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# Bromsgrove Development Plan – Transport Network Analysis and Mitigation Report

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Worcestershire County Council

May 2013

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## Document History

### Bromsgrove Development Plan – Transport Network Analysis and Mitigation Report

Worcestershire County Council

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**DRAFT**

# 1 Executive Summary

Bromsgrove District Council (BDC) is preparing its District Plan to guide all development up to 2030. To assist with the development of the Core Strategy, Halcrow has been commissioned to support Worcestershire County Council (WCC) with identifying the impact on the transport network of the proposed growth and developing the transport related infrastructure and services needed to best accommodate and manage the growth in demand. Halcrow is also giving advice on and preparing the transport evidence to contribute towards the transport elements of the Infrastructure Delivery Plans (IDPs) that Bromsgrove District Council and Redditch Borough Council will be preparing as part of their evidence base in support of their development plans. The identified transport infrastructure (highway, public transport, cycle and pedestrian) and passenger transport service requirements to support the Bromsgrove District Plan (BDP) are based on the planning assumptions set out in the Draft Bromsgrove District Core Strategy (BDCS), this will include all residential and employment generating land uses across the Bromsgrove District. The Draft Bromsgrove District Core Strategy is being renamed the Bromsgrove District Plan and all further references (BDCS/BDP) will be applicable to both documents.

The BDCS/BDP considers the long term vision and objectives for Bromsgrove District Council, up to the year 2030 with development sites identified up to 2022/23 with the future location of additional development yet to be determined. This analysis considers the development sites up to 2022/23 which have been provided by Bromsgrove District Council.

The transport elements of the final (IDP) will give details of the transport infrastructure and services that are required to support the growth set out in the BDCS/BDP. It is envisaged that the information set out in the IDP will be used to develop a Community Infrastructure Levy (CIL), and to inform and support negotiations with developers about site specific s106 agreements. The information in this assessment will also inform the development of the LTP3 Bromsgrove Package and associated schemes such that transport improvements are integrated with and take full account of planned land use changes. This will help to avoid a piecemeal and potentially poorly targeted approach to investment in transport which will do little to support economic growth or encourage sustainable development.

This report sets out the transport mitigation measures identified as being necessary to support the delivery of the BDCS/BDP; this includes highway, walk, cycle and passenger transport infrastructure and services. The transport schemes identified through this study aim to manage the impacts on the performance of the transport network of the draft BDCS/BDP and Redditch Borough Core Strategy (RBCS). These assumptions include the Cross Boundary development sites proposed for the Core Scenario across the two authority areas up to 2030. Under guidance from the Local Planning Authorities the preferred cross-boundary development scenario is Scenario 7 (i.e. Cross Boundary Sites 4 and 6) located to the west and north west of Redditch.

A key premise of this work is to recognise that the quantum of development proposed for Bromsgrove will not only have a local transport impact (immediately adjacent to an individual site) but also an impact on Worcestershire's and the Highway Agency's local and strategic transport network further afield. The local

impacts of any development can be identified, assessed and mitigation measures implemented, however for locations further away from the proposed development sites, whilst the cumulative impact of planned development on the performance of the highway and transport network may be known, their cause can be more difficult to identify.

The nature of the transport network means that a development site (or the summation of a number of small development sites) can cause a significant adverse impact some distance from the traffic generation source (development site). The congestion that occurs at pinch points throughout the network, will be caused by trips generated by cumulated demand generated by all developments both local to and remote from the congestion point. However, once the origin of these trips has been identified, an assessment of the allocation of mitigation measure costs can be identified. The methodology adopted as part of this work has developed the necessary tools to enable the identification of the source of the cumulative demand.

In order to undertake a network wide assessment of the transport network in Bromsgrove District, and specifically assess the cumulative transport impact on the transport networks resulting from development sites proposed through the draft BDCS/BDP, a Vehicle/Trip Generation modelling tool was developed. The modelling tool enables:

- The calculation of the numbers of trips that each proposed development site will generate;
- An assessment of the way in which those trips will route on the network; and
- The ability to sum the trips to establish an overall impact assessment.

The Vehicle/Trip Generation modelling tool, in the form of a strategic gravity model, draws upon existing evidence and previous related studies, namely:

- LTP3 Bromsgrove Package – Phase 1-3 Report (Planning Works)
- Bromsgrove Town Development Spreadsheet Model;
- Accessibility Assessments; and
- WCC Officer Workshops

Where appropriate the Vehicle/Trip Generation Model was validated for consistency against the previous studies.

In proposing future year transport infrastructure schemes, the scheme listings have, where appropriate, drawn on emerging Transport Packages. For example, issues and indicative scheme proposals identified through the LTP3 Bromsgrove Transport Package (BTP) including committed amendments arising from specific developments (e.g. the amendments to the Stourbridge Road/Birmingham Road junction intended to mitigate the impacts of the proposed Sainsbury Store) and the highways elements of the Bromsgrove High Street Public Realm improvement scheme have been taken as the core schemes for Bromsgrove Town.

Where additional issues have been identified in Bromsgrove and the outlying towns in the District, this project has identified further locations and modes of transport where mitigation is required to overcome or reduce the impact of proposed

development on the transport network. There are locations outside Bromsgrove that do not currently have the benefit of an existing identified package of measures. Furthermore, there are some development sites that were not considered at the time the first phases of the BTP analysis were undertaken. For these sites, analysis has been undertaken to identify schemes and other mitigation measures. These required schemes have been identified with the assistance of the Vehicle/Trip Generation Model.

Evidence from the Vehicle/Trip Generation model and the LTP3 Bromsgrove Transport Package Report suggests that many of the junctions located along the A38 corridor and town centre routes are already at operating at levels approaching or at capacity. These include:

- M42 Junction 1
- Slideslow Roundabout (A448/A38)
- Stourbridge Road/Birmingham Road junction (A448/B4091)
- A38 junctions (New Road, Stoke Road, Charford Road, Hanbury Road, Birmingham Road)
- A38 roundabouts (Buntsford Drive, Sherwood Road)
- A38 Worcester Road roundabout (A38/B4094)
- Town centre junctions (A448/B4184/B4091) Market Street-Hanover Street-St John St-Market Place

The passenger transport, walking and cycling evidence from the Vehicle/Trip Generation model and the LTP3 Bromsgrove Transport Package Report indicates that there are current and forecast issues with:

- Reliability and punctuality of local and inter-urban passenger transport services caused by delays on the highway network and inadequate infrastructure which, if improved, could improve reliability and patronage
- The performance of the passenger transport services is also constrained due to low frequency services, service routeing and interchange facilities
- Poor accessibility to/from key trip attractors/generators (development sites), district centres, town centres and railway stations by walking and cycling, this is due to limited infrastructure and the effects of severance.
- Schemes which can improve walking and cycling accessibility include lighting, signage, markings, surface quality, crossings, cycle parking and an integrated network

The transport schemes proposed have been identified to mitigate against forecast future year transport issues. That is, the proposed highway infrastructure schemes aim to improve capacity at key junctions which are anticipated to incur additional delays in future years as a result of the proposed housing and employment growth proposed for the area covered by Bromsgrove District.



The proposed sustainable transport infrastructure schemes and services aim to connect the proposed development sites to the existing transport network such that they can provide both a means of transport for those without access to a car and a realistic choice of travel for those with a car, in particular for journeys to/from/within congested areas (with consequent benefits in terms of delays, journey time reliability, the environment and the economy). Where appropriate, measures are proposed to improve the existing transport network with the objective of encouraging greater use of more sustainable transport modes to meet economic and environmental objectives.

In developing the required transport schemes to mitigate against additional demand on the transport network resulting from the BDCS/BDP development, Policy/Strategy, Feasibility/Deliverability and the appropriate Design Standards and Guidelines have been considered. Each of the required transport schemes has a 'cost for implementation' identified. Costs include construction costs, relevant percentage uplifts to account for scheme preparation and development costs over and above the basic construction and materials and optimism bias.

The highways, passenger transport, walk and cycle infrastructure requirements for Bromsgrove Town are provided below.

The infrastructure costs include a contingency allowance and "optimism bias" which are consistent with the transport industry standard approach to cost estimating which reflects the level of design detail, uncertainty and risk. As the majority of the schemes in this report are at an early stage in development (in terms of design etc.) the level of contingency and optimism bias is, necessarily high. This will reduce as and when the schemes are agreed and developed further (by the private sector as part of their developments and/or the public sector subject to funding availability).

Tables 1.1 and 1.2 – Costs associated with Improved Bus Service Provision in Bromsgrove Town (Table 1.1) and Inter-Urban Routes through Bromsgrove (Table 1.2) - these services are required to support the Bromsgrove District Plan.

Costs are Gross Annual Costs before Revenue. The net costs will be less and in some cases the services may be commercial (i.e. Farebox exceeds Opex).

