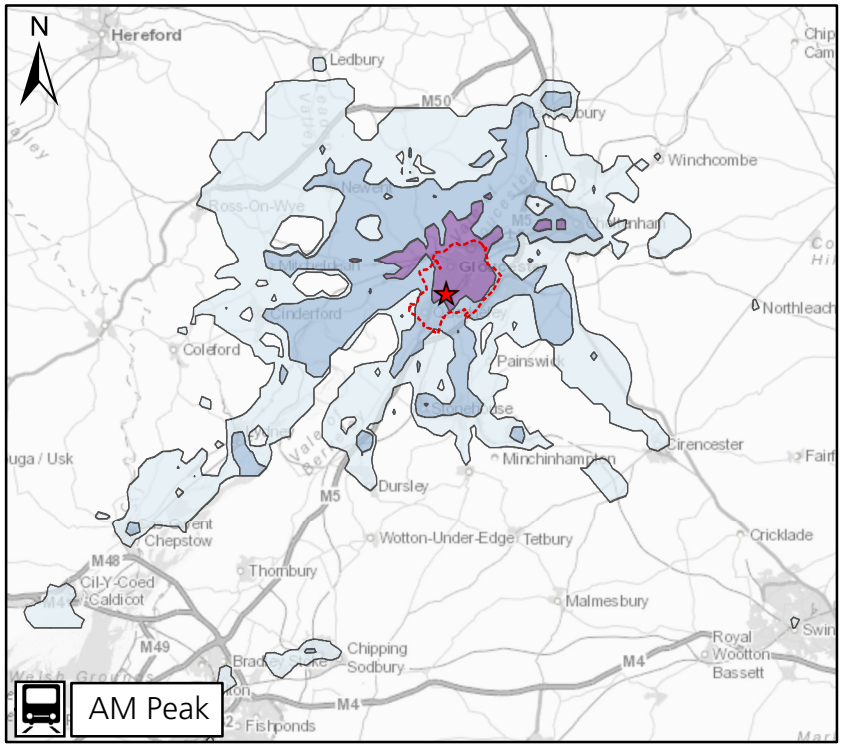
15 minutes **5 minutes** to a primary school

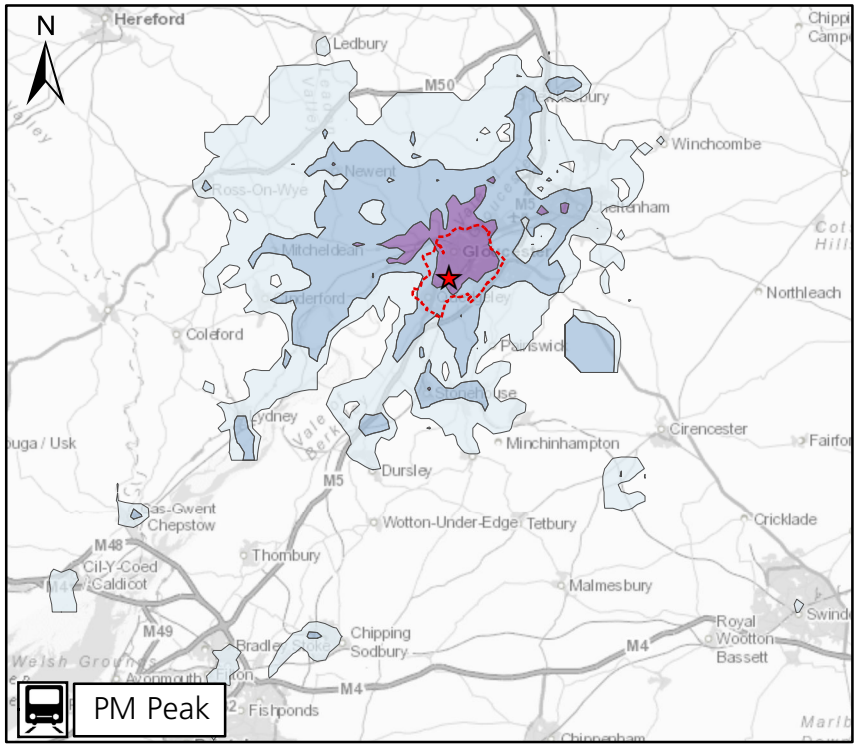
30+ minutes **15 minutes** to Gloucester city centre

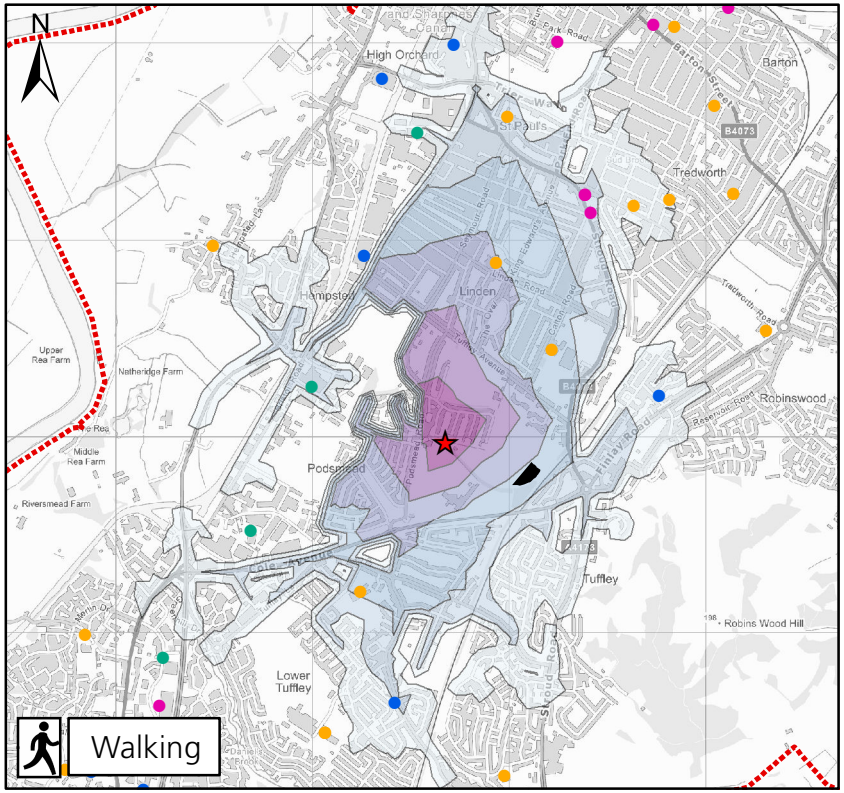
25 minutes **10 minutes** to other local centres of employment

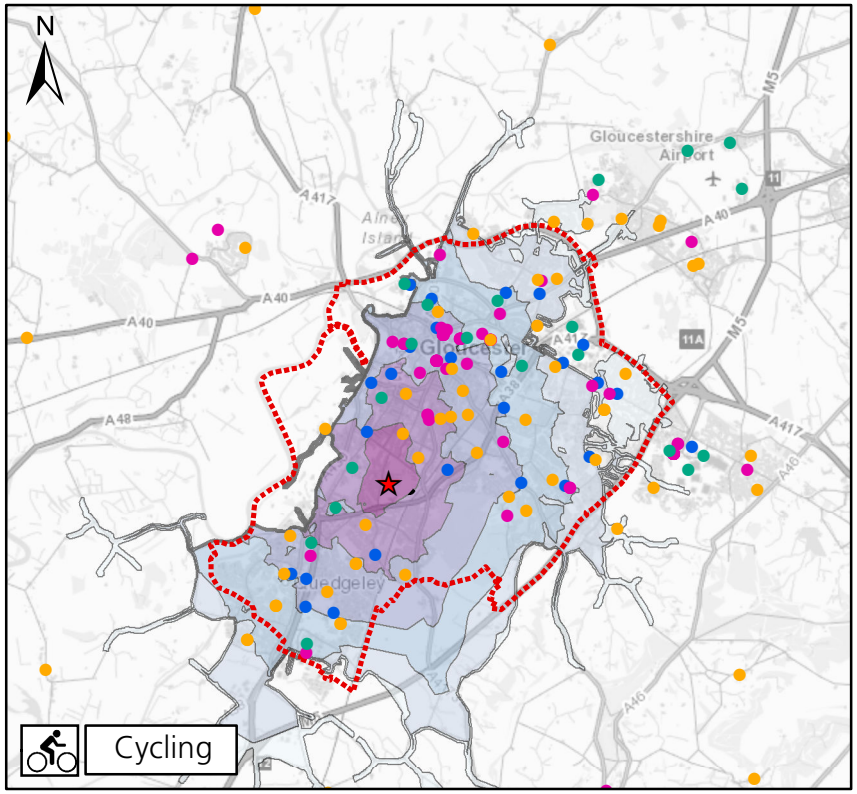
20 minutes **10 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Land East of Sneedhams Road

SA15

20 minutes
40 minutes
60 minutes

40 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

15 minutes **5 minutes** to healthcare provision

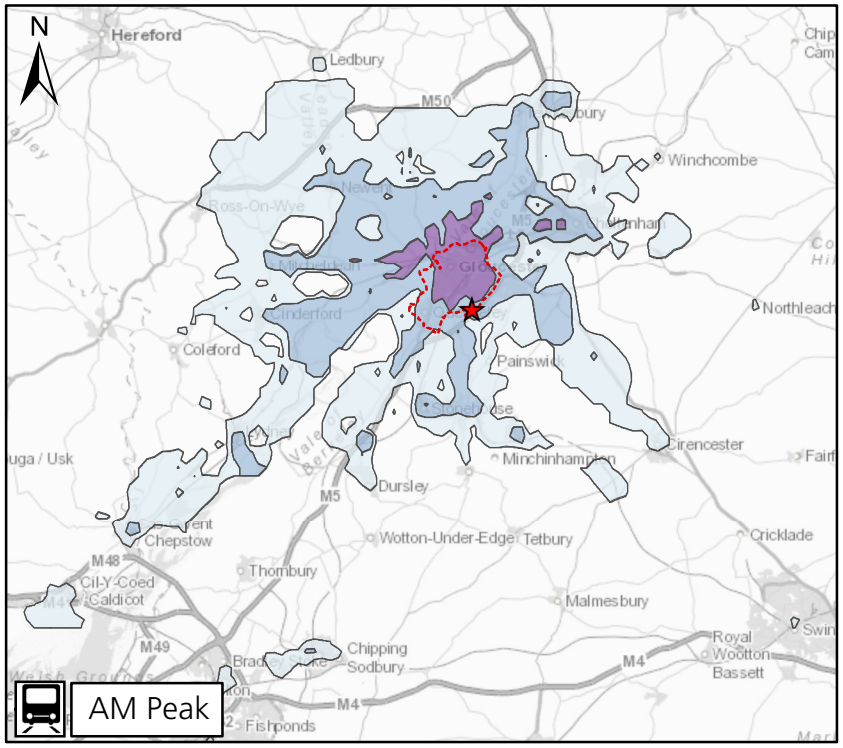
15 minutes **5 minutes** to a primary school

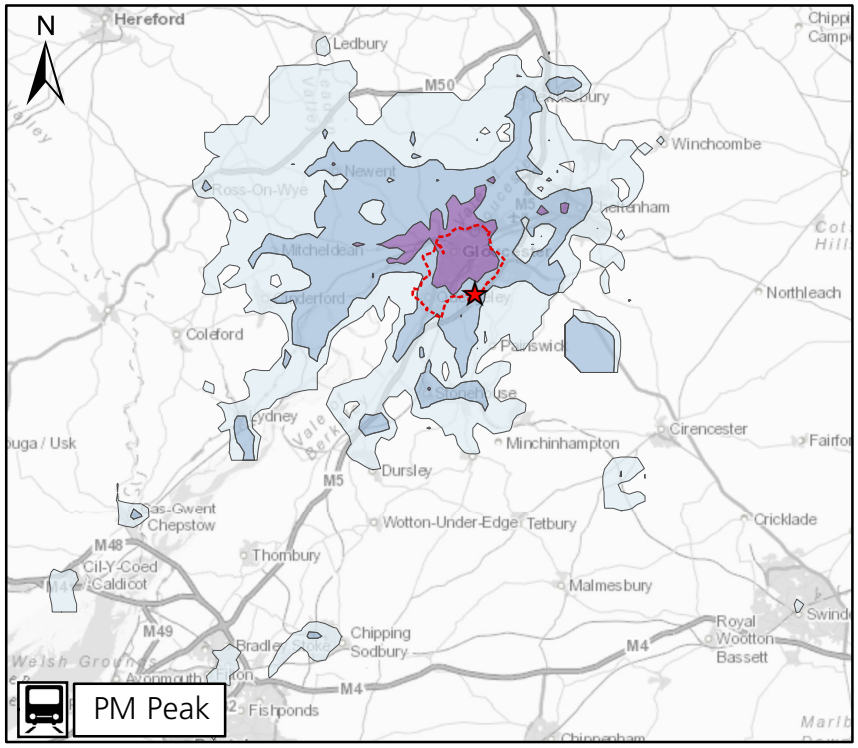
30+ minutes **20 minutes** to Gloucester city centre

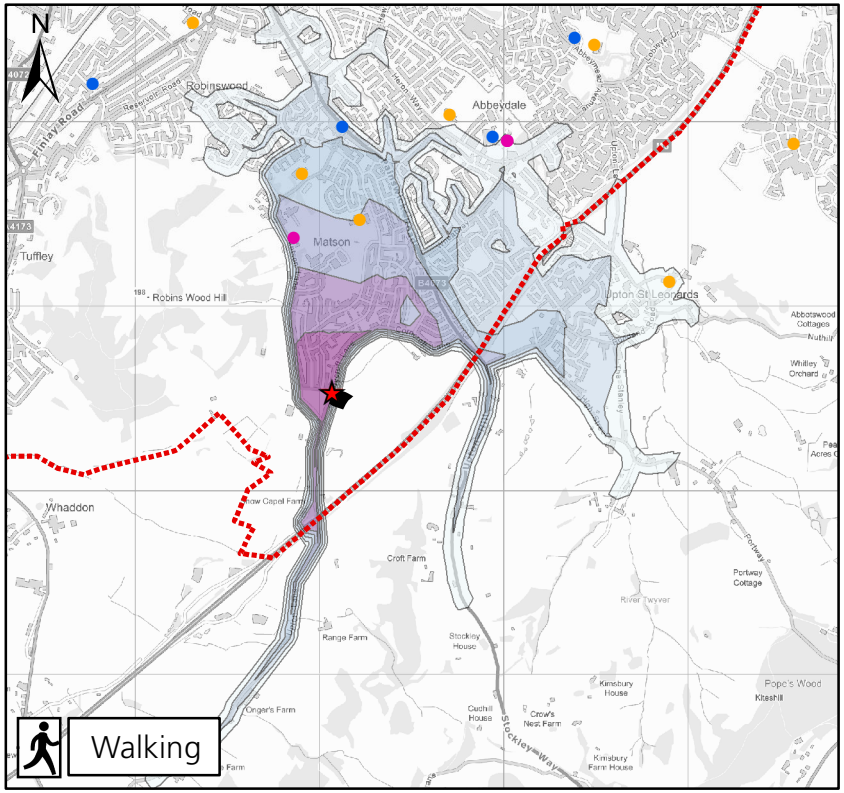
30+ minutes **20 minutes** to other local centres of employment