Table 1.1– Bromsgrove Bus Operations – Service Standards and Gross Annual Costs

<b>Bromsgrove Town Bus Operations - Routes and Frequencies</b>		
Note: Gold and Silver Bus Routes/Roadside Infrastructure referenced as per		
Worcestershire County Council Passenger Transport Infrastructure Best Practice Report		
(November 2007)		
<b>Location</b>	<b>Potential Scheme</b>	<b>Costs</b>
Bromsgrove Town Centre Services to link developments - 'Clover-leaf'	Silver Standard Bus Route, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 800,000.00
	<b>SUB TOTAL</b>	£ <b>800,000.00</b>

Table 1.2 - - Bromsgrove Bus Operations – Inter-Urban Service Standards and Gross Annual Costs

<b>Bromsgrove Inter-Urban Bus Operations - Routes and Frequencies</b>		
Note: Gold and Silver Bus Routes/Roadside Infrastructure referenced as per		
Worcestershire County Council Passenger Transport Infrastructure Best Practice Report		
(November 2007)		
<b>Location</b>	<b>Potential Scheme</b>	<b>Costs</b>
Inter-Urban - Service 144 - Birmingham to Worcester (via Bromsgrove and Catshill)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 2,200,000.00
Inter-Urban - Service X3 - Kidderminster to Redditch (via Bromsgrove)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,320,000.00
Inter-Urban - Service 143 - Birmingham to Redditch (via Bromsgrove and Catshill)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,680,000.00
Inter-Urban - Service 145 - Bromsgrove to Redditch (via Longbridge)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,200,000.00
	<b>SUB TOTAL</b>	£ <b>6,400,000.00</b>

WCC's Standards for a 'Gold' Bus Stop include the following (Worcestershire County Council Passenger Transport Infrastructure Best Practice Report, November 2007);

- In excess of 500 users per week;
- Bus Shelter – mainly glass construction, with seating, preferably provided by a shelter advertising company;
- Shelter Location – Preferably located as close to the boarding point as possible;
- Pole and Flag – Flag to be clearly visible from the roadside and should be integral to the bus stop, to minimise unnecessary street clutter;
- Raised Kerbs – To provide level access for buggies and wheelchairs;
- Road markings – Comprising of yellow bus-stop clearway markings, sign and red or green surfaced carriageway box;
- Timetable Information – For all routes serving the stop;
- Crossing Point; A safe place to cross the road within 50 metres of the bus stop, to include dropped kerbs and tactile paving where appropriate;
- DDA Compliant – Fully accessible for disabled people; and
- Double Length Bus Stops – Where Gold Standard bus stops are located on Premium Routes, it may be necessary to provide double length bus stops to permit express services to overtake stopping services.

WCC's Standards for a 'Silver' Bus Stop include the following (Worcestershire County Council Passenger Transport Infrastructure Best Practice Report, November 2007);

- Moderate use (250 to 499 users a week);
- Shelter Location – Preferably located as close to the boarding point as possible;
- Pole and Flag – Flag to be clearly visible from the roadside and should be integral to the bus stop to minimise unnecessary street clutter;
- Raised Kerbs – To provide level access for buggies and wheelchairs;
- Road markings – Comprising of yellow bus-stop clearway markings, sign and red or green surfaced carriageway box;
- Timetable Information; For all routes serving the stop;
- Crossing Point; A safe place to cross the road within 50 metres of the bus stop, to include dropped kerbs and tactile paving where appropriate;
- DDA Compliant – Fully accessible for disabled people; and

Bus Shelter – A bus shelter will be provided where funding allows, of mainly glass construction with seating.

Table 1.3 – Costs Associated with Sustainable Transport Infrastructure Schemes in Bromsgrove District

Sustainable Transport Schemes (Walking and Cycling)	Costs (£/millions)	
	Total (Construction)	Ongoing Maintenance (over duration of plan period) and/or Operating Costs (first year after construction)
TOTAL	£12.26m	£133k
Bromsgrove Town	£8.87m	£97k (excluding town centre public realm scheme)
Hagley	£210k	£4k
Longbridge	£130k	£5k
Barnt Green / Alvechurch	£2.49m	£15k
Wythall	£570k	£12k

Table 1.4 – Costs Associated with Highway Infrastructure Schemes in Bromsgrove District

Highway Infrastructure Schemes	Costs (£/millions)	
	Total (Construction)	Ongoing Maintenance (over duration of plan period) and/or Operating Costs (first year after construction)
TOTAL	£29.7m	£2.0m
Bromsgrove Town	£26.1m	£1.8m
Hagley	£1.44m	£97k
A491 Corridor	£370k	£25k
HGV Facilities	£1.84m	£125k

## 2 Introduction

### 2.1 Background

Bromsgrove District Council (BDC) is preparing its District plan. To assist with the development of this plan, Halcrow has been commissioned to support Worcestershire County Council (WCC) with identifying the impact on the transport network of the proposed growth and developing the transport related infrastructure and services needed to best accommodate and manage the growth in demand. Halcrow is also giving advice on and preparing the transport evidence to contribute towards the transport elements of the Infrastructure Delivery Plans (IDPs) that the two Local Planning Authorities will be preparing as part of their evidence base in support of their development plans.

The transport infrastructure (highway, public transport, cycle and pedestrian) and public transport services identified are based on the assumptions set out in the Draft Bromsgrove District Core Strategy (BDCS/BDP). These assumptions include the Cross-Boundary development sites proposed for the Core Scenario across the two authority areas up to 2030. Under guidance from the Local planning Authorities the preferred cross-boundary development scenario is Scenario 7 (i.e. Cross Boundary Sites 4 and 6) located to the west and north west of Redditch.

This report focuses on the findings of the study relating to Bromsgrove District.

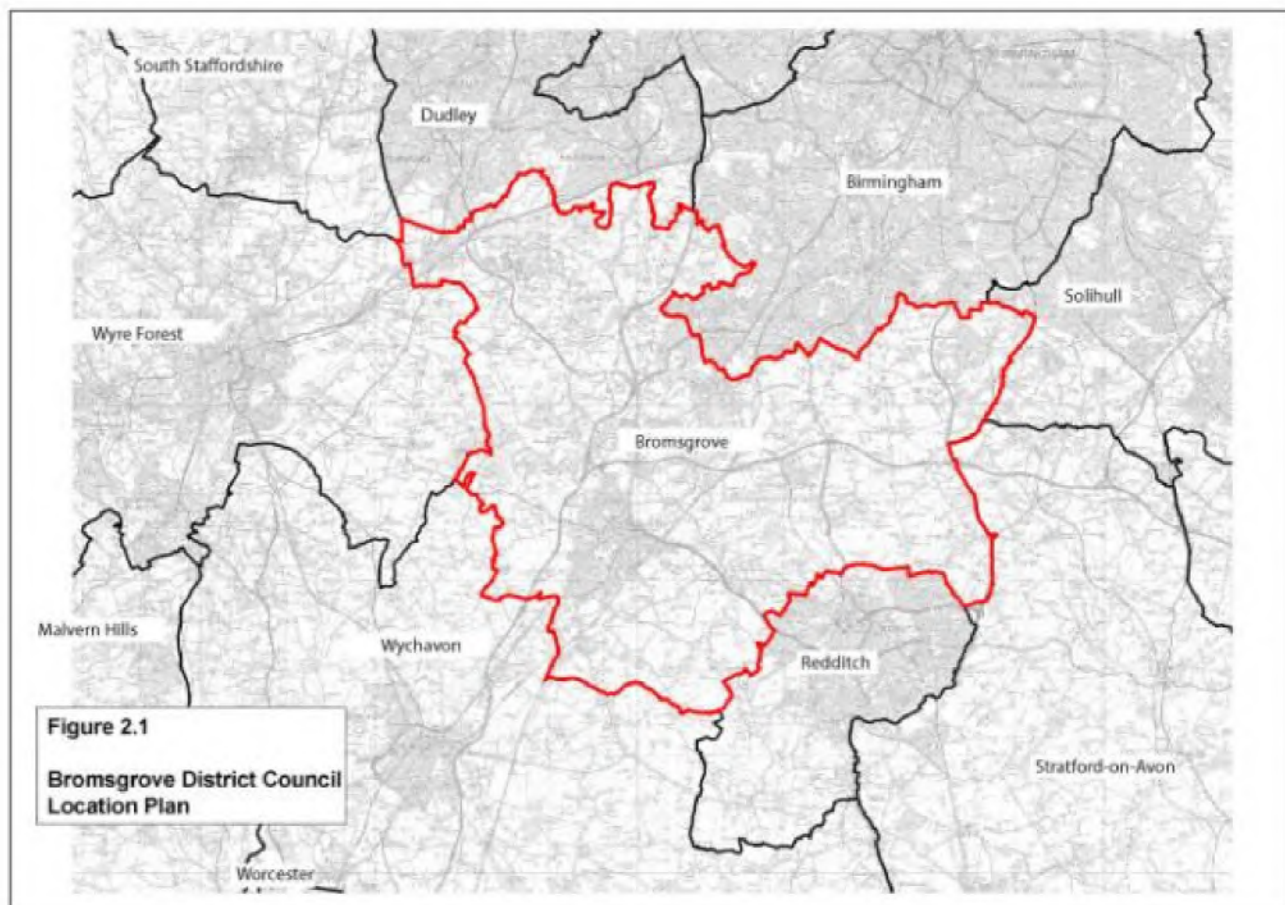
The BDCS/BDP considers the long term vision and objectives for Bromsgrove District Council, up to the year 2030 with development sites identified up to 2022/23 with the future location of additional development yet to be determined, and includes the policies for delivering these objectives in a planned and cohesive manner, through:

- providing policies to ensure that all development is sustainable; this will include Local Transport Plan 3 (LTP3);
- allocating larger 'strategic' sites across Bromsgrove District;
- identifying infrastructure requirements to support the delivery of the development plan, including transport, education, health, water and energy. This will be the Infrastructure Delivery Plan; and
- assessing all other potential development sites whether it is for housing, employment, retail, education, health, community use or indeed an open space use.

The BDCS/BDP will replace the existing Local Plan for Bromsgrove District when it is adopted in 2014.

The relationship of the authority areas and their environs are shown in Figure 2.1

Figure 2.1 – Bromsgrove District Council Location Plan



## 2.2 Purpose of this report

This report and its appendices provide details of the infrastructure that is required to support the growth set out in the BDCS/BDP. As such it is expected that the findings of this report will be used to inform the transport elements of the Infrastructure Delivery Plan (IDP) for the BDCS/BDP. As such it provides supporting evidence to demonstrate the way in which the transport schemes contribute towards the wider aims of the BDCS/BDP.

It is envisaged that the information set out in the IDP will be used to develop a Community Infrastructure Levy (CIL), and to inform and support negotiations with developers about site specific s106 agreements. The information in this assessment will also inform the development of the LTP3 Bromsgrove Package and associated schemes such that transport improvements are integrated with and take full account of planned land use changes. This will help to avoid a piecemeal and potentially poorly targeted approach to investment in transport which will do little to support economic growth or encourage sustainable development.

The report and its appendices contains a description of the adopted methodology used to derive the list of proposed transport schemes and sets the work in the context of other transport evidence work recently undertaken for Bromsgrove. The methodology adopted through this study, agreed between Halcrow and WCC

through Officer Meetings and Workshops, has created a means of providing an evidence base for the transport infrastructure (highway, public transport, cycle and pedestrian) and passenger transport services necessary to mitigate the transport impacts of the planned (vehicle access, movements, and multi-modal trip generation of the development sites included in the draft BDCS/BDP.

## 2.3 Structure of this report

Following this introductory chapter:

- Chapter 3 sets out the methodology followed to identify schemes. This includes an introduction to the spreadsheet based transport model used to assess future trip generation by all modes of transport
- Chapter 4 considers previous transport evidence work undertaken in Bromsgrove and how this comprehensive review has drawn upon and complemented the previous work undertaken.
- Chapter 5 describes the baseline performance of the transport network
- Chapter 6 introduces and contains the scheme tables

The report contains four appendices:

- Appendix A Modelling Assessment Tool: Contents and Description
- Appendix B Bromsgrove District Core Strategy – Planning Data
- Appendix C Forecast number of trips from development sites by mode
- Appendix D Infrastructure Delivery Plan – Transport Scheme Tables

## 3 Methodology

### 3.1 Introduction

The methodology used to complete this project was agreed jointly between Halcrow, Worcestershire County Council and the Local Planning Authorities. Further details on the methodology are provided in Appendix A.

The methodology adopted has:

- Considered previous work, evidence and relevant policy guidance;
- Agreed parameters for the project with WCC and Bromsgrove District Council;
- Established the transport network and infrastructure baseline conditions for Bromsgrove thereby understanding the network performance for all modes of transport and to identify potential key gaps in transport infrastructure and service provision across Bromsgrove District;
- Developed a joint Vehicle/Trip Generation model for the Bromsgrove and Redditch transport network to act as an assessment tool to assist with the identification of schemes to support proposed development contained in the draft BDCS/BDP;
- Assessed the BDCS/BDP planning assumptions provided by Bromsgrove District Council, this includes development quantum, types and locations; and
- Identified infrastructure schemes and services to mitigate against the impacts of proposed development.

Further details on the above are provided in Appendix A. The methodology adopted has ensured that the best use was made of existing data and tools available. It has set a clear foundation for the identification of schemes and has provided a means by which complex cumulative 'knock on' effects can be identified and assessed.

The way in which schemes have been identified has recognised environmental and deliverability factors as well as requirements to overcome identified problems and create opportunities for more sustainable travel choices.

The overall approach has been based on achievable interventions. Furthermore, it does not rely on an approach focussing on the delivery of a single or limited number of schemes that could unrealistic in terms of funding and delivery.

### 3.2 Need for assessment

A key premise of this project is to recognise that the quantum of development planned for Bromsgrove District, Town and surrounding area will not only have a local transport impact (immediately adjacent to the site) but also an impact on the strategic transport network further afield. The local impacts of any development can be identified, assessed and mitigation measures implemented, for locations further away from the proposed development sites, whilst the highway impact issues to address are all to readily obvious, their cause is more difficult to identify.



The identification of the source of issues away from the immediate environs of development sites can demonstrate that a relatively small development site (or the summation of a number of small development sites) can cause a significant issue on the transport network as a result of both local and long distances trips. In identifying the cumulative effects of growth it is possible to both develop adequate mitigation and to provide the evidence which underpins the requirement that the identified sources of additional traffic (vehicular and all person trips) should contribute appropriately toward the costs of delivering the necessary improvements to the wider transport infrastructure.

Thus a tool that provides the:

- calculation of the numbers of trips that each proposed development site will generate;
- the assessment of the way in which those trips will route on the network; and
- ability to sum the trips to establish an overall impact assessment

....will enable a network wide assessment to be conducted. Such an assessment tool has been prepared jointly for Bromsgrove District and Redditch Borough for the purposes of this project. Whilst the tool is necessarily strategic in nature, it does include all the key routes and most importantly key junctions. Without such a tool it is difficult to assess the cumulative impact of development sites over a large area.

Existing data, and recently undertaken transport network assessments for Bromsgrove District, also provides the means to identify the need for transport infrastructure and services resulting from the proposals in the Draft BDCS/BDP. This data includes accessibility assessments and individual spreadsheet models developed to assess Bromsgrove District and Redditch Borough planned growth. A review of previous studies informing the IDP and the associated transport scheme proposals is provided in Section 4 of this report.

### **3.3 Development of assessment tool**

The assessment tool is a Vehicle/Trip Generation spreadsheet model that combines a number of functions:

- Multi-modal trip generation model;
- Trip routeing model;
- Gravity model; and
- Presentation and analysis of results

[See Appendix A for a Technical Note setting out assumptions and the methodology applied to develop the Vehicle/Trip Generation Modelling tool used to assess the impact of developments across Bromsgrove District and Redditch Borough. The Technical Note also contains comparison to other models being used for assessment in the area.]

In summary, the model provides a means of assessing the cumulative impact of proposed development on the highway network across Bromsgrove District and Redditch Borough. The development details provided by each authority and coded in

to the model are contained in Appendix B. The model covers the AM and PM peak periods and provides trip generation data for walk, cycle, bus and highway. In addition, for walk, cycle and public transport, a full 24 hour period assessment of trip generation is made.

The scope of the modelled network is the area covered by Bromsgrove District and Redditch Borough, but recognises key destinations for travel beyond the two areas such as Birmingham, Solihull and Worcester. Highway (car) trips are assessed through a trip generation calculation and assigned to the modelled highway network. The assignment of highway trips is based on the strategic and main road network serving the area; motorways, the main 'A' roads and key 'B' class roads in the area. For further information on the trip origins and destinations as modelled through the Vehicle/Trip Generation Model refer to Figure 7.1 in the Modelling Assessment Tool Technical included as Appendix A of this report.

In terms of non-car trips (sustainable modes), the model contains a 'trip generation' element. The model calculates the likely number of trips by walk, cycle, rail and bus modes from each of the development clusters. The model takes account of relevant local mode share data and applies appropriate trip rates to indicate the number of additional trips on the transport network resulting from the proposed development sites. For further details regarding mode share and trip generation details please refer to the Modelling Assessment Tool Technical Note included as Appendix A of this report.

### **3.4 Overview of assessment results**

The Vehicle/Trip Generation Model has been used to identify the impact of the BDCS/BDP on the transport network and assist the identification of the schemes set out in this Transport Network Analysis and Mitigation Report. Appendix C of this report contains the details of trip generations from each cluster/site by each mode; walk, cycle, passenger transport (bus and rail) and the car.

The results have been analysed to identify the locations where schemes should be considered to overcome the pressure points identified in the network with an issue in the forecast year scenario. It is noted that the model has not been the sole source of scheme identification, other sources include:

- Bromsgrove Town Development Model and Redditch Town Development Model;
- Accessibility Assessments;
- WCC Officer Workshops;
- LTP3 Bromsgrove Package – Phase 1-3 Report (Planning Works); and
- Bromsgrove Town Centre Regeneration Project and associated background information.

These sources have all combined to provide a comprehensive assessment of network requirements to accommodate forecast development proposals. The inputs from this assessment are set out in Section 4 of this report and Appendix A.

### 3.5 Overview: Bromsgrove District Existing Highway Issues

The key highway routes of Bromsgrove District are illustrated on Figure 3.1 which shows that the area is divided by the M5 and M42 Motorways. Access to the M5 Motorway is via Junctions 4 (in the north of the District) and 5 (in the south of the District). Located between M5 junction 4 and 5 is the intersection linking the M5 and M42. Located across the centre of the district are Junctions 1, 2 and 3 of the M42.

The main A-Roads in Bromsgrove town are the A38 and the A448. The key junction of the A38 and the A448 is the Slideslow 5-arm Roundabout which has two lane approaches on all arms.