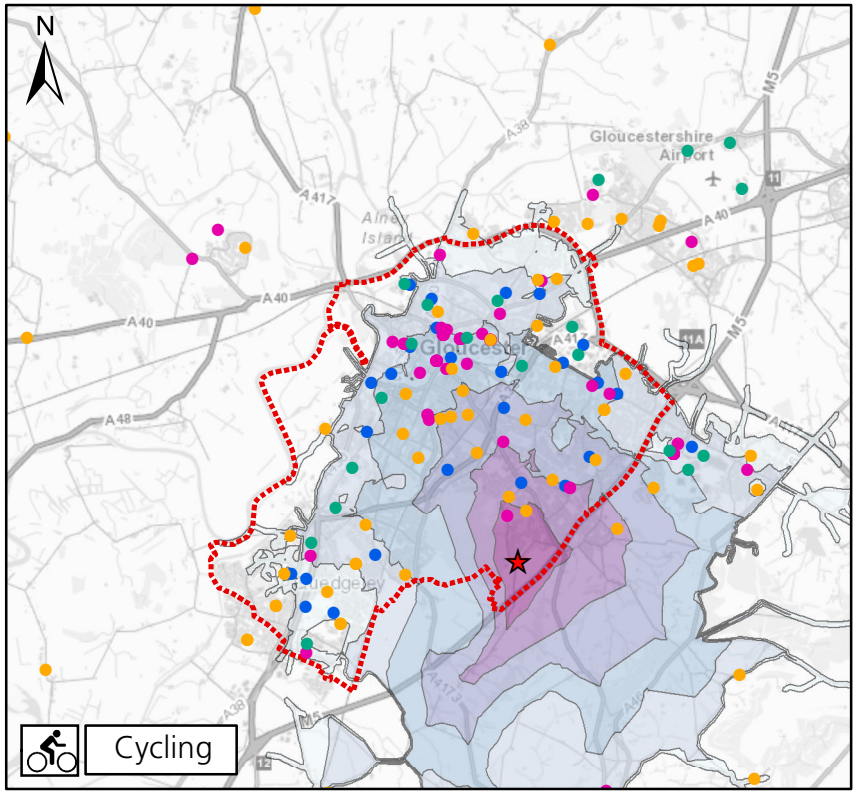
25 minutes **10 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









Land off Eastgate Street

SA16

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes **5 minutes** to healthcare provision