The A38 links Bromsgrove to Birmingham and the M42 Junction 1 and M5 Junction 5 to the north of the town and Droitwich and Worcester to the south. The A38 corridor located to the east of Bromsgrove town centre has a number of signalised and roundabout junctions providing access to and from housing, employment and commercial developments. This section of highway has congestion, noise and air quality issues and has a 'severance' effect which is a barrier to the use of sustainable transport modes in the town (LTP3 Bromsgrove Package Phase 1-3 Report).

The A448 travels from east to west linking Redditch to Bromsgrove and onwards to Kidderminster.

The A448 routes east to west through Bromsgrove town centre. All B roads in Bromsgrove town (including the B4091, B4184 and B4091) link to the A448 at various roundabout and signalised junctions around the town centre.

The A448 provides the main link road to Redditch from Bromsgrove. Traffic accessing the A448 from Bromsgrove towards Redditch must route through the A448/A38 junction (Slideslow Roundabout) east of Bromsgrove town centre. This is the last eastbound access point to the A448 until Redditch. Running parallel in the east-west direction to the A448 is the B4184 which provides an alternative but less appropriate route between the two towns. Traffic routeing from the eastern residential areas of Bromsgrove and the railway station are likely to route this way to Redditch as access to the A448 is only via the A38 corridor.

North of Bromsgrove Town Centre the A38 links to the M42 at Junction 1. This junction operates as a signalised junction with two lane approaches on all arms except the B4096. The slip roads providing access to the M42 are east facing only (i.e. accessing the eastbound M42 and the westbound off slip).

The A38 continues north from M42 Junction 1 through Catshill to link to M5 Junction 4 and the A491 which links west towards Hagley. M5 Junction 4 operates as a 3-arm signalised roundabout with 3 approach lanes on all arms. The A38 routes from this location north east towards the Birmingham Conurbation through Rubery and Longbridge. Note this junction is being considered by the Highways Agency as part of the Pinch Point programme. The A491 between M5 Junction 4 and Hagley operates predominantly as a dual carriageway with section of single carriageway (between M5 Junction 4 and A491/B4091 roundabout). The settlement of Hagley is located at the intersection of the A491 and the A456. The A491 and the A456 converge at a large 5-arm roundabout and a signalised junction with all approach arms having 2 lanes. This roundabout has been identified to have current issues with delays and congestion and its performance would deteriorate with additional demand without

mitigation taking place. Within Hagley village the the A491 and A456 converge at a signalised junction, from this junction the A456 links Kidderminster in the south west to the goes Birmingham Conurbation in the north east, including Stourbridge on the A491, and the A491 to Stourbridge.

In the north west of the district the main A roads (A441 and A435) link Redditch with the Birmingham Conurbation passing through settlements such Alvechurch and Wythall and through Bromsgrove District

South of Bromsgrove Town Centre the A38 provides the route to access the M5 at Junction 5. This junction operates as a 'dumbell' junction with roundabouts located on both sides of the motorway. Beyond the motorway intersection the A38 routes south towards Droitwich and Worcester

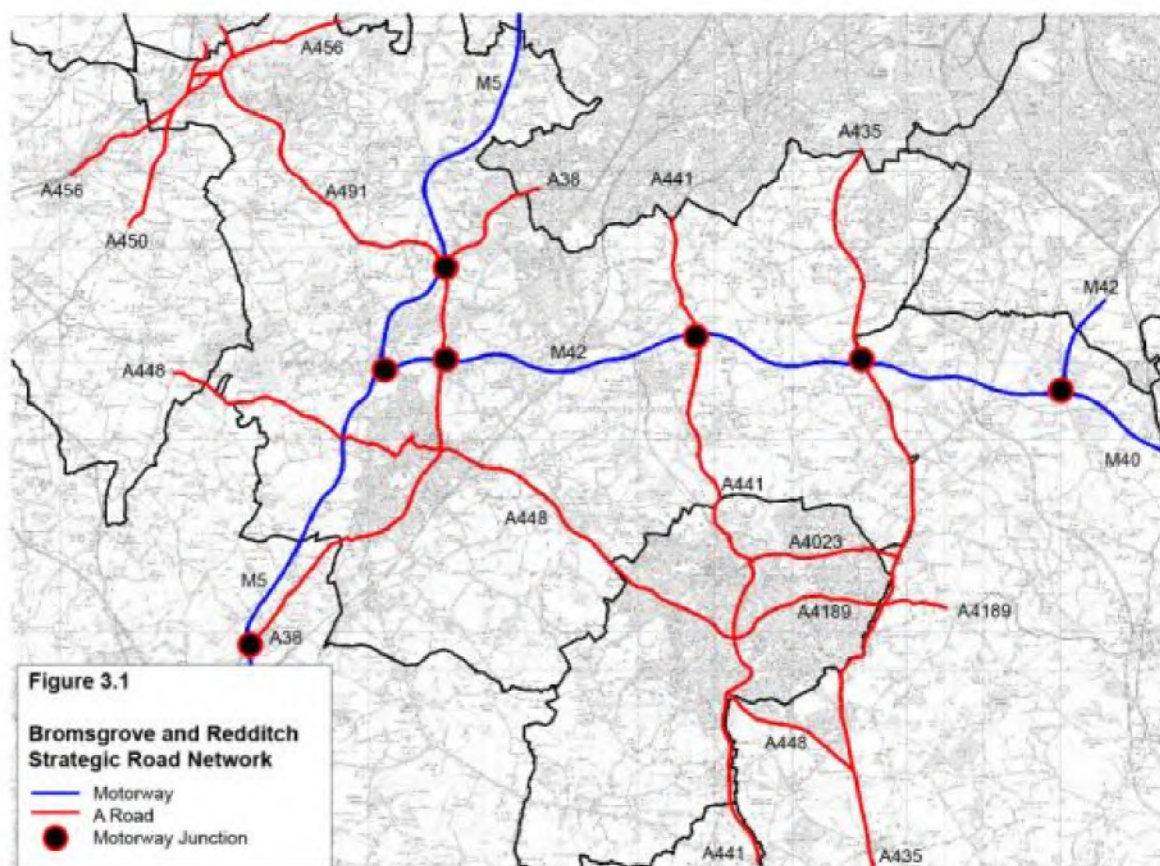
The location of the development sites proposed in the BDCS/BDP indicates that the A38 corridor and the key intersection with A448 are fundamental to the future traffic routeing patterns around the district. Although the proposed development sites are spread around the district much is focussed on the area in and around Bromsgrove town. The destinations of these trips mean much of the additional traffic will route via the A38 and/or the A448 at some point of their journeys. (For further information on the trip origins and destinations as modelled through the Vehicle/Trip Generation Model refer to Figure 7.1 in the Modelling Assessment Tool Technical Note included as Appendix A of this report).

Evidence from the LTP3 Bromsgrove Transport Package Report suggests many of the junctions located along these key corridors are already operating at levels approaching or at capacity. These include:

- M42 Junction 1
- Slideslow Roundabout (A448/A38)
- Stourbridge Road/Birmingham Road junction (A448/B4091)
- A38 junctions (New Road, Stoke Road, Charford Road, Hanbury Road, Birmingham Road)
- A38 roundabouts (Buntsford Drive, Sherwood Road)
- A38 Worcester Road roundabout (A38/B4094)
- Town centre junctions (A448/B4184/B4091) Market Street-Hanover Street-St John St-Market Place

Details of the forecast year vehicle flows associated with the proposed development sites are provided in the Modelling Assessment Tool Technical Note included as Appendix A of this report.

Figure 3.1 – Bromsgrove and Redditch Strategic Road Network



### 3.6 Overview: Existing Public Transport (bus) Issues

The existing bus network operating in Bromsgrove District, in terms of its proximity to proposed development sites, is described below. A plan showing the bus network routes in Bromsgrove and Redditch and the inter-urban routes is shown on Figure 3.2.

Overall, the (local and inter-urban) bus network in operation across Bromsgrove District is concentrated on Bromsgrove, whilst other key services operate in Catshill and Hagley. In Bromsgrove town, there are key inter-urban bus services, which connect Bromsgrove to Worcester, Birmingham, Redditch and Kidderminster, whilst there are local services which directly connect some residential and employment areas with the town centre.

Bromsgrove and Catshill are connected to surrounding towns by a number of different bus services – this is a function of their relative location. Examples are as follows;

- 143 – Birmingham to Redditch (via Bromsgrove and Catshill)
- 144 – Birmingham to Worcester (via Bromsgrove and Catshill)
- X3 – Kidderminster to Redditch (via Bromsgrove)

A number of other services from Bromsgrove link to the key surrounding settlements, notable examples include;

- 141 – Bromsgrove – Droitwich
- 142 – Bromsgrove – Redditch
- 145 – Bromsgrove – Redditch
- 183 – Bromsgrove – Redditch
- 318 – Bromsgrove – Stourbridge

Hagley is served by the 192, 197 and 318 services that provide links to a number of surrounding towns including Bromsgrove, Stourbridge, Birmingham and Kidderminster.

The current performance of the bus network in Bromsgrove District is limited due to issues with reliability, punctuality and congestion, whilst some areas have a low frequency of bus services (local and/or inter-urban). It is therefore important that bus infrastructure and services are provided to support the Draft BDCS/BDP and hence to maximise the efficiency of the transport network in Bromsgrove District.

In order to accommodate the growth contained within the BDCS/BDP a set of bus service and infrastructure standards have been developed by WCC. These are consistent with the policies set out in the Worcestershire LTP3.

An assessment of total cost to provide services to these standards on key corridors has been calculated. It is recognised that these services may be already supplied, either wholly or in part. Hence, the role of this Transport Network Analysis and Mitigation report is to ensure that this minimum level of service is identified as a requirement and maintained in order to retain the attractiveness of services and to provide the necessary capacity to accommodate the forecast bus passenger demand.

If this level of service is not met, whilst some individuals may have the ability to transfer mode to use a car (resulting in increased pressure on the highway network), for others, the potential to access employment, training and social opportunities will be lost.

The bus service operation standards must be accompanied by infrastructure to deliver reliable and attractive bus services. This includes bus shelter provision and access arrangements to these shelters from the development sites, as well as priority measures at the most congested locations to address the identified reliability and punctuality issues. Bus shelter/stop provision is proposed to fit with WCC's 'Gold' and 'Silver' standards for Bus Stops.

WCC's Standards for a 'Gold' Bus Stop include the following (Worcestershire County Council Passenger Transport Infrastructure Best Practice Report, November 2007);

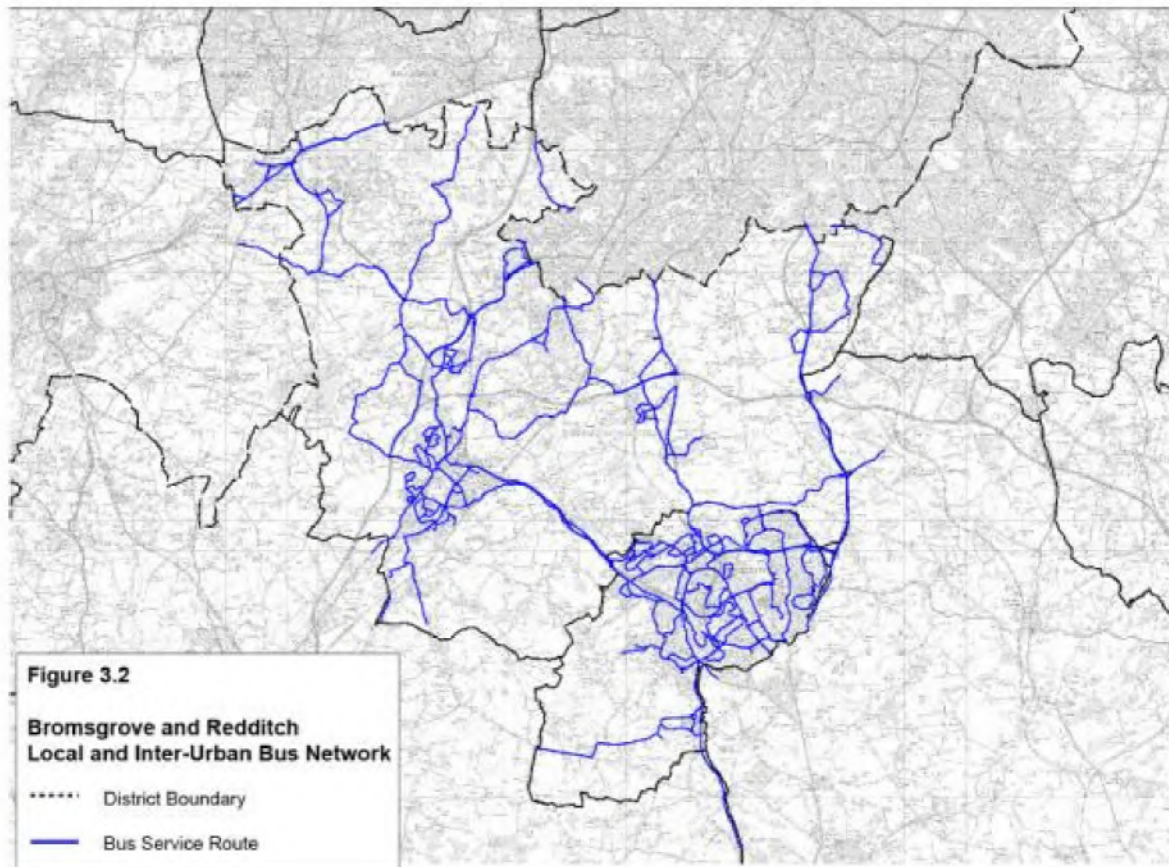
- In excess of 500 users per week;
- Bus Shelter – mainly glass construction, with seating, preferably provided by a shelter advertising company;
- Shelter Location – Preferably located as close to the boarding point as possible;

- Pole and Flag – Flag to be clearly visible from the roadside and should be integral to the bus stop, to minimise unnecessary street clutter;
- Raised Kerbs – To provide level access for buggies and wheelchairs;
- Road markings – Comprising of yellow bus-stop clearway markings, sign and red or green surfaced carriageway box;
- Timetable Information – For all routes serving the stop;
- Crossing Point; A safe place to cross the road within 50 metres of the bus stop, to include dropped kerbs and tactile paving where appropriate;
- DDA Compliant – Fully accessible for disabled people; and
- Double Length Bus Stops – Where Gold Standard bus stops are located on Premium Routes, it may be necessary to provide double length bus stops to permit express services to overtake stopping services.

WCC's Standards for a 'Silver' Bus Stop include the following (Worcestershire County Council Passenger Transport Infrastructure Best Practice Report, November 2007);

- Moderate use (250 to 499 users a week);
- Shelter Location – Preferably located as close to the boarding point as possible;
- Pole and Flag – Flag to be clearly visible from the roadside and should be integral to the bus stop to minimise unnecessary street clutter;
- Raised Kerbs – To provide level access for buggies and wheelchairs;
- Road markings – Comprising of yellow bus-stop clearway markings, sign and red or green surfaced carriageway box;
- Timetable Information; For all routes serving the stop;
- Crossing Point; A safe place to cross the road within 50 metres of the bus stop, to include dropped kerbs and tactile paving where appropriate;
- DDA Compliant – Fully accessible for disabled people; and
- Bus Shelter – A bus shelter will be provided where funding allows, of mainly glass construction with seating.

Figure 3.2 – Bromsgrove and Redditch Local and Inter-Urban Bus Network



### 3.7 Overview of Existing Pedestrian Issues

To identify pedestrian infrastructure requirements to support the development assumptions put forward through the BDCS/BDP, each development site has been considered. The number of anticipated pedestrians travelling to and from each site over a 24 hour period has been calculated and used to inform the assessment (further information regarding the evidence used to inform the anticipated number of pedestrians is provided in Appendix A). The analysis focussed on identifying links between the proposed development sites and the existing pedestrian network in terms of footways and pedestrian crossing facilities (where required) and links to key trip attractors/generators including railway stations.

The infrastructure requirements do not include pedestrian infrastructure within the BDCS/BDP development sites.

### 3.8 Overview of Existing Cycle Network

To identify cycle infrastructure requirements to support the development assumptions put forward through the BDCS/BDP, each development site has been considered. The number of anticipated cyclists travelling to and from each site over a 24 hour period has informed the process (further information regarding the evidence



used to inform the anticipated number of cyclists is provided in Appendix A). Analysis has focussed on identifying links from the proposed development sites to existing cycle infrastructure and links to key trip attractors/generators including railway stations.

The cycle network in Bromsgrove comprises of a combination of recommended on-road routes (that have been assessed for suitability) and a series of dedicated off road routes, some of which form part of the National Cycle Network. The cycle routes map for Bromsgrove ([www.worcestershire.gov.uk/cms/cycling.aspx](http://www.worcestershire.gov.uk/cms/cycling.aspx)) has been used to assess linkages from proposed development sites to existing cycle infrastructure.

The cycle infrastructure included on the proposed list of schemes includes all aspects of cycle infrastructure including signage, on-road cycle marking and where appropriate dedicated off road cycle links.

Cycle infrastructure within the development sites will be considered by developers from the outset (planning and design stages) and will meet relevant LTP3 and other policy & design standards, this includes all cycle paths and the appropriate amount of cycle storage facilities.

### **3.9 Overview of Public Transport (Rail) Issues**

The local rail network provides a valuable contribution towards local and longer distance travel. Indeed, Bromsgrove, Barnt Green, Alvechurch, Hagley and Wythall benefit from direct rail services to regional and national destinations by the rail network. The local rail network is shown on Figure 3.3.

Services are provided on the following services;

- Hereford – Worcester – Bromsgrove – Birmingham Service – Service connects to Barnt Green, Bromsgrove and Hagley;
- Redditch - Longbridge – Birmingham – Sutton Coldfield – Lichfield Service – Service connects to Redditch, Alvechurch, Barnt Green, and Longbridge.; and
- Worcester – Birmingham – Service connects to Hagley.

To increase patronage of the rail network from stations within Bromsgrove District and maximise the efficiency of the transport network, WCC has identified improving access to the railway stations by all modes of transport as a key requirement for investment.

The important role of attractive walking and cycling routes to the stations has been described in this report and identified in the LTP3 Bromsgrove Package Report. Improving access to Bromsgrove railway station for walking and cycling is critical from both existing and proposed development sites. Also, given the location of Bromsgrove railway station, bus access needs to be considered, particularly direct services from some areas currently not served within Bromsgrove and the District.