10 minutes **5 minutes** to a primary school

5 minutes **5 minutes** to Gloucester city centre

5 minutes **5 minutes** to other local centres of employment

5 minutes **5 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

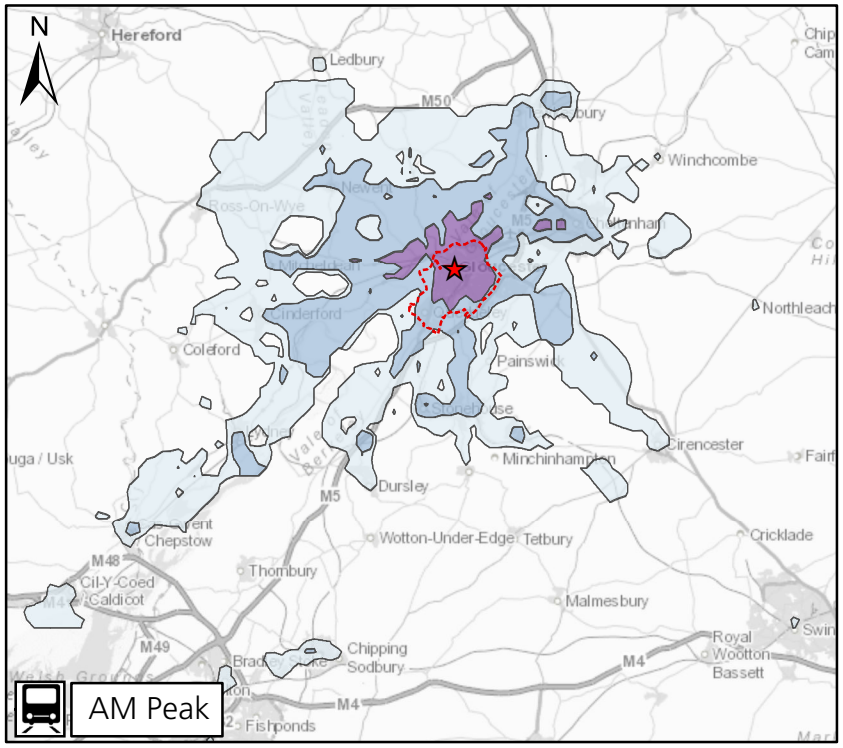
Local retail provision

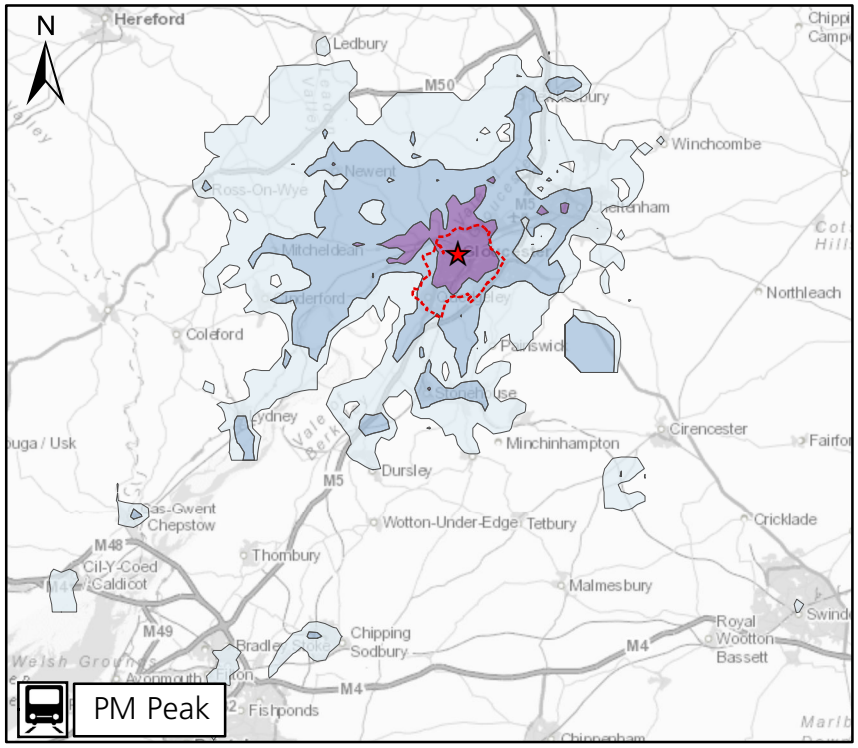
Employment sites

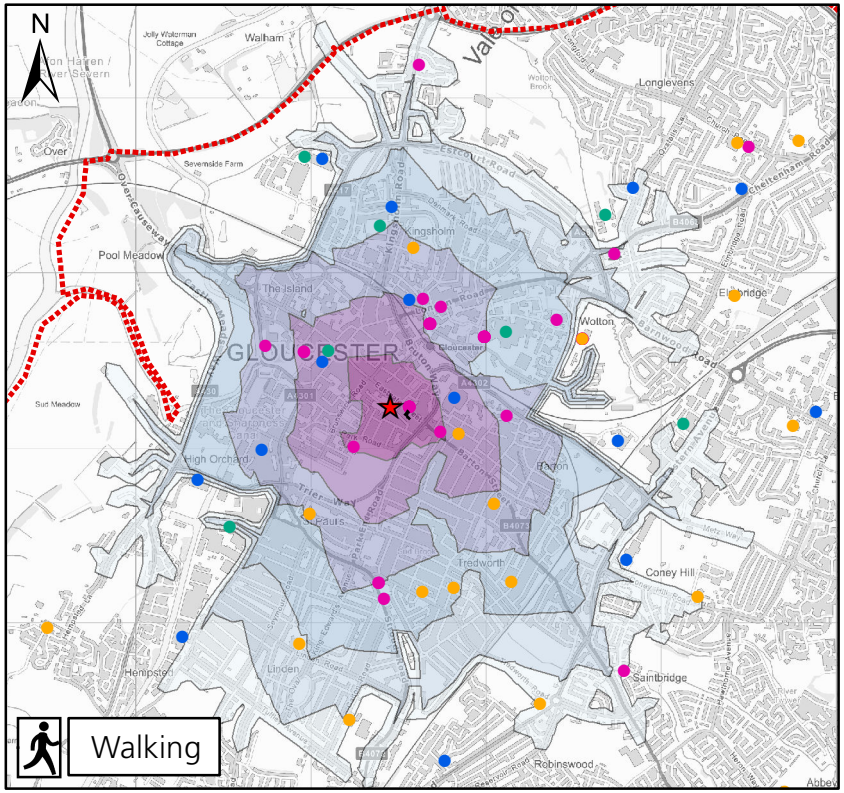
Primary School

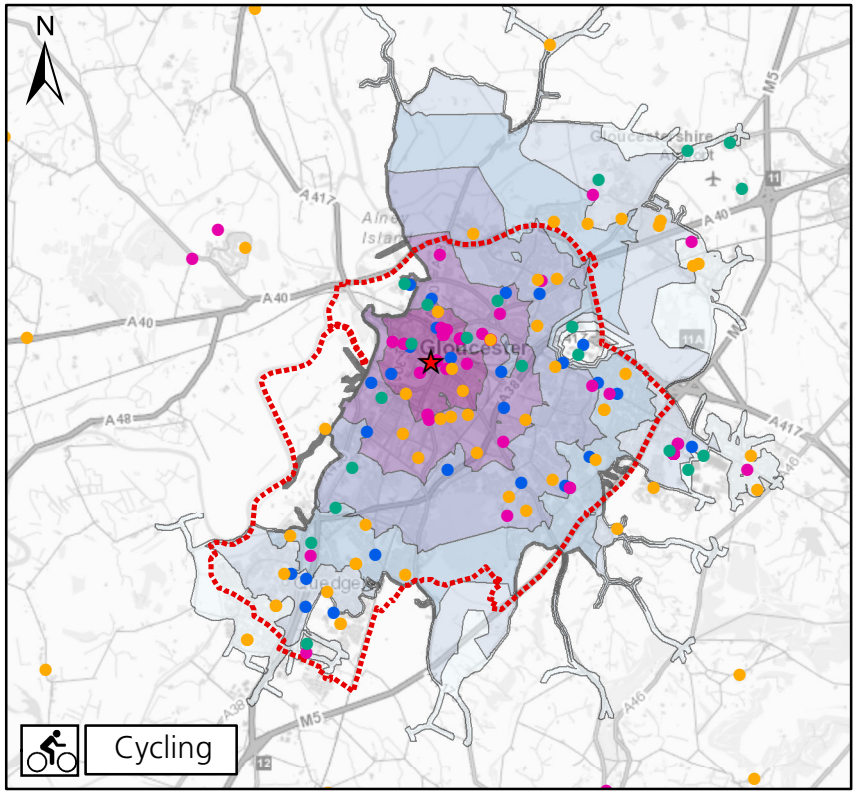
Healthcare provision

Gloucester City Boundary









Southern Railway Triangle

SA17

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

10 minutes / **5 minutes** to healthcare provision

15 minutes / **5 minutes** to a primary school

25 minutes / **5 minutes** to Gloucester city centre

15 minutes / **5 minutes** to other local centres of employment

5 minutes / **5 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

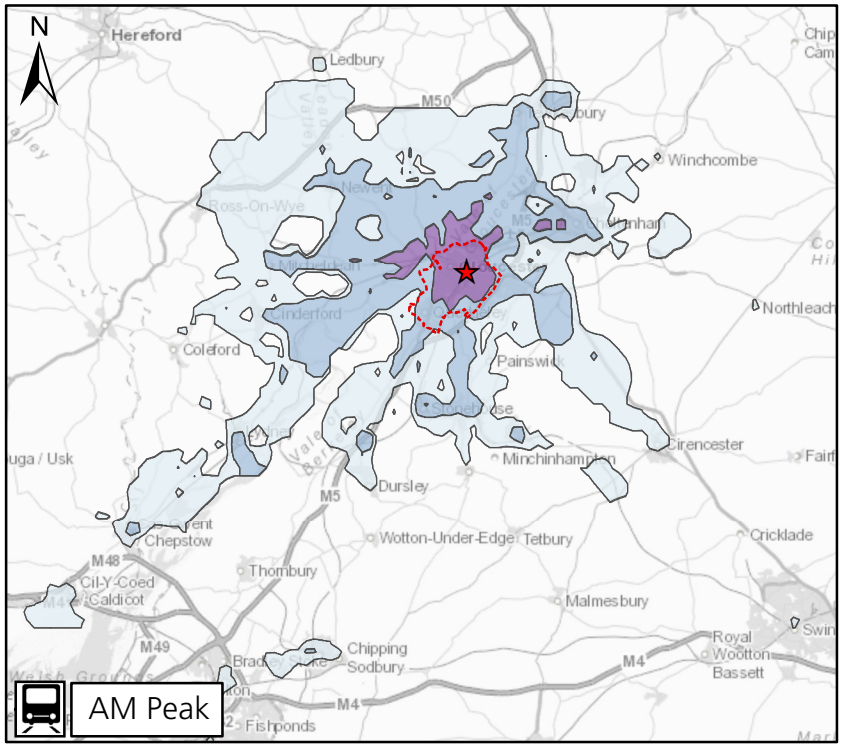
Local retail provision

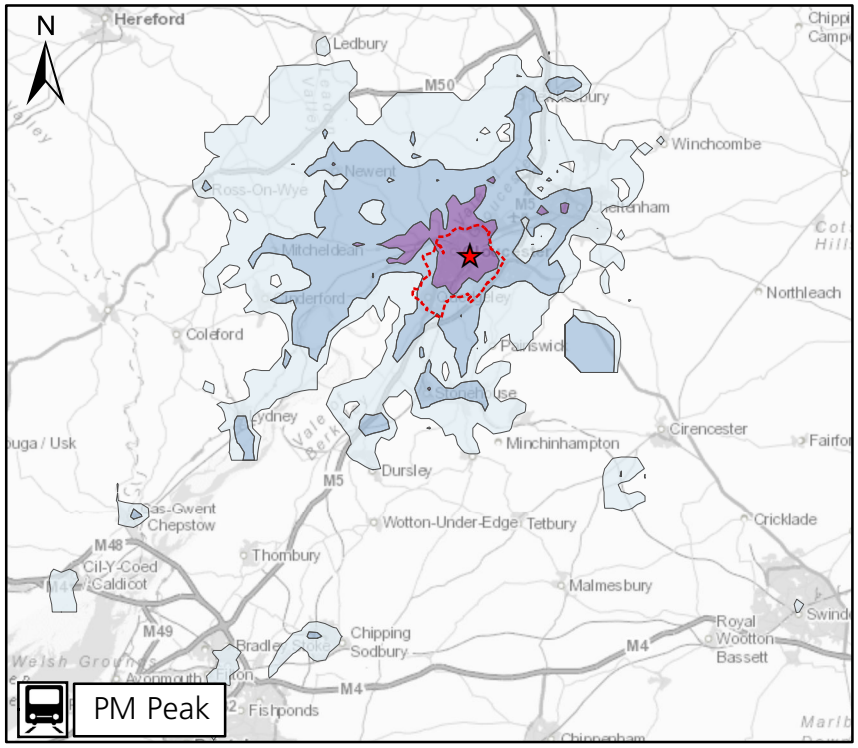
Employment sites

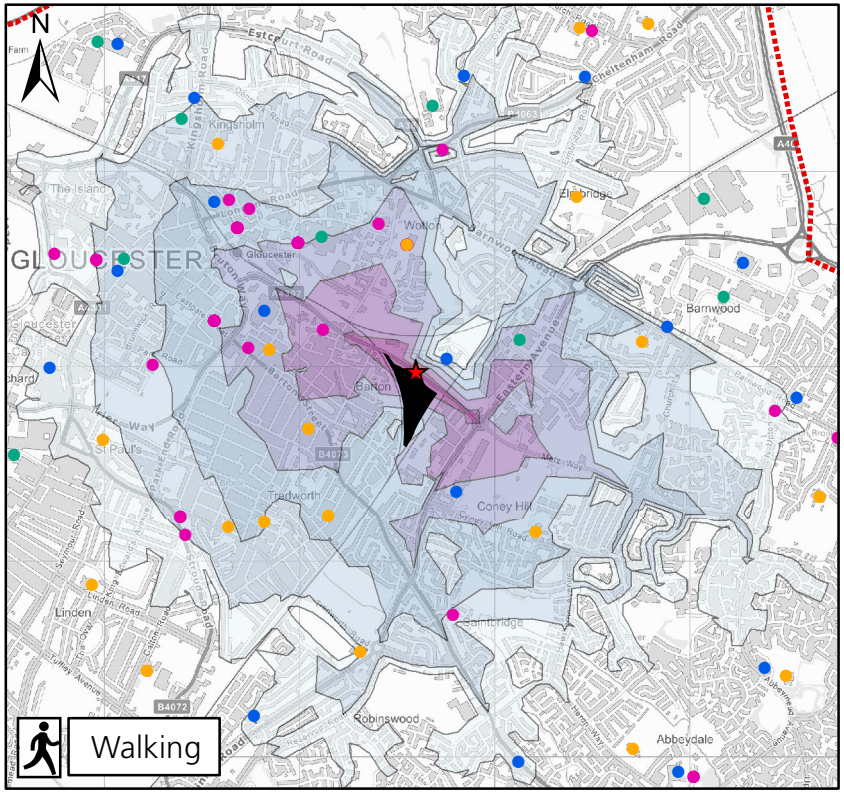
Primary School

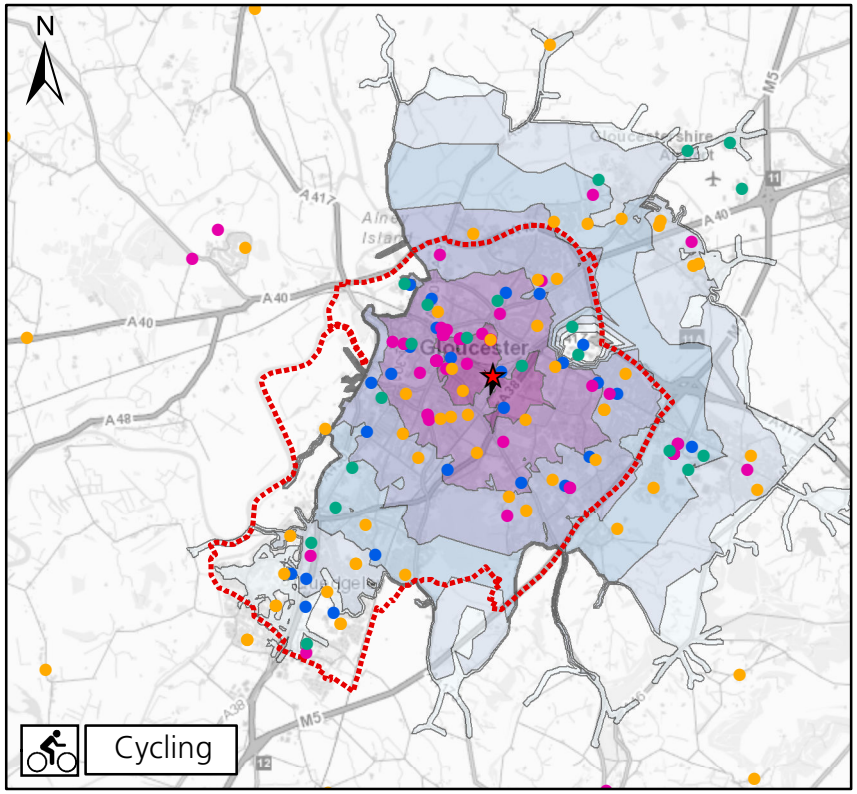
Healthcare provision

Gloucester City Boundary









Jordan's Brook House

SA18

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

5 minutes 5 minutes to healthcare provision

10 minutes 5 minutes to a primary school

30+ minutes 5 minutes to Gloucester city centre

10 minutes 5 minutes to other local centres of employment

5 minutes 5 minutes to local retail provision

Indicative Site Access

City Plan Allocations

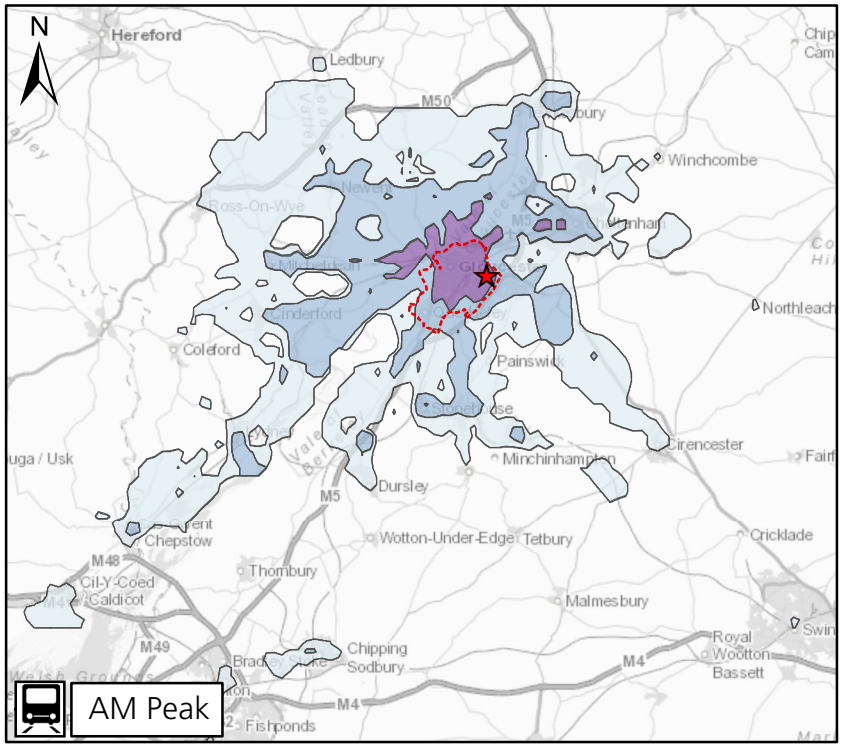