In terms of accessing rail services at Bromsgrove railway station, there are current proposals to relocate and improve facilities at the Station. These improvements are key to enabling the extension of Cross-City line services from Longbridge to Bromsgrove.

In terms of the other railway stations within the District, as shown in Figure 3.3, the following points were raised during WCC Officer Workshops;

**Hagley:**

- Requirement for Wheelchair Access to the railway station; and
- Requirement for Cycle Parking.

**Alvechurch:**

- Potential need to expand the Rail Station Car Park; and
- Redditch Line Enhancements (Network Rail) – include extra platform and bridge at Alvechurch railway station.

**Barnt Green**

- Requirement for Wheelchair Access to the railway station;
- Improvements required to the RTI system; and
- Birmingham Cross-City line project (WCC, Centro, Network Rail) to increase the number of Bromsgrove Barnt Green Services

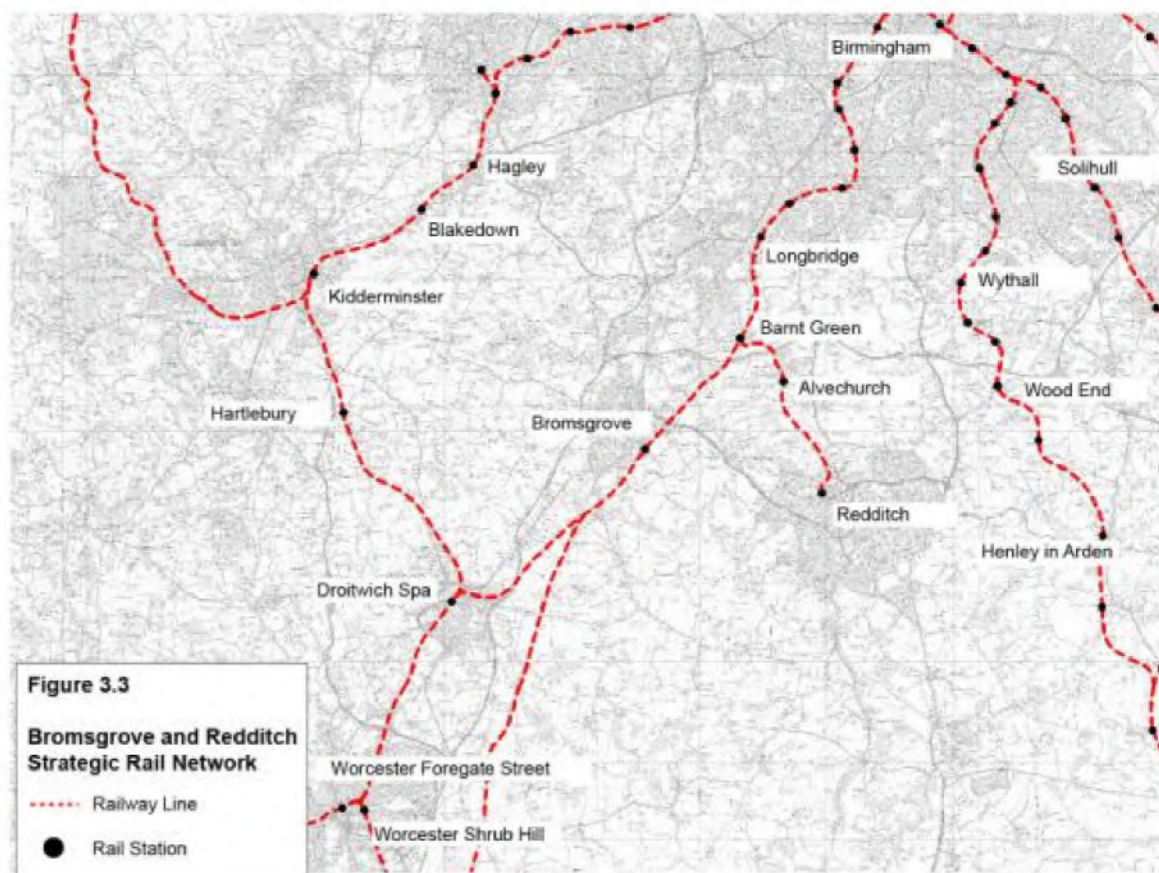
**Wythall**

- Currently no formal car parking facility in the vicinity of the railway station, as a result many rail passengers use Whitlocks End as an alternative where there is better parking provision. Therefore there is a requirement for a station car park at Wythall railway station;
- Upgrade to the RTI system required; and
- Requirement to upgrade bus stop infrastructure located outside the railway station.

**Longbridge**

- Walk and cycle access from development sites to the railway station are critical

Figure 3.3 – Bromsgrove and Redditch Rail Network



Network Rail is currently consulting with stakeholders with a view to implementing a rail enhancement project on the section of line linking Redditch and Birmingham New Street. The proposals include the construction of a second section of railway track which will run from north of Alvechurch Station for approximately 3km towards Redditch. The scheme would have a number of benefits for passengers from Bromsgrove district including:

- Increased services between Alvechurch and Barnt Green to Redditch and into Birmingham;
- Additional capacity for passengers travelling between Alvechurch and Barnt Green to Redditch and into Birmingham;
- A more flexible service; and
- Improved interchange facilities at Alvechurch railway station.

Based on current timescales the scheme is due for completion by the end of 2014.

## 4 Review of previous BDCS/BDP work

### 4.1 Introduction

In order to ensure alignment between all transport studies highlighting requirements for future year transport infrastructure within Bromsgrove District, the following studies have informed this project:

- LTP3 Bromsgrove Transport Package – Report on Phases 1-3 (May 2012)
- Bromsgrove Allocation Accessibility Study; and
- Bromsgrove Spreadsheet Modelling (2011)

A brief discussion of how each of the studies was used follows.

### 4.2 Bromsgrove Transport Package (Phases 1 – 3)

The Bromsgrove Transport Package (BTP) was developed to identify the existing and forecast transport issues in Bromsgrove to inform the content of the Bromsgrove LTP3 Package (Phases 1-3 of the Package process). This Transport Network Analysis and Mitigation report provides an additional evidence base for the development of the Bromsgrove Package.

The BTP reporting includes significant data gathered and analysed to develop a robust evidence base upon which to develop a clear transport strategy for the town. The BTP provides a commentary of the current operation of Bromsgrove transport infrastructure and services, and how this is forecast to change as a result of demand generated from new planned residential and commercial development. The report seeks to identify those areas where investment is required to resolve current and forecast transport related issues to meet with the agreed transport policy objectives.

The BTP reiterates the main policy objectives of the Bromsgrove District Core Strategy. These include:

- Enhance economic activity and growth;
- Reduce impacts of transport on the local environment (noise and air quality);
- Improve the safety and security of the transport network;
- Enhance accessibility to key services and facilities for all modes;
- Conserve and improve the natural and historic built environments; and
- Enhance the overall quality of the transport asset.

The BTP concludes that transport has a critical role to play in defining of the future of Bromsgrove District in terms of economic and environmental objectives. Significant data collection and analysis completed for the purposes of the BTP provided evidence for the identification of a series of recommended transport recommendations to tackle identified issues. These transport requirements meet with the objectives of the BTP, LTP3 and Bromsgrove District Objectives. The recommended schemes include:

- Re-development of Bromsgrove railway station (Committed Scheme);

- Bromsgrove Eastern Bypass (A38) Corridor Enhancement;
- Bromsgrove Town Junctions Enhancement Programme;
- Bromsgrove Walking and Cycling Network Development;
- Bromsgrove Road Based Local and Strategic Passenger Transport Enhancement;
- Bromsgrove Local Bus Service Enhancement;
- Bromsgrove Town Centre Public Realm Enhancement;
- Development and Delivery of a Parking Management Strategy for Bromsgrove; and
- Bromsgrove Smarter Choices Programme.

In developing the list of schemes for the Bromsgrove District IDP, Halcrow has been mindful of the considerable work undertaken to develop the LTP3 Bromsgrove Transport Package and has thus not sought to duplicate this work. It is noted that the pressure points on the network identified through the BTP process are consistent with those identified through this project. Hence, the list of transport infrastructure and service proposals included in the BTP have been included in the list of required schemes. That is, with specific regard to the highway impact assessment work completed to inform this Transport Network Assessment and Mitigation Report, the junctions identified through the modelling work are consistent with the BTP.

### **4.3 Bromsgrove Allocation Accessibility Study (January 2010)**

A meeting was held with WCC officers' to gain an understanding of local issues and to draft a list of possible infrastructure requirements based on the draft BDCS/BDP. This resulted in a list of sustainable transport schemes to support the Bromsgrove Development Plan proposals. The draft list of schemes was considered against the findings of the Accessibility Assessment of Bromsgrove completed in 2010 in order to finalise the list of sustainable infrastructure proposed through the Infrastructure Development Plan.

The assessment analysed accessibility by walk, cycle and passenger transport to key employment, health, education, retail and leisure destinations. The assessment concluded that accessibility is dependent on the destination type and the mode of transport. Most sites in Bromsgrove have good levels of access by cycle. However, more sites are considered to have poor levels of accessibility by walk compared to cycle, with the majority of sites in proximity to the rail station being classed a 'poor' in terms of walk and cycle access to key services and facilities in the north of the town, this is due to the severance effect of the A38. In terms of public transport, accessibility is considered more mixed across the town, with sites around the rail station and in the north of town being considered as 'good' and sites to the west of the town being considered as 'okay'.