Local retail provision

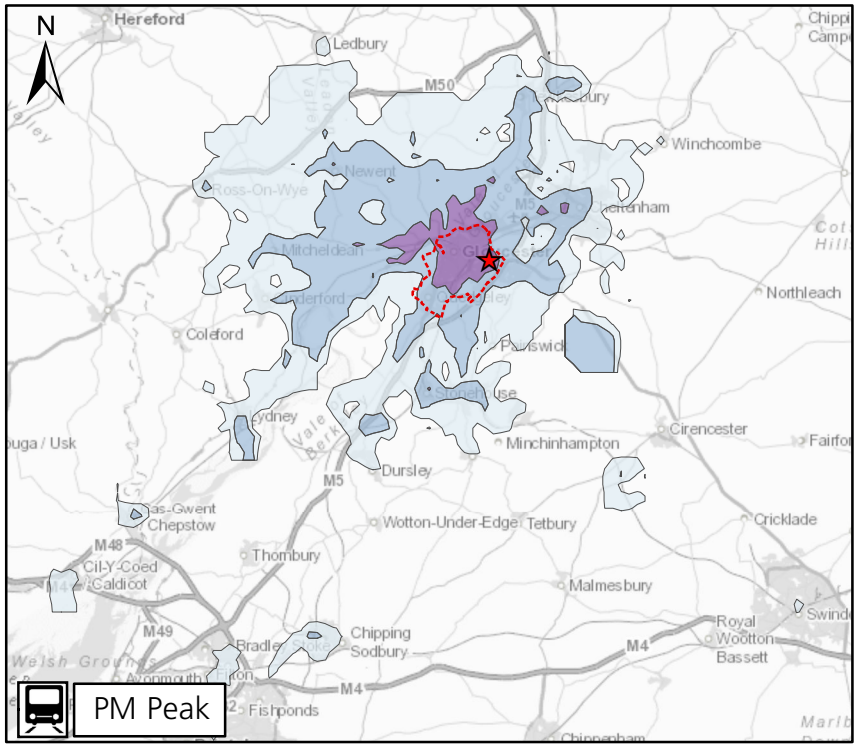
Employment sites

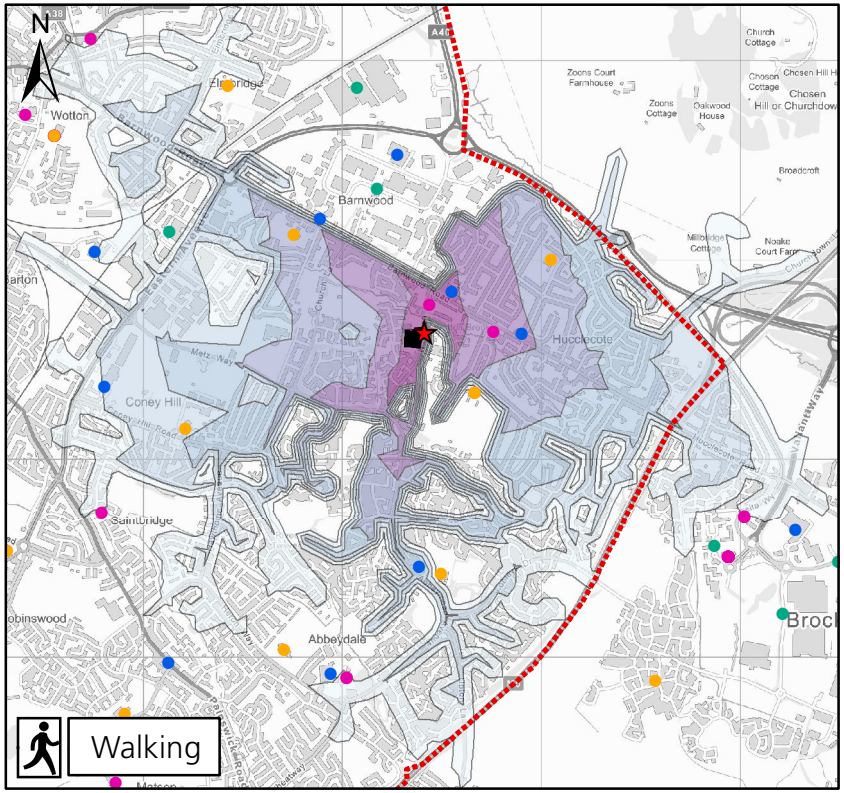
Primary School

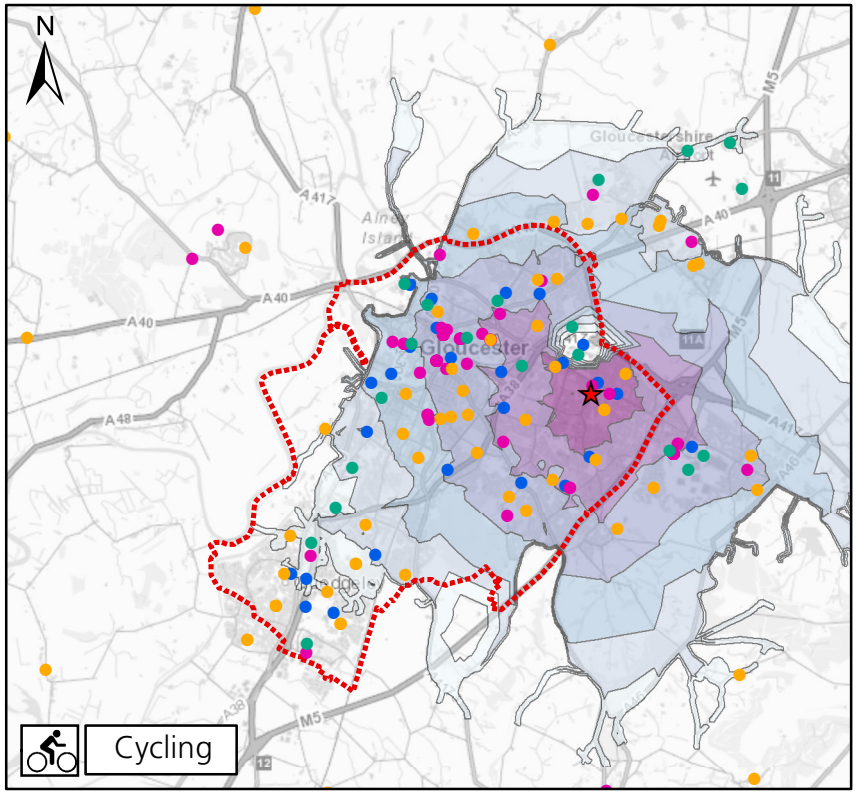
Healthcare provision

Gloucester City Boundary









Land off Myers Road

SA19

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

10 minutes / **5 minutes** to healthcare provision

5 minutes / **5 minutes** to a primary school

20 minutes / **5 minutes** to Gloucester city centre

10 minutes / **5 minutes** to other local centres of employment

15 minutes / **5 minutes** to local retail provision

Indicative Site Access

City Plan Allocations

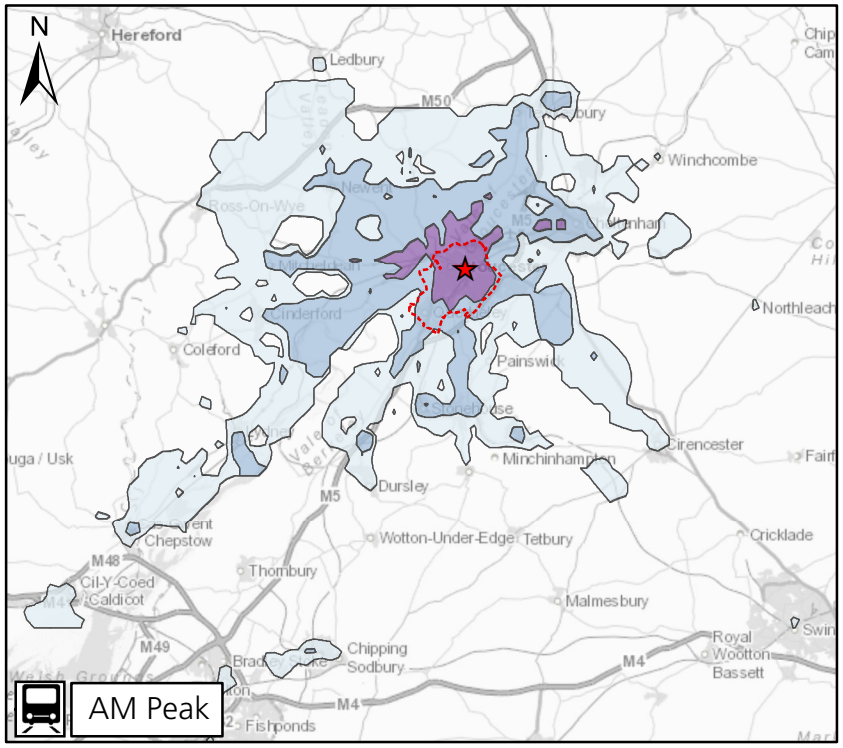
Local retail provision

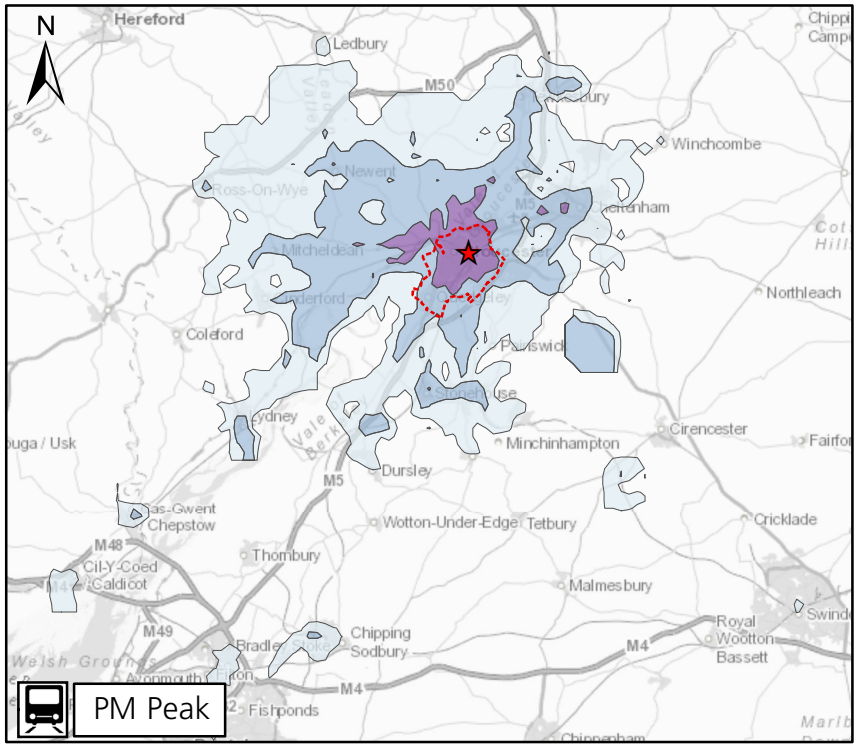
Employment sites

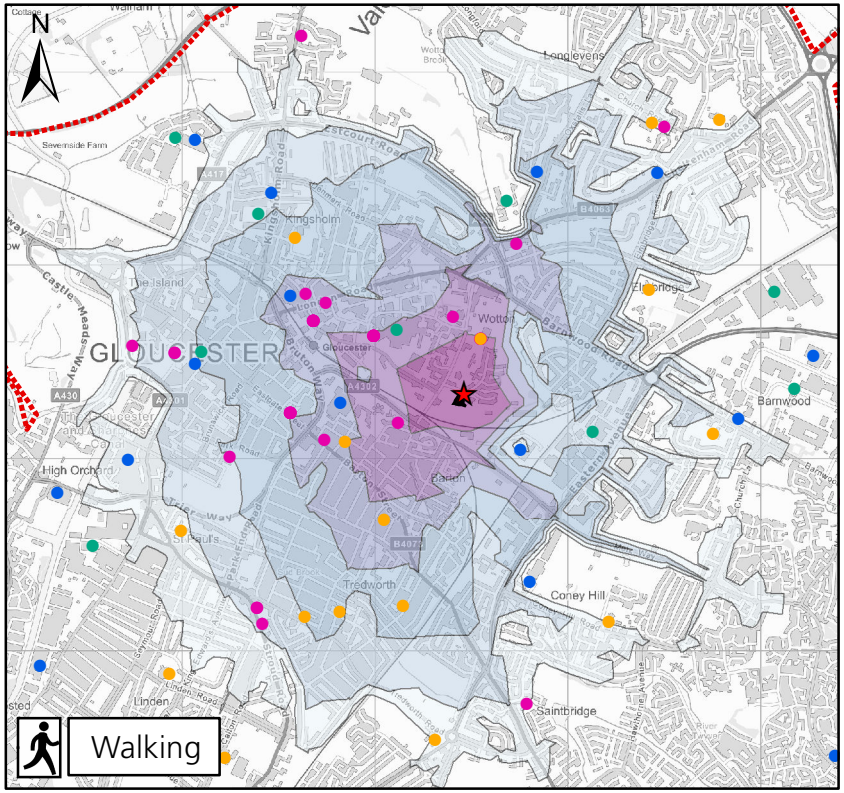
Primary School

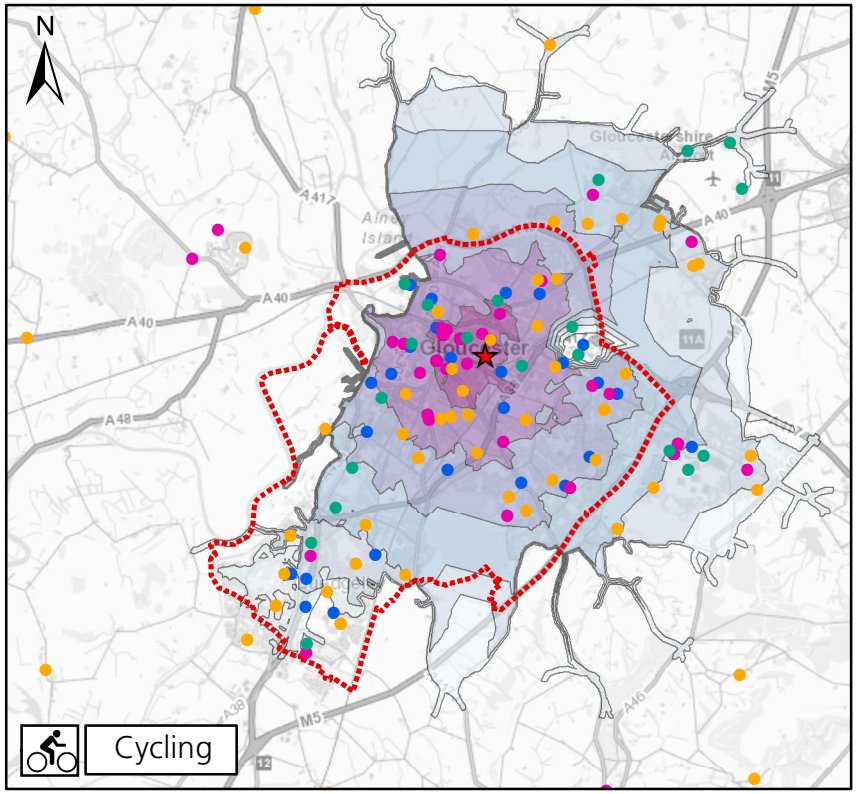
Healthcare provision

Gloucester City Boundary









White City Replacement Community Facility

SA20

20 minutes
40 minutes
60 minutes

20 minutes — from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

20 minutes / 10 minutes — to healthcare provision

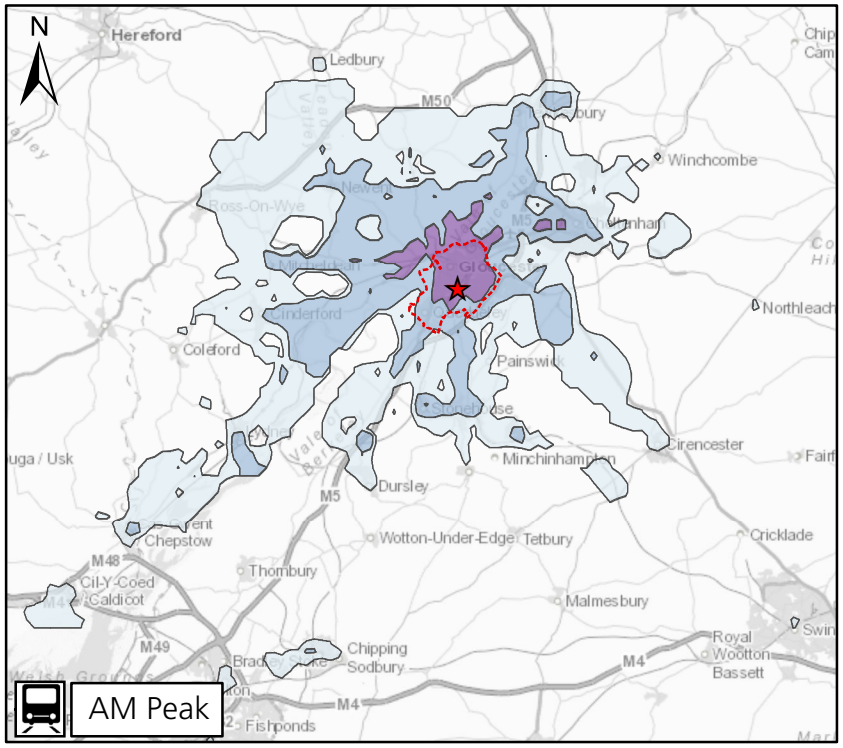
15 minutes / 5 minutes — to a primary school

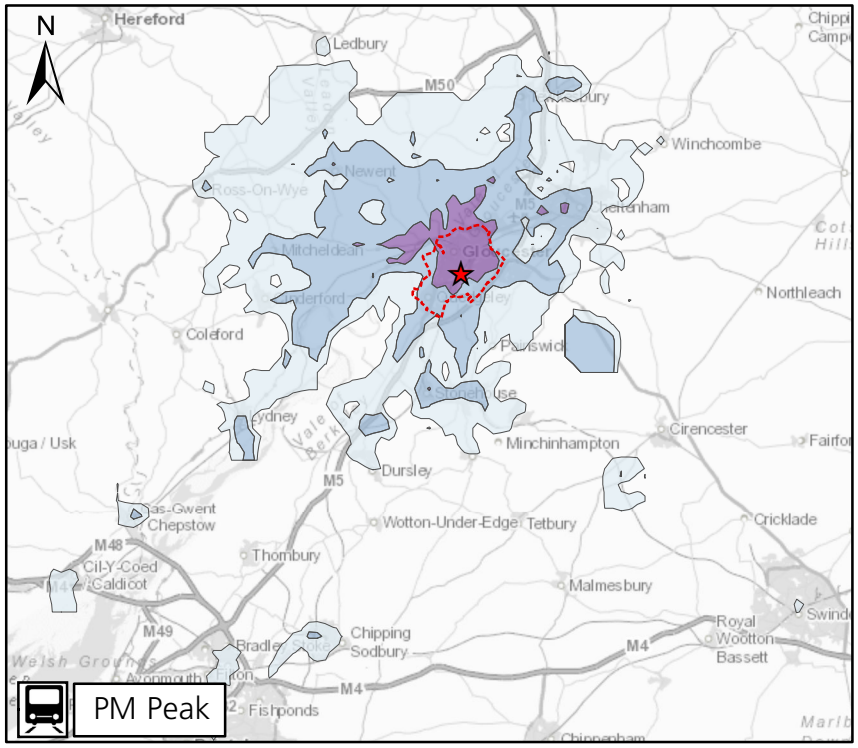
+30 minutes / 15 minutes — to Gloucester city centre

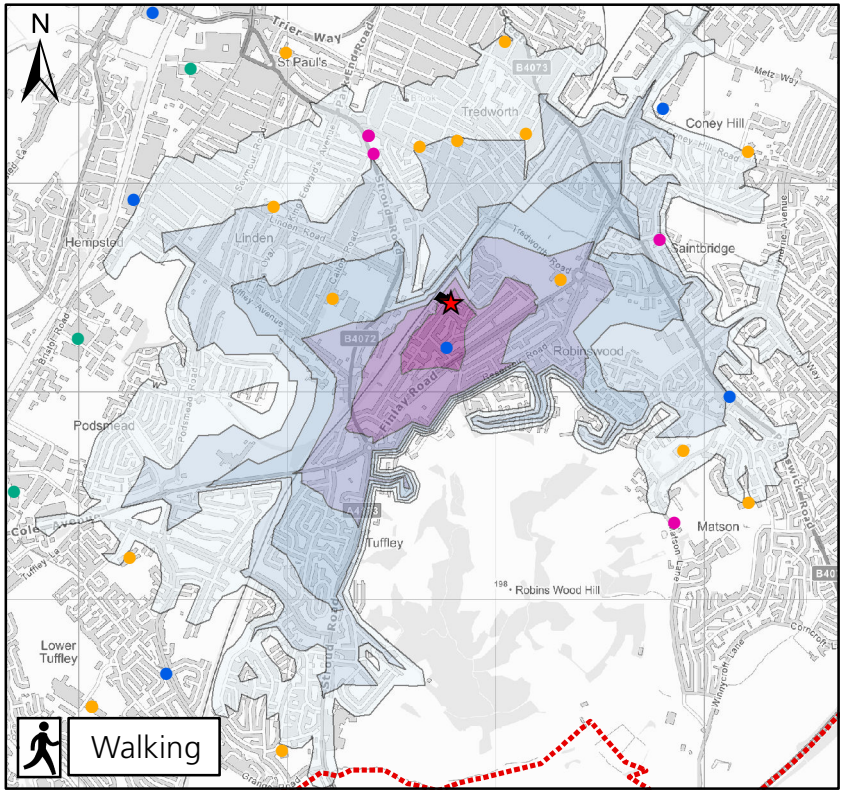
+30 minutes / 15 minutes — to other local centres of employment

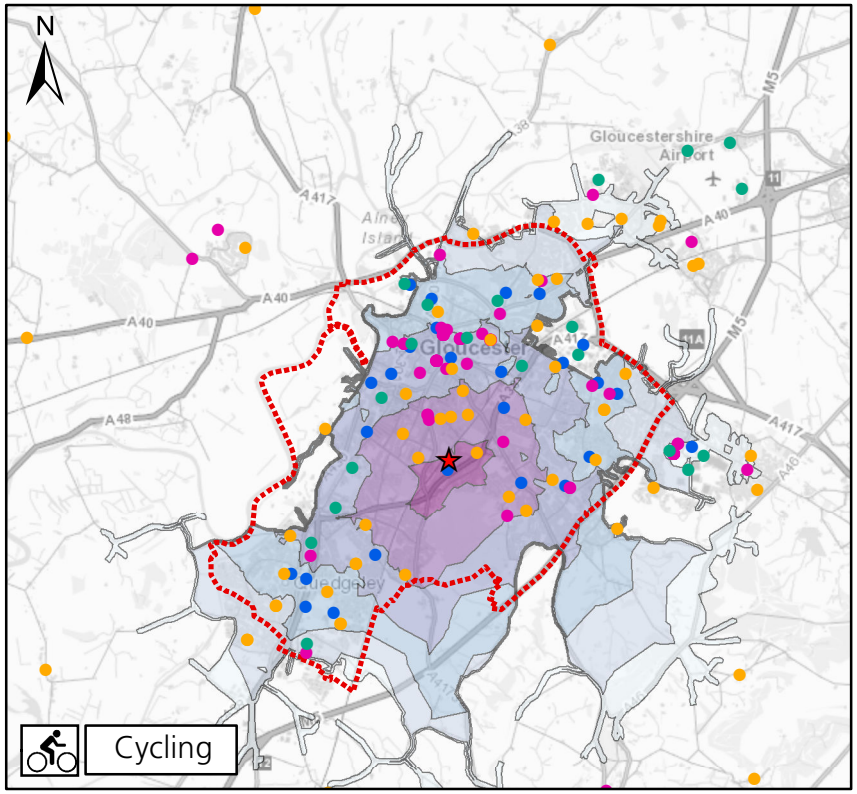
5 minutes / 5 minutes — to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary









West Quay

SA21

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

10 minutes / 5 minutes to healthcare provision

15 minutes / 5 minutes to a primary school

15 minutes / 5 minutes to Gloucester city centre

15 minutes / 5 minutes to other local centres of employment

5 minutes / 5 minutes to local retail provision

Indicative Site Access

City Plan Allocations

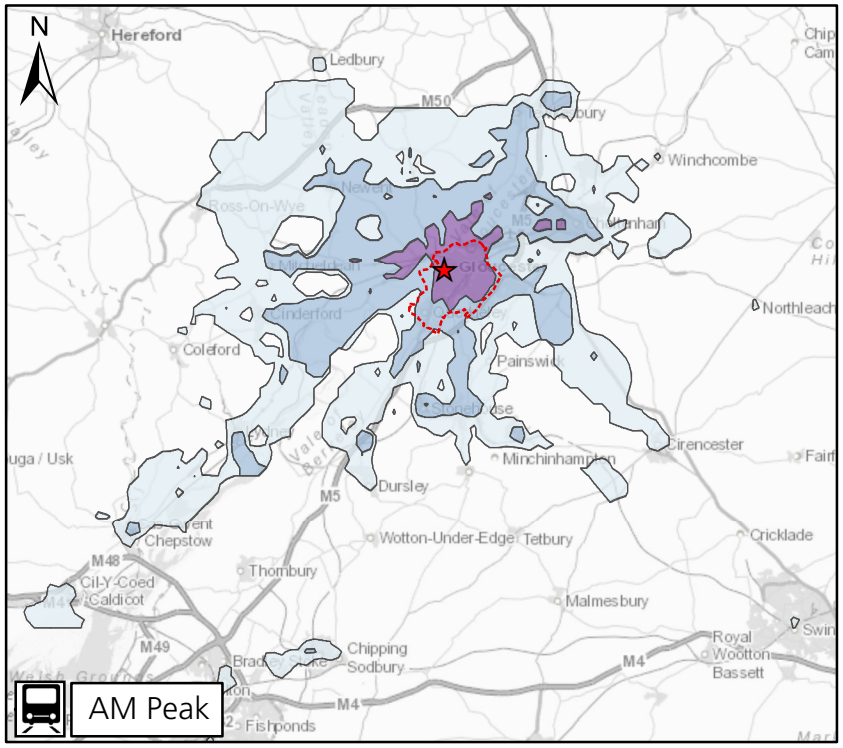
Local retail provision

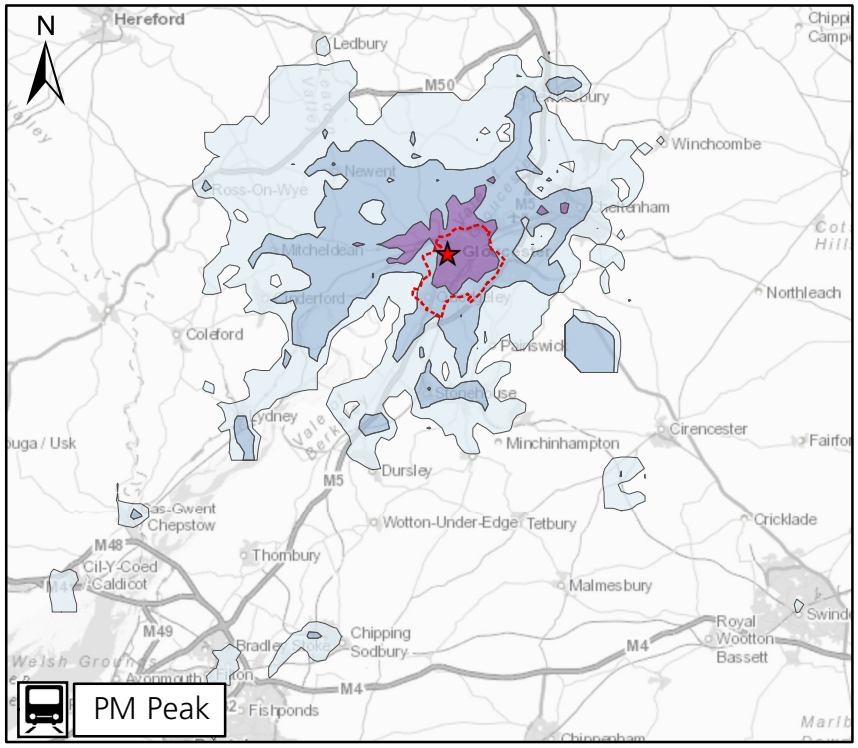
Employment sites

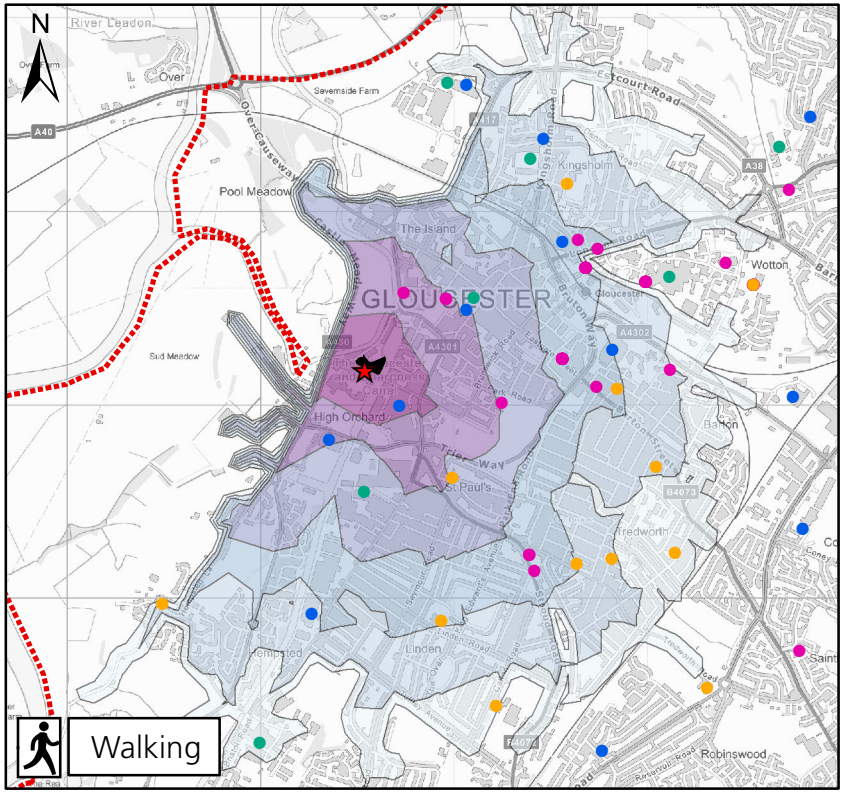
Primary School

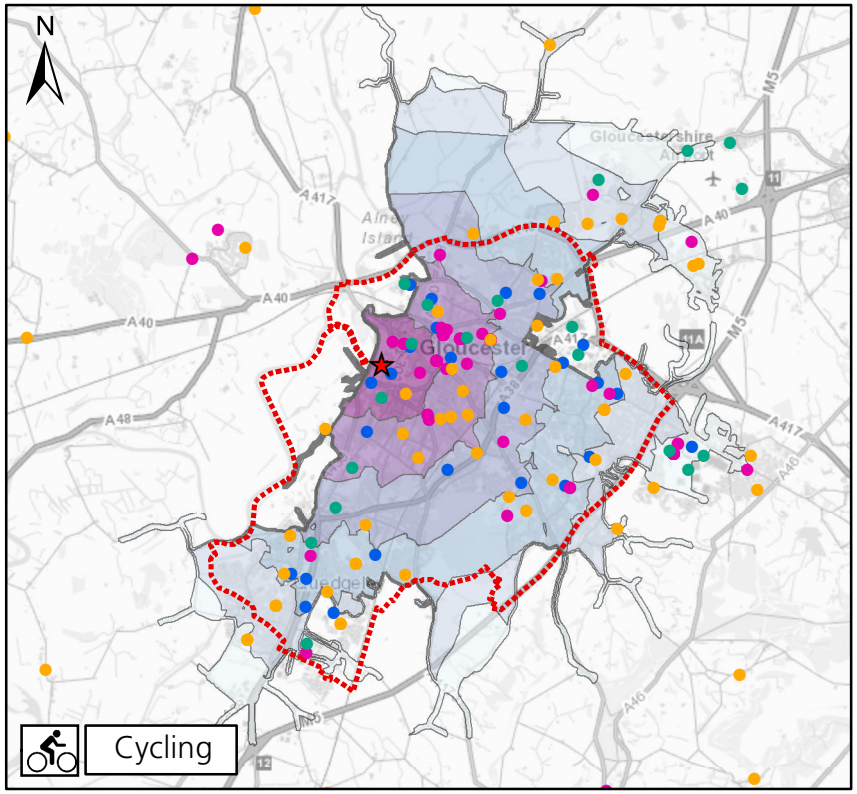
Healthcare provision

Gloucester City Boundary









Secunda Way Industrial Estate

SA22

20 minutes
40 minutes
60 minutes

20 minutes from Gloucester city centre by public transport during peak periods

5 minutes
10 minutes
15 minutes
20 minutes
25 minutes
30 minutes

20 minutes / **10 minutes** to healthcare provision

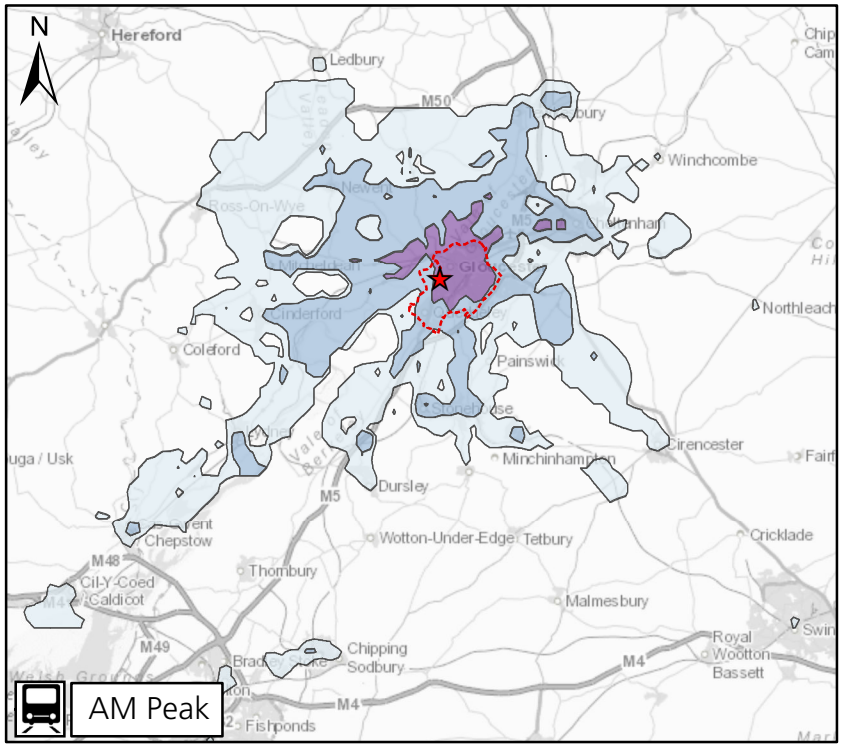
20 minutes / **10 minutes** to a primary school

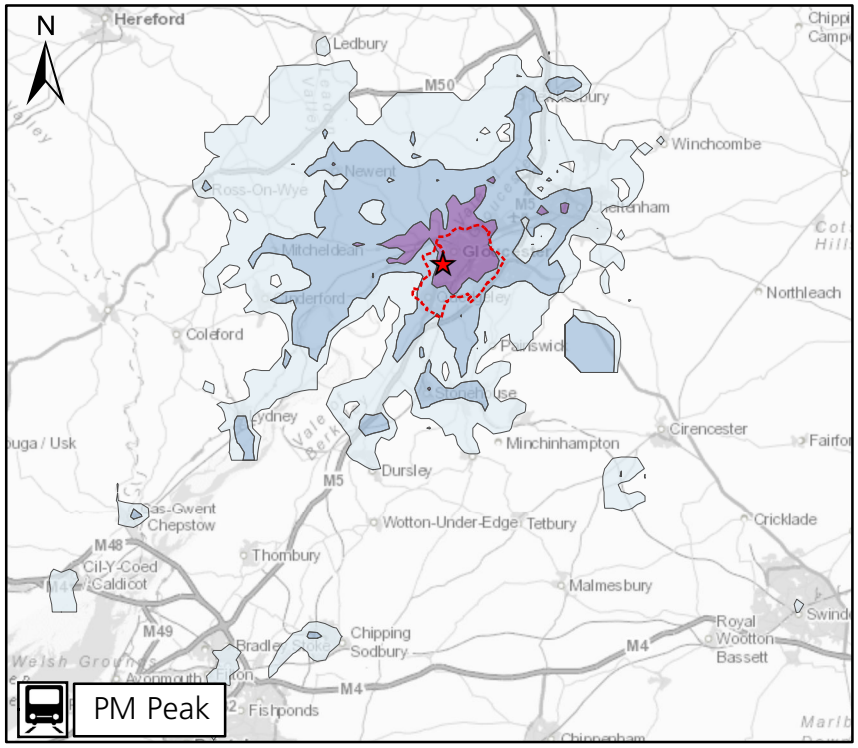
25 minutes / **10 minutes** to Gloucester city centre

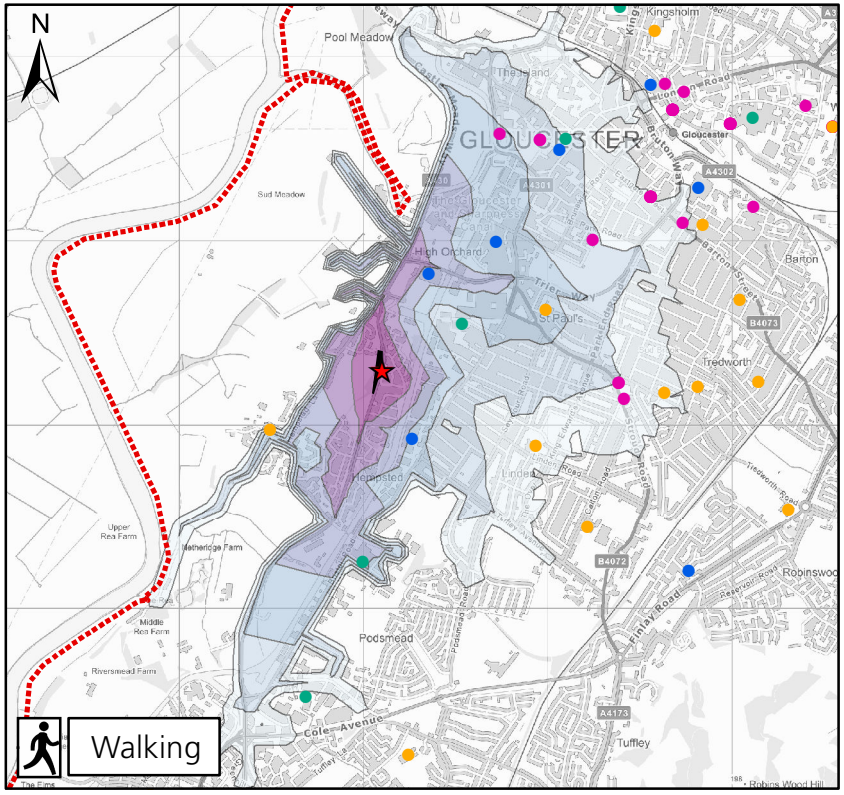
15 minutes / **5 minutes** to other local centres of employment

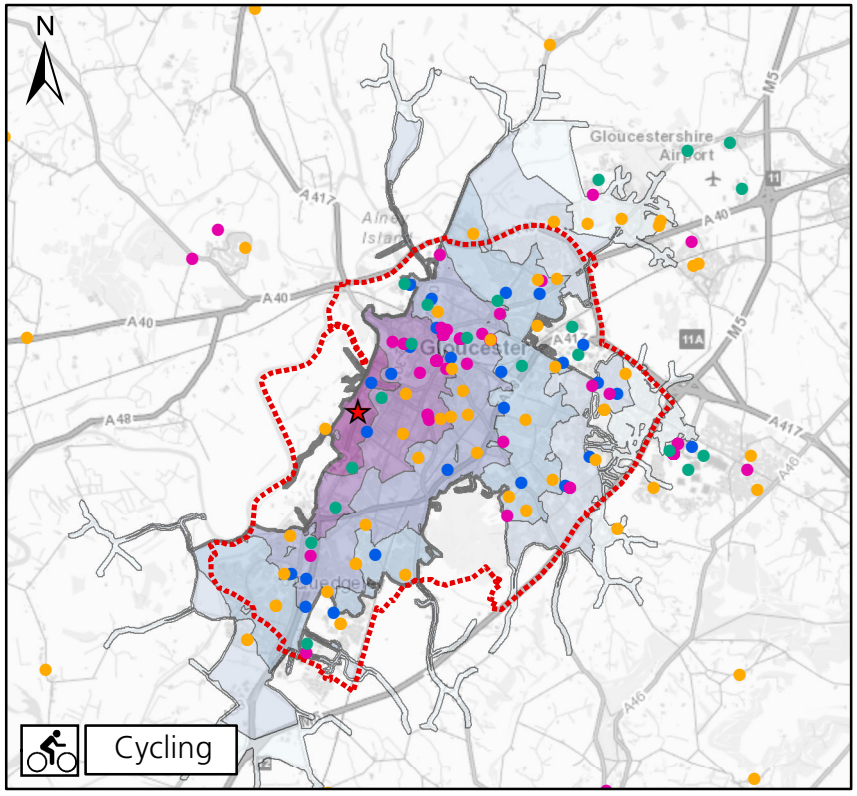
15 minutes / **5 minutes** to local retail provision

- Indicative Site Access
- City Plan Allocations
- Local retail provision
- Employment sites
- Primary School
- Healthcare provision
- Gloucester City Boundary



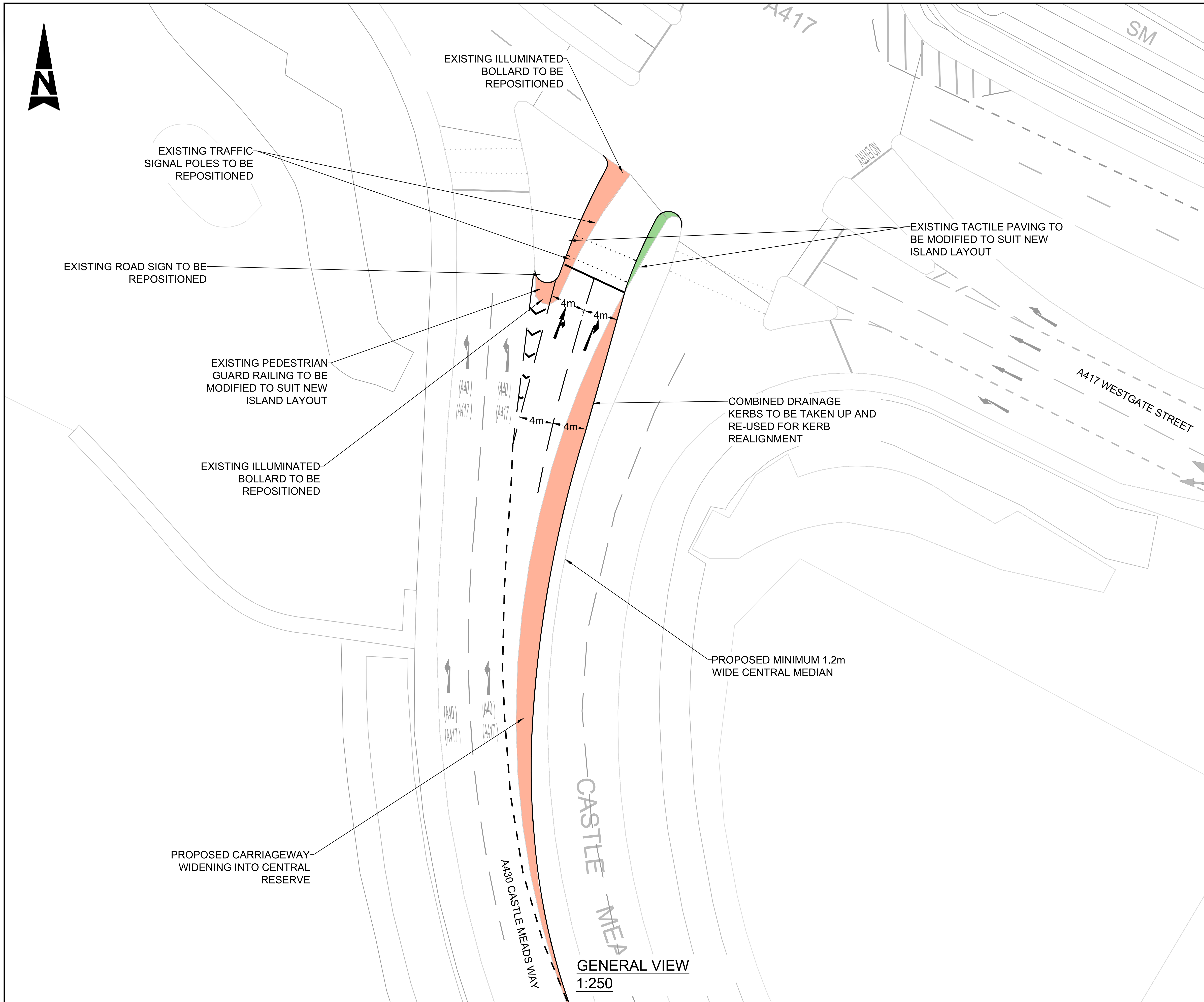




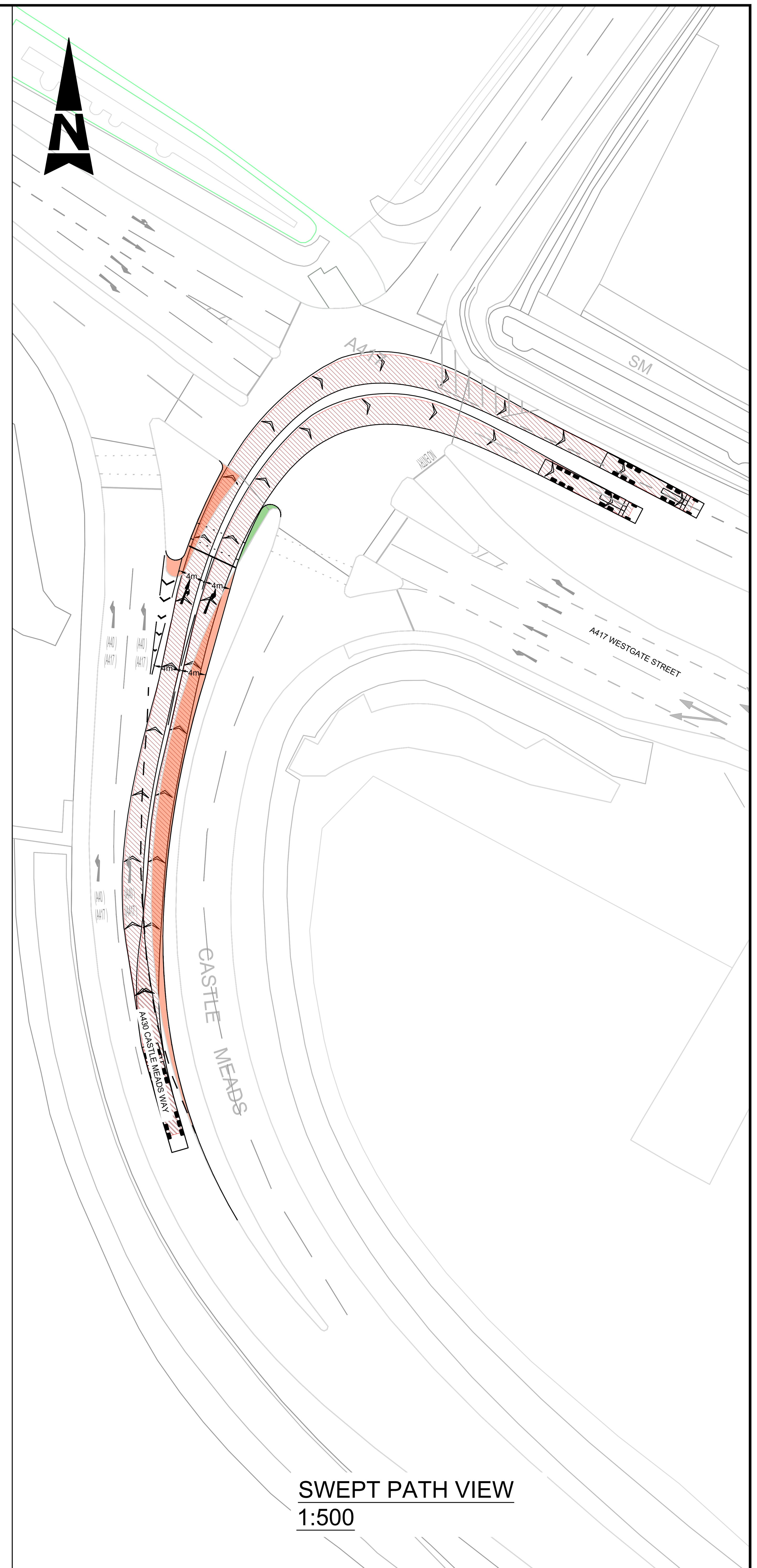


Appendix D. Drawings

DO NOT SCALE



GENERAL VIEW
1:250



SWEPT PATH VIEW
1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

3. ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TSRGD 2015.

KEY:

AREA OF NEW CARRIAGEWAY

AREA OF NEW FOOTPATH

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	Org	Chk'd	App'd	Aut'd
P01.1	28/08/19	First Issue	M.C.	A.E.	P.R.	P.R.

Suitability: FOR INFORMATION
Design Status: S2

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Fax: +44 (0)1792 472019
www.atkinsglobal.com

Client: GLOUCESTER CITY COUNCIL

Project Title: GLOUCESTER CITY PLAN JUNCTION ASSESSMENTS

Drawing Title: PROPOSED MITIGATION - A430/A417 - INDICATIVE LAYOUT

Scale	Originator	Checked	Approved	Authorised
AS SHOWN	M.C.	A.E.	P.R.	P.R.
Original Size: A1	Date: 28/08/19	Date: 28/08/19	Date: 28/08/19	Date: 28/08/19

Drawing Number (Project | Originator | Volume / Location | Type | Role | Number):
5157942-001-ATK-HGN
GCC-SK-D-0001

Project Ref. No.: 5157942

Revision: P01.1

Plotted by: CATL7549 Date: Aug 29, 2019 - 3:04pm
Drawing file saved on ProjectWise

DO NOT SCALE

Millimetres 0 10 100

EXISTING MERGE TAPER LENGTHENED (NB LESS THAN 100m RECOMMENDED BY TD50/04)

A430 LLANTHONY ROAD

EXISTING SOUTH BOUND STOP LINES TO BE PULLED BACK APPROXIMATELY 10m

NEW TRAFFIC SIGNALS

EXISTING ILLUMINATED BOLLARD TO BE REPOSITIONED

SPINNAKER JUNCTION

EXISTING TRAFFIC SIGNAL TO REMAIN

SPINNAKER JUNCTION

ST ANN WAY

NEARSIDE LANE TO ACCOMMODATE RIGHT TURN MOVEMENTS

GENERAL VIEW
1:250

A430 LLANTHONY ROAD

SPINNAKER JUNCTION

ST ANN WAY

SWEPT PATH VIEW
1:500

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

3. ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TSRGD 2015.

KEY:

AREA OF NEW CARRIAGEWAY

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
(Enter "None" if applicable)
Maintenance / Cleaning
(Enter "None" if applicable)
Use
(Enter "None" if applicable)
Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	Org	Chk'd	App'd	Aut'd
P01.1	28/08/19	First Issue	M.C.	A.E.	P.R.	P.R.

Suitability: FOR INFORMATION

Design Status: S2

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Fax: +44 (0)1792 472019
www.atkinsglobal.com

Client: GLOUCESTER CITY COUNCIL

Project Title: GLOUCESTER CITY PLAN JUNCTION ASSESSMENTS

Drawing Title: PROPOSED MITIGATION - A430/ SPINNAKER ROAD - INDICATIVE LAYOUT

Scale	Originator	Checked	Approved	Authorised
1:250	M.C.	A.E.	P.R.	P.R.
Original Size	**Date**	**Date**	**Date**	**Date**
A1	28/08/19	28/08/19	28/08/19	28/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
5157942-001-ATK-HGN GCC-SK-D-0003

Project Ref. No.: 5157942

Revision: P01.1

Plotted by: CATL7549 Date: Aug 29, 2019 - 3:12pm
Drawing file saved on ProjectWise

Millimetres 0 10 100

DO NOT SCALE

N

EXISTING 9 NO. POWER CABINETS/FEEDER PILLARS TO BE RELOCATED FOLLOWING CARRIAGEWAY REALIGNMENT

EXISTING TRAFFIC SIGNALS, SIGNS, GULLIES, PEDESTRIAN GUARD RAILS, LIGHTING COLUMNS, ILLUMINATED BOLLARDS, VRS AND TACTILE PAVING ON TRAFFIC ISLAND TO BE RELOCATED TO SUIT FOLLOWING CARRIAGEWAY WIDENING

EXISTING TRAFFIC SIGNALS, SIGNS, GULLIES, PEDESTRIAN GUARD RAILS, LIGHTING COLUMNS, ILLUMINATED BOLLARDS AND TACTILE PAVING ON TRAFFIC ISLAND TO BE RELOCATED TO SUIT FOLLOWING CARRIAGEWAY WIDENING

25m QUEUE STORAGE OBTAINED DUE TO LANE LENGTHENING

EXISTING TACTILE PAVING TO REMAIN AS EXISTING

EXISTING TRAFFIC SIGNAL, CENTRAL TRADING ESTATE SIGN, GULLIES, PEDESTRIAN GUARD RAILS, LIGHTING COLUMN, AND FEEDER PILLAR TO BE RELOCATED TO SUIT FOLLOWING CARRIAGEWAY WIDENING

3m

0.8m

CURRENT SUP REALIGNED TO ACCOMMODATE NEW ROAD WIDENING, WITH A SEPARATION STRIP OF 0.8m ACHIEVED AND SUP WIDTH OF 3m

EXISTING PEDESTRIAN GUARD RAILS TO BE MODIFIED FOLLOWING CARRIAGEWAY AND SUP RE-ALIGNMENT

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

3. ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TSRGD 2015.