Overall, the accessibility study claims public transport in the Bromsgrove area is recognised as 'poor' and especially in linking internal areas of Bromsgrove to the

local centre and rail station. It was calculated that most of the Bromsgrove urban area is covered within a 15 minute catchment area, suggesting that walking and cycling should be promoted wherever possible.

#### **4.4 Bromsgrove Development Model (BDM)**

WCC commissioned Halcrow to produce a spreadsheet gravity model to assess the highway impact of potential new development sites within and on the edge of Bromsgrove town. The spreadsheet helped inform discussion on the potential for mitigation measures.

It should be noted that the BDM was developed for different purposes to the model developed for the purposes of the Bromsgrove IDP (Vehicle Trip Generation Model). Hence there is some difference in the methodology and input data used in the development of the two forms of assessment. However, a sense check between the models has been undertaken to ensure consistency between the proposed recommendations. The results indicate that for each methodology, a similar set of conclusions have been drawn which highway junctions require investment in order to support the development proposed in the BDCS/BDP.

DRAFT

## 5 Baseline (2012) and Do-Minimum (2030) Network Problems/Issues

### 5.1 Introduction

This section of the report provides an overview of the existing and predicted future, (with further development) performance of the transport network in Bromsgrove. The previous analysis undertaken into the identification of current and forecasting of future transport network performance for the purposes of the Bromsgrove Transport Package has provided a comprehensive list of problems and issues. This section of the report draws on that work and the evidence produced from the Bromsgrove and Redditch Vehicle/Trip Generation Model.

### 5.2 Highway Network Performance

Analysis of the performance of the highway network across Bromsgrove, for the current year (2012) and a 2026 'do minimum' forecast year identify highway related problems and issues which adversely impact on Bromsgrove both now and in the future. These issues include the following:

- Significant congestion across the local highway network (particularly at peak times) which impacts upon all modes of transport; Reference Section 5 (Highway Network Performance) of the Bromsgrove Transport Package 1-3 (May 2012);
- Congestion along the A38 Bromsgrove Eastern Bypass and approaches to this route (in particular, New Road and Stratford Road approaches);
- Congestion on A448 junctions, including Slideslow Roundabout (A448/A38), town centre junctions (A448/B4091 junctions)
- Evidence suggests congestion issues arise from junction capacity issues rather than link capacity;
- School traffic contributes to network congestion, particularly in the AM peak period;
- Air quality is deteriorating across the network. Stoke Heath (on the Bromsgrove Eastern Bypass) and M42, Junction 1 are classed as Air Quality Management Areas. Bromsgrove Town Centre, on Worcester Road, Market Street and Birmingham Road as borderline Air Quality Management Areas. Reference Section 9 (Local Environmental Quality) of the Bromsgrove Transport Package 1-3 (May 2012). There is also an identified AQMA in Hagley; and
- Noise issues have been identified within Bromsgrove town, these have identified by the DEFRA Noise Mapping tool (DEFRA, 2011).

The BTP recommended corridor enhancement proposals for the A38 Bromsgrove Eastern Bypass. This would require significant investment in junction design and

capacity at all junctions along the route from Upton Warren (located south of the town) to M42 Junction 1 (located north of the town). Any proposals should include enhancements to crossing opportunities to increase the efficiency of the corridor. Improvements to junctions across the Bromsgrove urban area are also recommended to improve the efficiency of traffic flow by providing sufficient capacity to cater for planned growth.

### **5.3 Passenger Transport and Sustainable Modes of Transport**

Analysis of existing public transport provision and facilities for cyclists and pedestrians carried out for the purposes of the Bromsgrove Transport Package highlights a number of issues as discussed in the relevant sections below.

#### **Passenger transport infrastructure and services**

Traffic congestion on the highway network directly impacts on the punctuality, reliability and overall efficiency of strategic (inter-urban) and local bus services in Bromsgrove, particularly during peak hour periods. It is noted that bus stop infrastructure across Bromsgrove has deteriorated over time and has reduced the attractiveness of bus services in Bromsgrove. Reference Section 6 (Passenger Transport Network) of the Bromsgrove Transport Package 1-3 (May 2012).

The BTP highlights that in its existing form Bromsgrove railway station has poor interchange facilities for passengers. Furthermore, the location of the rail station away from Bromsgrove town centre puts it at a disadvantage. From a service point of view, it is not currently served by frequent rail services, which has the consequence of directly impacting on the attractiveness of rail as a mode of travel to key destinations for residents of Bromsgrove. Access to the railway station by walk, cycle and PT from the majority of Bromsgrove town is poor, the BTP highlights that there it is key to improve access to the station by all modes of transport.

The BTP notes that there is a perception that access to passenger transport information across Bromsgrove is poor whilst the provision and quality of infrastructure is also poor.. As a consequence of this, the attractiveness of bus and rail to access key services and destinations is reduced.

The 2010 Accessibility Assessment completed for Bromsgrove shows development sites in close proximity to the railway station have relatively good access to employment opportunities, all other sites are considered to have poor access to employment via public transport. Other development sites in the town are considered to have good access to education and healthcare destinations (located to the north of the town) via public transport services.

#### **Walking and Cycle Infrastructure**

The BTP states 'the quality of walking and cycling networks in Bromsgrove is particularly poor'. Reasoning behind this statement notes that the walking and cycling network is fragmented with limited signage and poor information for potential users. As a result, there is a perception walking and cycling is not an attractive alternative to using the car.



High traffic volumes across Bromsgrove, particularly along the A38 corridor, coupled with 'inadequate junction design and limited crossing opportunities' cause significant severance issues for pedestrians and cyclists. Key destinations for pedestrians and cyclists are spread across the geographical area of the town. For example the town centre and the railway station are located on separate sides of the key A38 highway corridor. Therefore, travel by sustainable modes of travel between these key destinations is not perceived as a viable mode choice.

Another factor contributing to the perception that walking and cycling are not seen as viable alternatives to the car is the deterioration of the public realm in Bromsgrove town centre. The BTP claims 'many of the transport corridors and in particular the town centre, are not attractive places to walk or cycle to, or through'.

The 2010 Accessibility Assessment states that access to a range of destinations by cycling is potentially good across the town. However, development located at sites to north and east of the A448 and A38 corridors are classed as having poor levels of access to all destinations due to the severance issues resulting from the geographical locations of the sites and severance caused by the high traffic volumes on the A38/A448 and the lack of adequate crossing facilities. In terms of accessibility to key destinations by walking, development sites located to the north and west of the town centre are shown to be the best performing, with 'good' access to all destinations.

#### **Overall conclusion**

Focussing purely on one mode of transport (for example the car) will not deliver sufficient decongestion and accessibility benefits to improve overall quality of life in Bromsgrove. It is strongly recommended that a multimodal investment approach is pursued, which will deliver enhanced transport choice for Bromsgrove's residents, businesses and visitors, as well as reducing congestion and improving quality of life'.

## 6 Scheme Identification

### 6.1 Introduction

This section of the Report sets out the mitigation measures identified as a result of the analysis of previous work and the Vehicle/Trip Generation Model developed for this study. The mitigation measures have been presented in tabular form, with a description of location, issue, the mitigation required and cost. (See Appendix D for the list of schemes required to support the 2030 development assumptions).

The following sections set out the assumptions that have formed the basis of the scheme assessment and costs.

### 6.2 Scheme Identification Methodology

Where appropriate, the study has drawn on existing Transport Packages (See Section 4). For example, proposals identified through the Bromsgrove Transport Package have been taken as the core proposals for Bromsgrove town.