KEY:

- AREA OF NEW CARRIAGEWAY
- AREA OF NEW FOOTPATH
- AREA OF NEW GRASS SEPARATION STRIP
- AREA OF NEW SUP

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).

Construction
(Enter "None" if applicable)

Maintenance / Cleaning
(Enter "None" if applicable)

Use
(Enter "None" if applicable)

Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	Org	Chk'd	App'd	Aut'd
P01.1	28/08/19	First Issue	M.C.	A.E.	P.R.	P.R.

Suitability: FOR INFORMATION

Design Status: S2

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Fax: +44 (0)1792 472019
www.atkinsglobal.com

Client: GLOUCESTER CITY COUNCIL

Project Title: GLOUCESTER CITY PLAN JUNCTION ASSESSMENTS

Drawing Title: PROPOSED MITIGATION - A38 / B4008 / COLE AVENUE - INDICATIVE LAYOUT

Scale	Originator	Checked	Approved	Authorised
1:250	M.C.	A.E.	P.R.	P.R.
Original Size	**Date**	**Date**	**Date**	**Date**
A1	28/08/19	28/08/19	28/08/19	28/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
5157942-001-ATK-HGN
GCC-SK-D-0004

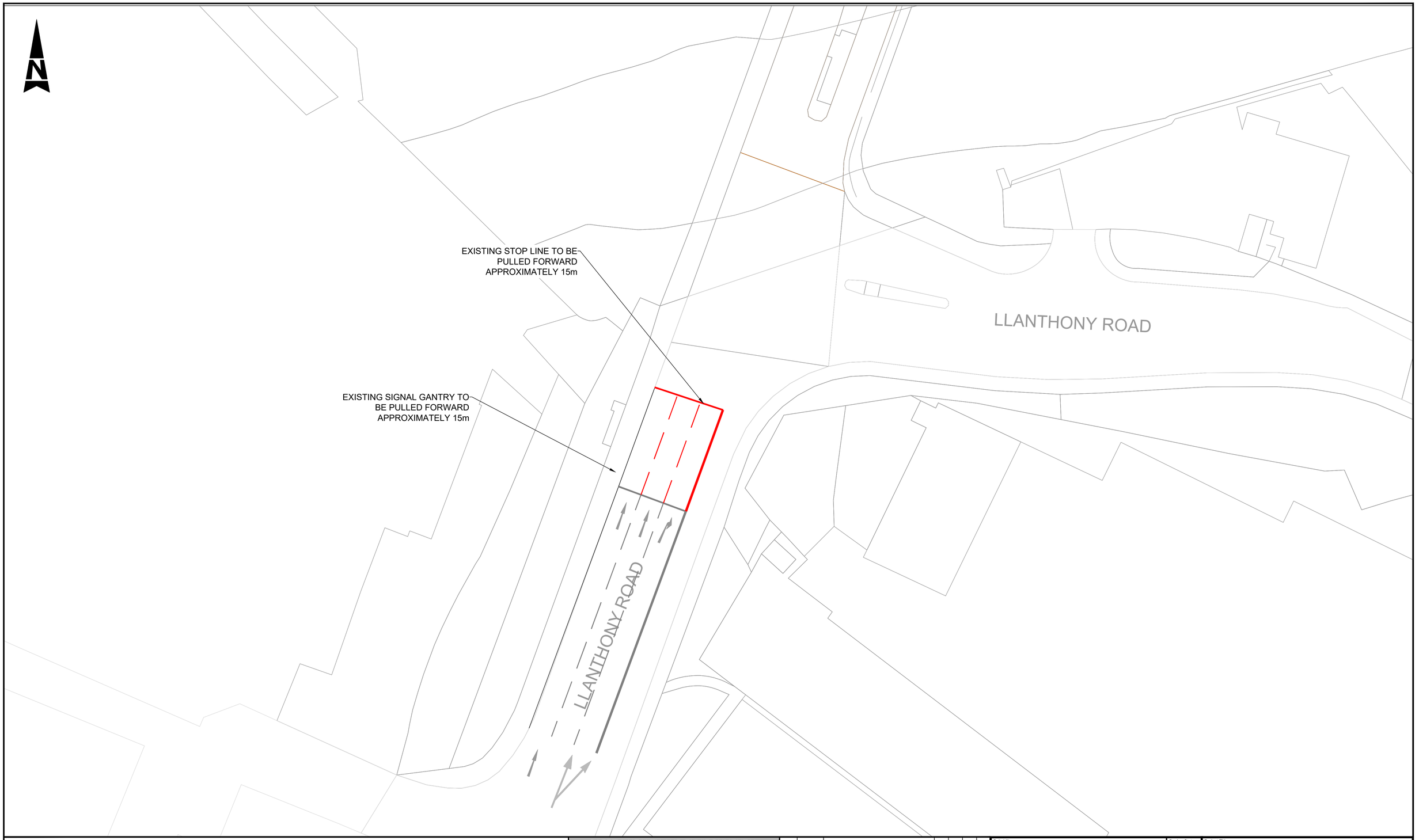
Project Ref. No.: 5157942

Revision: P01.1

Plotted by: CATL7549 Date: Aug 30, 2019 - 3:44pm
Drawing file saved on ProjectWise

DO NOT SCALE

Millimetres 0 10 100



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

2. ONLY WRITTEN DIMENSIONS SHALL BE USED, DO NOT SCALE.

3. ALL ROAD MARKINGS TO BE IN ACCORDANCE WITH TSRGD 2015.

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks (Reference shall also be made to the design hazard log).
Construction
(Enter "None" if applicable)
Maintenance / Cleaning
(Enter "None" if applicable)
Use
(Enter "None" if applicable)
Decommissioning / Demolition
(Enter "None" if applicable)

Rev.	Date	Description	Org	Chk'd	App'd	Aut'd
P01.1	28/08/19	First Issue	M.C.	A.E.	P.R.	P.R.

Suitability: FOR INFORMATION

Design Status: S2

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Fax: +44 (0)1792 472019
www.atkinsglobal.com

Client: GLOUCESTER CITY COUNCIL

Project Title: GLOUCESTER CITY PLAN JUNCTION ASSESSMENTS

Drawing Title: PROPOSED MITIGATION - A430 LLANTHONY ROAD INDICATIVE LAYOUT

Scale	Originator	Checked	Approved	Authorised
1:250	M.C.	A.E.	P.R.	P.R.
Original Size	**Date**	**Date**	**Date**	**Date**
A1	28/08/19	28/08/19	28/08/19	28/08/19

Drawing Number: Project | Originator | Volume | Location | Type | Role | Number
5157942-001-ATK-HGN GCC-SK-D-0005

Project Ref. No.: 5157942

Revision: P01.1

Plotted by: CATL7549 Date: Aug 30, 2019 - 3:11pm
Drawing file saved on ProjectWise

Appendix E. Cost Estimates

ATKINS

Document Reference:	Castle Meads Way
Issued by:	AW
Checked by:	
Approved by:	
Issued Date:	29/08/2019
Revision:	A

Site 1 - Castle Meads Way

Item		CIVIL WORKS	TOTAL	Description
	Site 1	**£76,445**	**£76,445**	
	Main Contractor Preliminaries @ 25%		**£19,111**	
	Sites Investigation @ 1.5%		**£1,433**	
	Design @ 8%		**£7,759**	
	Contingency @ 20%		**£20,950**	
	Optimism Bias @ 25%		**£31,425**	

TOTAL £ 76,445 **£ 157,123**

Note: Costs have been obtained either from suppliers, cost build ups or estimates from other projects.

ATKINS

Issued by:	AW
Checked by:	0
Approved by:	0
Issued Date:	29/08/2019
Revision:	A

Site 1 - Castle Meads Way

Item		No Total		Price/unit	Price /total	SUBTOTAL	Source	Description
A	Traffic management and road diversions (Provisional)	1	Item	£20,000	£ 20,000.00			
B	New carriageway construction (300mm sub-base, 200mm base, 60mm binder, 40mm surface	210	m2	£80	£ 16,800.00			
C	Break out existing road surfacing and disposal off site	222	m2	£30	£ 6,660.00			
D	Combined drainage kerb realignment	110	m	£110	£ 12,100.00			
E	Pedestrian guardrail alterations	17	m	£60	£ 1,020.00			
F	Joint new road to existing	125	m	£40	£ 5,000.00			
G	Signage alteration	1	Item	£1,000	£ 1,000.00			
H	Traffic Signal alteration	3	item	£1,750	£ 5,250.00			
I	New footway construction	12	m2	£30	£ 360.00			
J	Illuminated bollard alterations	3	item	£500	£ 1,500.00			
K	Road Markings allowance	1	item	£5,000	£ 5,000.00			
L	Tactile paving alterations	3	m2	£60	£ 180.00			
M	Kerb alterations	45	m	£35	£ 1,575.00			
					Sub - Total	**£ 76,445.00**		

Exclusions

VAT
Detailed survey of the proposed location
Service Diversions
Land/Property costs
Planning approval
Legal Fees
Ecology costs associated with protected habitat, flora and fauna

Assumptions

No contaminated ground
Existing on-site utility connections are of adequate size and at convenient locations
No major earthworks are required.
Unrestricted access for construction traffic to site
No restrictions on out of hours working

ATKINS

Document Reference:	Cole Avenue/Bristol Road
Issued by:	AW
Checked by:	
Approved by:	
Issued Date:	30/08/2019
Revision:	A

Site 2 - Cole Avenue/Bristol Road Junction

Item		CIVIL WORKS	TOTAL	Description
	Site 2	**£129,350**	**£129,350**	
	Main Contractor Preliminaries @ 25%		**£32,338**	
	Sites Investigation @ 1.5%		**£2,425**	
	Design @ 8%		**£13,129**	
	Contingency @ 20%		**£35,448**	
	Optimism Bias @ 25%		**£53,173**	

TOTAL £ 129,350 **£ 265,863**

Note: Costs have been obtained either from suppliers, cost build ups or estimates from other projects.

ATKINS

Issued by:	AW
Checked by:	0
Approved by:	0
Issued Date:	30/08/2019
Revision:	A

Cole Avenue/Bristol Road Junction

Item		No Total		Price/unit	Price /total	SUBTOTAL	Source	Description
A	Traffic management and road diversions (Provisional)	1	Item	£20,000	£ 20,000.00			
B	New carriageway construction (300mm sub-base, 200mm base, 60mm binder, 40mm surface	350	m2	£80	£ 28,000.00			
C	Break out existing surfacing and disposal off site	350	m2	£30	£ 10,500.00			
D	Joint between new and existing carriageway	225	m	£40	£ 9,000.00			
E	Allowance for the relocation of traffic signals following alterations	4	item	£1,750	£ 7,000.00			
F	Remove existing kerbs/edgings	335	m	£5	£ 1,675.00			
G	Illuminated bollard alteration	3	item	£500	£ 1,500.00			
H	Install new kerbs	225	m	£30	£ 6,750.00			
I	Install new concrete edging	100	m	£16	£ 1,600.00			
J	New footway construction	100	m2	£30	£ 3,000.00			
K	Guardrail alterations	100	m	£60	£ 6,000.00			
L	Allowance for road markings	1	item	£5,000	£ 5,000.00			
M	Allowance for signage relocation and replacements	1	item	£10,000	£ 10,000.00			
N	Tactile Paving alterations	20	m2	£60	£ 1,200.00			
O	Take down and reinstall VRS following kerb realignment	40	m	£100	£ 4,000.00			
P	Topsoil/seeding of new verge areas	25	m2	£5	£ 125.00			
Q	Allowance for lighting column relocation	4	item	£1,000	£ 4,000.00			
R	Allowance for feeder pillar/power cabinet relocation	10	item	£1,000	£ 10,000.00			
					Sub - Total	**£ 129,350.00**		

Exclusions
VAT
Detailed survey of the proposed location
Service Diversions
Land/Property costs
Planning approval
Legal Fees
Ecology costs associated with protected habitat, flora and fauna

Assumptions
No contaminated ground
Existing on-site utility connections are of adequate size and at convenient locations
No major earthworks are required.
Unrestricted access for construction traffic to site
No restrictions on out of hours working

ATKINS

Document Reference:	Llanthony Road
Issued by:	AW
Checked by:	
Approved by:	
Issued Date:	02/09/2019
Revision:	A

Site 4 - Llanthony Road

Item		CIVIL WORKS	TOTAL	Description
	Site 4	**£11,500**	**£11,500**	
	Main Contractor Preliminaries @ 25%		**£2,875**	
	Sites Investigation @ 20%		**£2,875**	
	Design @ 20%		**£3,450**	
	Contingency @ 20%		**£4,140**	
	Optimism Bias @ 25%		**£6,210**	

TOTAL £ 11,500 **£ 31,050**

Note: Costs have been obtained either from suppliers, cost build ups or estimates from other projects.

ATKINS

Issued by:	AW
Checked by:	0
Approved by:	0
Issued Date:	02/09/2019
Revision:	A

Llantony Road

Item		No Total		Price/unit	Price /total	SUBTOTAL	Source	Description
A	Traffic management and road diversions (Provisional)	1	Item	£5,000	£ 5,000.00			
B	Road Markings Allowance (minimum day rate)	1	Item	£1,500	£ 1,500.00			
C	Allowance for the relocation of Traffic Signal & Signal Gantry	1	Item	£3,000	£ 5,000.00			
					Sub - Total	**£ 11,500.00**		

Exclusions
VAT
Detailed survey of the proposed location
Service Diversions
Land/Property costs
Planning approval
Legal Fees
Ecology costs associated with protected habitat, flora and fauna

Assumptions
No contaminated ground
Existing on-site utility connections are of adequate size and at convenient locations
No major earthworks are required.
Unrestricted access for construction traffic to site
No restrictions on out of hours working

ATKINS

Document Reference:	Spinnaker Road
Issued by:	AW
Checked by:	
Approved by:	
Issued Date:	29/08/2019
Revision:	A

Site 3 - Spinnaker Road

Item		CIVIL WORKS	TOTAL	Description
	Site 3	**£33,200**	**£33,200**	
	Main Contractor Preliminaries @ 25%		**£8,300**	
	Sites Investigation @ 1.5%		**£623**	
	Design @ 8%		**£3,370**	
	Contingency @ 20%		**£9,098**	
	Optimism Bias @ 25%		**£13,648**	
	TOTAL £	33,200	**£ 68,238**	

Note: Costs have been obtained either from suppliers, cost build ups or estimates from other projects.

ATKINS

Issued by:	AW
Checked by:	0
Approved by:	0
Issued Date:	29/08/2019
Revision:	A

Spinnaker Road

Item		No Total		Price/unit	Price /total	SUBTOTAL	Source	Description
A	Traffic management and road diversions (Provisional)	1	Item	£15,000	£ 15,000.00			
B	New carriageway construction (300mm sub-base, 200mm base, 60mm binder, 40mm surface	20	m2	£80	£ 1,600.00			
C	Break out existing surfacing and disposal off site	20	m2	£30	£ 600.00			
D	Joint between new and existing carriageway	30	m	£40	£ 1,200.00			
E	Allowance for installation of new traffic signal	2	item	£5,000	£ 10,000.00			
F	Remove existing kerbs	30	m2	£5	£ 150.00			
G	Illuminated bollard alteration	1	item	£500	£ 500.00			
H	Install new kerbs	5	m	£30	£ 150.00			
I	Road Markings allowance	1	item	£4,000	£ 4,000.00			
					Sub - Total	**£ 33,200.00**		

Exclusions
VAT
Detailed survey of the proposed location
Service Diversions
Land/Property costs
Planning approval
Legal Fees
Ecology costs associated with protected habitat, flora and fauna

Assumptions
No contaminated ground
Existing on-site utility connections are of adequate size and at convenient locations
No major earthworks are required.
Unrestricted access for construction traffic to site
No restrictions on out of hours working

Appendix F. Overall Assessment Summary

Gloucester City Plan Assessment Results Summary

Summary of Findings
All results are for 2031 forecast year

STAGE 1 - CSV SATURN MODELLING
For all junctions - V/C > 85% is considered to be over capacity

STAGE 2 - JUNCTION ASSESSMENTS & MITIGATION
For signal junctions are considered to be over capacity with PRC<0% and DoS>90%
For roundabouts - RFC > 0.85 is considered to be over capacity

Junction Ref	Junction	Junction Type DM	Mitigation proposed as part of DS7?	Commentary - DM				Commentary - DS7				Overall		Stage 2	Summary - DM Testing	Summary - DS7 Testing	Mitigation Required	Comments	Impact of Mitigation	Mitigation Scheme Reference	Budget Cost Estimate
				GCP DM - Node results	vs JCS DM (node results)	Thresholds exceeded & period	Other DM concerns with GCP	GCP DS7 - Node results	vs JCS DS7 (node results)	Thresholds exceeded & period	Other DS7 concerns with GCP	Overall conclusion	Further notes	Assessment Needed							
1	A38/A430/A417/Tewkesbury Road	Roundabout	No	Node well within capacity in both AM and PM	Slight improvement in the AM, minimal change in PM	None	None	Node well within capacity in both AM and PM	Slight improvement in the AM, significant improvement in PM	None	None	No further assessment needed		No							
2	A430/Gouda Way/Worcester Street	Signals	No	Node within capacity overall in both AM and PM	Slight increase in V/C in AM, and slight decrease in PM	None	One arm is over capacity with V/C of 100.9% in AM	Node within capacity overall in both AM and PM	Small improvement in AM, significant improvement in PM	None	One arm is over capacity with V/C of 92.6% in AM	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C >85% with GCP DM & DS7	Yes - Test GCP DM & GCP DS7	Junction operates within capacity in AM & PM with GCP	Junction operates within capacity in AM & PM with GCP	No					
3	A430/B4063/Northgate Street	Signals	No	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	No change in AM and significant improvement in PM	None	None	No further assessment needed		No							
4	A430/A4302	Signals	No	Node within capacity overall in both AM and PM	Minimal changes in both AM and PM	None	One arm is over capacity with V/C of 91.2% in PM	Node within capacity in both AM and PM	Small improvement in AM, significant improvement in PM	None	None	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C >85% with GCP DM	Yes - Test GCP DM only	Junction operates within capacity in AM & PM with GCP	Not assessed as not identified at Stage 1 as being over capacity with DS7	No					
5	A430/B4073/Eastgate Street		No	Node well within capacity in both AM and PM	Minimal increase in V/C in AM & PM	None	None	Node well within capacity in both AM and PM	Small improvement in AM, significant improvement in PM	None	None	No further assessment needed		No							
6	A4031/A430/Bristol Road	Signals	No	Node within capacity overall in both AM and PM	Minimal changes in both AM and PM	None	One arm is over capacity with V/C of 93.5% in AM and two arms over capacity in PM with V/C of 107.1% and 90.3%	Node within capacity overall in both AM and PM	Minimal increase in AM and significant improvement in PM	None	One arm is over capacity with V/C of 92.4% in AM & 102.8% in PM	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C>85% in AM and two in PM with GCP DM & DS7	Yes - Test GCP DM & GCP DS7	Junction operates within capacity in AM, but slightly overcapacity in PM DM with PRC of -8.8% and max DoS of 97.9%.	Junction operates marginally overcapacity in the AM DS7 with PRC of -1.6% and max DoS of 91.5%, but operates within capacity in PM	No	Existing signal junction in built up location with limited scope to widen. Junction appears to be under MOVA control with nearside ped detection. Even without mitigation forecast queuing is not excessive with a max queue of 28.1 pcu on Trier Way.				
7	Bristol Road/Clifton Road	Signals	No	Node within capacity overall in both AM and PM	Minimal changes in both AM and PM	None	One arm is over capacity with V/C of 100.9% in AM & 91.7% in PM	Node within capacity overall in both AM and PM	Small improvement in AM, significant improvement in PM	None	One arm is over capacity with V/C of 89.3% in AM	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C>85% in AM and PM with GCP DM & in DS7 AM	Yes - Test GCP DM & GCP DS7	Junction operates within capacity in AM & over capacity in the PM with GCP, with PRC of -10.9% and max DoS of 99.8%	Junction operates within capacity in AM & PM with GCP	No	Existing signal junction in built up location with limited scope to widen. Junction operates within capacity with JCS DS7 scenario, which is the more likely scenario.				
8	A430/Spinnaker Road	Signals	No	Node within capacity overall in both AM and PM	Minimal change in AM & PM	None	One arm is over capacity with V/C of 93.2% in AM	Node within capacity overall in both AM and PM	Small improvement in AM, significant improvement in PM	None	One arm is over capacity with V/C of 89.6% in AM	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C>85% in AM in DM & DS7	Yes - Test GCP DM & GCP DS7	Junction operates over capacity in AM and PM with PRC of -19.4% and -13.9%	Junction operates over capacity in AM only, with PRC of -16.2%	Yes	Minor alterations to the St Ann Way approach and A430(N) exit to provide two lanes for the right turn to A430(N)	Junction operation significantly improved, with mitigation slightly over capacity in AM DM with PRC of -2.4% and max DoS of 92.1%. Junction within capacity in all other scenarios.	5157942-001-ATK-HGN-GCC-SK-D-003	£68K
9	A430/Lanthony Road	Signals	No	Node over capacity in AM & PM	Increase in V/C in AM, no change in PM	V/C increase >20% (AM)	Two arms (AM) and all arms (PM) are over capacity with V/C >85%. Overall V/C is 88.3% in AM and 95.0% in PM	Node within capacity overall in AM & PM, but one arm exceeds V/C 85% in AM & PM	Small improvement in AM, significant improvement in PM	None	One arm is over capacity with V/C of 99.9% in AM & 95.1% in PM	Further assessment needed as node threshold exceed	V/C threshold exceeded in the DM comparisons, and arms >85% with DM & DS7	Yes - Test GCP DM & GCP DS7	Junction operates slightly over capacity in AM with PRC of -2.5% and max DoS of 92.3%, and similarly in PM with PRC of -1.4% and max DoS of 91.3%	Junction operates slightly over capacity in AM with PRC of -4.5% and max DoS of 94.0%, and well within capacity in the PM	Yes	Move the stop line on the southern arm forward by c15m to reduce intergreen times	Junction works within capacity in AM DM & PM DM, and PM DS7, and marginally over capacity in AM DS7, with PRC of -0.2%	5157942-001-ATK-HGN-GCC-SK-D-005	£31K
10	A417/A4301 - St Oswalds Rd approach	Free flow gyratory	No	Link operating well within capacity in both AM and PM	Small improvements in AM and PM	None	None	Link operating well within capacity in both AM and PM	Minimal improvement in AM, small improvement in PM	None	None	No further assessment needed		No							
11	A4301/A417 - Westgate St approach	Free flow gyratory	No	Link operating well within capacity in both AM and PM	Improvement in AM & PM	None	None	Link operating well within capacity in both AM and PM	Significant improvement in AM & PM	None	None	No further assessment needed		No							
12	A417/A430 Castle Meads Way	Signals	Yes - upgrade signals to MOVA or SCOOT	Node within capacity in both AM and PM	Slight improvement in AM, minimal or no change to flow or V/C in PM but increase in delay	Delay increase >30s (PM)	Delay increase in PM	Node within capacity in both AM and PM	Small improvements in AM and moderate improvement in PM	None	None	Further assessment needed as node threshold exceed	Delay threshold exceeded in the DM PM	Yes - Test GCP DM only (as DS7 mitigation proposed and operates fine)	Junction operates over capacity in AM with PRC of -27.1% and max DoS of 114.4%, but operates within capacity in PM	Not assessed as JCS includes mitigation at this location, comprising of MOVA/SCOOT	Yes	Provide two lane right turn from A430(S) to A417	Junction operation improved significantly, with mitigation marginally over capacity in AM DM with PRC of -5.2% and max DoS of 94.7%. Junction within capacity in PM DM. MOVA / SCOOT could be added as per JCS DS7 proposal to improve the performance further	5157942-001-ATK-HGN-GCC-SK-D-001	£157K
13	A40/A417/B4063	Signalised Roundabout	Yes - upgrade signals to MOVA or SCOOT	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	Moderate improvements in AM & PM	None	None	No further assessment needed		No							
14	A417/Corinium Avenue/Barnett way	Signalised Roundabout	No	Node well within capacity in both AM and PM	Small increases in AM and minimal change in PM	None	None	Node well within capacity in both AM and PM	Small improvement in AM, significant improvement in PM	None	None	No further assessment needed		No							
15	Corinium Avenue/Barnwood Road/Eastern Avenue	Signalised Roundabout	Yes - 3rd lane on circulatory carriageway between Barnwood Rd and A38 Eastern Ave	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	Small increase in V/C and flows in AM, moderate improvements in PM	None	Flow and V/C increases in AM exceed thresholds on one arm, but V/C's well below 85%	No further assessment needed		No							
16	A38/A4302/Metz Way	Signals	No	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	Small increase in V/C and flows in AM, moderate improvements in PM	None	None	No further assessment needed		No							
17	A38/B4073 Painswick Road	Roundabout	No	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	Slight improvement in the AM, significant improvement in PM	None	None	No further assessment needed		No							
18	A38/A4173/B4672/Reservoir Road	Roundabout (in DM), Signalised Junction in (DS7)	Yes - replace 5 arm roundabout with 4 arm signalised cross roads	Node within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node over capacity in both AM & PM	Slight improvement in the AM, moderate improvement in PM	None	D57 mitigation scheme over capacity in AM and PM, with overall V/C of 99.4% and 87.1%	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	Potential DS7 (V/Cs >85%) - but separate study commissioned so assume suitable mitigation will be identified	N/A - Although the DS7 mitigation scheme is over capacity, this junction will not be considered in Stage 2. GCC have commissioned a separate study of this junction, likely that future tests will use JCS flows from the JCS model. No further testing as DM scenario operates within capacity	Not assessed as subject of separate on-going study, and junction not identified in Stage 1 as needing further assessment, for the DM scenario	Not assessed as subject of separate on-going study. Stage 1 identified junction is over capacity in the DS7 scenario only (signalised cross roads)	For the DS7 scenario but subject to separate study.	N/A	N/A	N/A	N/A
19	A430/Bristol Road/Goodridge Avenue	Signals	No	Node within capacity in both AM and PM	Minimal changes in both AM and PM	None	One arm over capacity with V/C of 89.1% in AM	Node within capacity in both AM and PM	Slight improvement in the AM, significant improvement in PM	None	None	Further assessment not needed based on node threshold results, but recommended based on arm results with GCP	One arm has V/C >85% with GCP DM	Test GCP DM only	Junction operates within capacity in AM & PM with GCP	Not assessed as not identified at Stage 1 as being over capacity with DS7	No					
20	A38/B4008/Cole Avenue	Signals	Yes - grade separation of A38 through junction	Node close to capacity in AM & PM	Slight increase in AM & PM	Delay increase >30s in AM & PM	One arm over capacity with V/C of 107.1% in AM & 99.1% in PM	Node within capacity in both AM and PM	Slight improvement in the AM, significant improvement in PM	None	None	Further assessment needed as node threshold exceed	Delay threshold exceeded in the DM AM & PM, and arms with V/C>85% in DM AM & PM	Test GCP DM only	Junction operates over capacity in AM with PRC of -35.0% and max DoS of 121.5%, and in PM with PRC of -23.9% and max DoS of 111.5%	Not assessed as JCS includes mitigation at this location, comprising of grade separation of A38 to A38 movement	Yes	Widening of A430(N) approach to 3 lanes through to A38(S), widening left turn from B4008 to A430(N), and widening on the left turn from A38(E) to A38(S)	Junction operation improved with mitigation but still over capacity in AM DM with PRC of -11.8% and max DoS of 100.6%, and in the PM with PRC -12.8% and max DoS of 101.5%. Further mitigation would require a scheme such as the DS7 mitigation scheme which includes grade separation.	5157942-001-ATK-HGN-GCC-SK-D-003	£266K
22A	M5/A417 Jnc 11A (West of M5)	Roundabout	Yes - remove left slip from Detla Way (Brockworth) to C&G roundabout, and signalise A417 approach from Cirencester	Node close to capacity in AM & PM	Increase in AM and slight improvement in PM	None	None	Node well within capacity in both AM and PM	Small improvement in AM, significant improvement in PM	None	None	No further assessment needed		No							
22B	M5/A417 Jnc 11A (East of M5)	Grade Separated Roundabout	Yes - improved signing and lining and area wide reassignment	Node close to capacity in AM & well within capacity in PM	Increase in AM and minimal change in PM	Delay increase >30s in AM	One arm over capacity with V/C of 106.1% in AM	Junction operating within capacity in both AM and PM	Minimal change in AM, significant improvement PM	None	None	Further assessment needed as node threshold exceed	Delay threshold exceeded in DM AM, and V/C>85% in DM AM	Test GCP DM only	Junction operates fractionally over capacity in AM, with max RFC of 0.88, and within capacity in the PM peak	Not assessed as JCS includes mitigation at this location, comprising signing and lining and area wide reassignment (limited details available)	No - see comment	A free flow left turn lane from M5 NB off slip to A417 (E) could mitigate the impact. However, the issue is a function of the JCS model whereby c1000 trips are exiting M5 at J11A to head east to A46, majority of which then travel to Cheltenham to avoid delays at J11 and on the A40 corridor. The JCS includes improvements to J11 and A40 corridor, as well as new slip roads at J10, which will mean Cheltenham bound traffic will stay on the M5 and the issue identified in the DM at Stage 1 will not be an issue long term			
23	M5/A40 Jnc 11	Grade separated junction	Yes - signalise southbound offslip, and extra lane on northbound offslip	Node well within capacity in both AM and PM	Improvement in AM and minimal change in PM	None	V/C increase on one arm >30% in AM but well within capacity	Node within capacity in both AM and PM	Minor increases in V/C and delay in AM & PM	None	None	No further assessment needed		No							
24	M5/B4008 Jnc 12	Grade separated junction	Yes - upgrade on and offslips to 2 lanes wide	Node well within capacity in both AM and PM	Minimal changes in both AM and PM	None	None	Node well within capacity in both AM and PM	Small improvement in AM and small increase in PM	None	Flow increase and V/C increase on two arms exceed thresholds, but arms well within capacity	No further assessment needed		No							

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