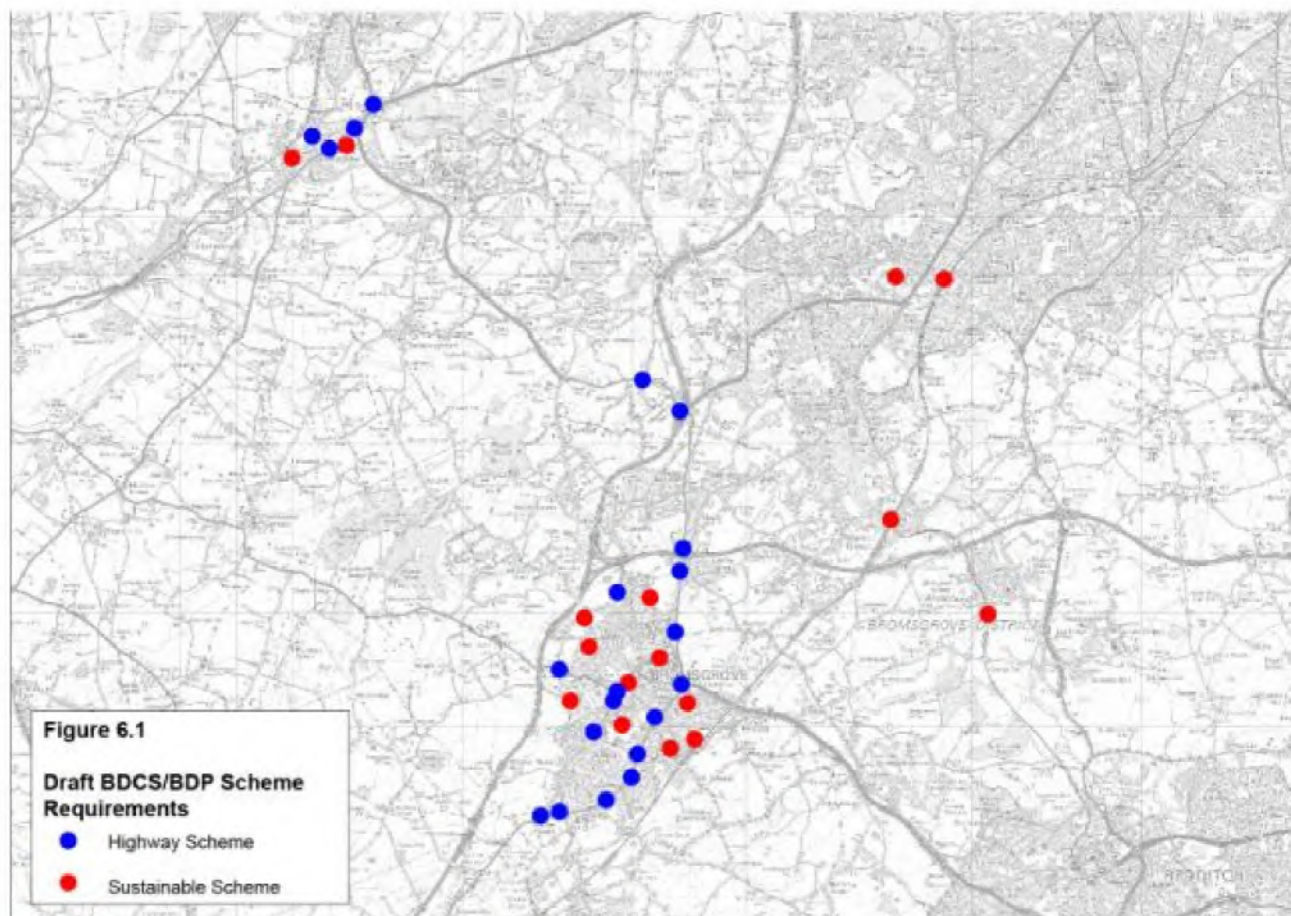
However, this study has identified additional issues in both Bromsgrove and the outlying towns as a result of the use of Vehicle/Trip Generation Model. Thus, further locations where mitigation is required to overcome or reduce the impact of proposed development have been identified. That is, there are locations outside Bromsgrove town that do not currently have the benefit of an existing package of measures identified through the BTP strategy.

Required transport schemes have been identified to mitigate against predicted future year transport issues. The required highway infrastructure schemes aim to improve capacity at key junctions which are predicted to incur additional delays in future years as a result of the housing and employment growth in the BDCS/BDP. These junctions have been identified through the use of the Vehicle/Trip Generation Model. The Vehicle/Trip Generation Model looks at the predicted forecast year traffic flows and compares these with the junction capacities on the identified links to calculate volume over capacity ratios. For more detailed information please refer to section 10 of the Modelling Assessment Tool Technical Note included as Appendix A of this report.

The required sustainable transport infrastructure schemes aim to connect the proposed BDCS/BDP development sites to the existing transport network and where appropriate improve the existing transport network to encourage greater use of more sustainable transport modes. These schemes have been identified through consideration of the results of the Vehicle/Trip Generation Model to determine where additional infrastructure and services are required to complete the sustainable transport network to support trips by sustainable modes to and from these development sites.

The required transport schemes are shown on Figure 6.1. These plans show the locations of the schemes identified as a result of the Vehicle/Trip Generation Model.

Figure 6.1. – Highway and Sustainable Schemes – Bromsgrove District



Each of the required transport infrastructure schemes have also been considered against the following;

- Policy/Strategy – proposals have recognised the policies and strategies put forward through WCC’s Local Transport Plan and to be consistent with the general approach to transport schemes in the area, including the LTP3 Bromsgrove Package;
- Feasibility/Deliverability – consideration has been given to the deliverability of the proposed transport schemes. That is, the proposed schemes have considered potential land constraints, proximity to existing obstructions (e.g. railway lines), topography and overground services and utilities; and
- Design Standards and Guidelines – good practice design guidelines have been considered against all of the proposed transport schemes. Only schemes that could meet appropriate design guidelines have been proposed, subject to detailed design.

### 6.3 Overview of Schemes

The different characteristics of locations within the BDCS/BDP area have been taken into consideration when identifying schemes. That is, though there is always an emphasis on the provision of sustainable alternatives, there is also an

acknowledgement that the measures identified need to be appropriate for the journey being made and their origin.

In Bromsgrove a balanced approach has been adopted, identifying both highway and more sustainable measures. In the rural areas, whilst the use of sustainable modes is to be encouraged, it is acknowledged that highway capacity issues also need to be addressed to enable both car and bus trips to use the network efficiently.

## 6.4 Scheme Tables

The Scheme Tables are presented in Appendix D.

Cost estimates for each scheme were prepared primarily using construction rates used by WCC through the costing of schemes associated with the Worcester Transport Strategy (WTS). It should be noted that where some items fell outside the scope of the WTS, assumptions were made using costs incurred from other similar schemes carried out for other local authorities and by using the SPONS Handbook. Costs can vary considerably from site to site and supplier to supplier. More detailed cost estimates will be determined when the precise details of each scheme are known during further design stages. Subsequent to the initial construction cost estimates, construction cost uplifts (cost contingencies) (as presented in Table 6.1 for highway schemes and Table 6.2 for sustainable scheme) and optimism bias were applied. Optimism bias is explained following Table 6.2.

These construction cost uplifts are summarised in Table 6.1 (Highways) and Table 6.2 (Sustainable Modes)

Table 6.1: Uplifts to Highway Scheme base construction costs (Cost Contingencies)

Preparation	12%
Supervision	5%
Evaluation	0%
Drainage	10%
Preliminary	5%
Site Supervision	5%
Design	10%
Services and Utilities	30%
Landscape	10%
Highway Network Traffic Management (Normal Road)	10%
Highway Network Traffic Management (Strategic Road)	20%
Groundworks/Earthworks	2%
Maintenance	25%
Consultation	10%
Ecology	10%

The uplifts included in Table 6.1 are based upon values used for WTS costing purposes and previous work undertaken for other local authorities.

These uplifts are calculated based on the construction cost and prior to the optimism bias being added. The uplifts cover the additional costs above and beyond the actual cost of construction. That being items including site preparation, site supervision and evaluation. A generic drainage cost is included along with design, landscaping and ecology. Different uplifts are applied for traffic management dependent on the local road network, i.e. a greater allowance is provided for on the strategic highway network.

Table 6.2: Uplifts to Sustainable Mode base construction costs (Cost Contingencies)

Preparation	0%
Supervision	2%
Evaluation	0%
Drainage	3%
Preliminary	5%
Site Supervision	3%
Design	10%
Services and Utilities	3%
Landscape	3%
Highway Network Traffic Management (Normal Road)	2%
Groundworks/Earthworks	2%
Maintenance	5%
Consultation	5%
Ecology	2%

The uplifts for sustainable mode schemes are generally less than those applied for the highway schemes. This is because the proposed schemes are generally smaller schemes which are less intrusive and have fewer associated risks. Allowances for Ecology and Drainage are often less as the proposed schemes pose less risk to local environments meaning that Sustainable Urban Drainage Systems (SUDs) and surface drainage can often be applied. The design uplift costs remain the same for both the highway and sustainable schemes.

The Optimism Bias is calculated by referring to 'The British Department for Transport Procedures for Dealing with Optimism Bias in Transport Planning Guidance Document – June 2004'. It is noted that all the uplift items have been added to the cost of construction prior to the 44% Optimism Bias Uplift. The Optimism Bias uplift is based upon the maximum applied rate for standard civil engineering works at this preliminary stage. This percentage, when applied, suggests an 80% probability of staying within the budget.

The cost estimates do not include Land Costs (if required).

## 7 Conclusions and Next Steps

### 7.1 Conclusions

The report has set out the context, methodology and tabulated results of a strategic assessment of the impact of development proposals in the BDCS/BDP. The schemes identified have been chosen based on the degree to which additional demand to travel impacts on the surrounding road network and the policy and design requirements of central and local government.

The list is comprehensive, but contains no very major proposals to accommodate the increase in demand. It is noted that the scale of infrastructure proposed is significantly less than that which has been introduced to the network over the past 20/30 years. There are no new town bypasses, major improvements to inter-urban routes or new major river crossings. In terms of the criteria used to identify mitigation measures, the schemes this exercise were considered against cost, environmental and deliverability criteria as well as mitigation of transport impacts.

Hence, there is an expectation that some change in mode share will occur as a result of increased attractiveness of more sustainable modes, as well as increased congestion on the highway network.

The schedule of schemes presented, and the associated costs, have taken into account the additional costs associated with scheme design and an allowance made for scheme maintenance over a 30 year period. These added allowances mean that if the scheme costs are simply compared to construction costs they appear high, but the additional costs have been derived through experience and represent the total cost to deliver the individual schemes.

Overall, the inputs provide a comprehensive schedule of infrastructure interventions to mitigate the transport impacts of the proposed BDCS/BDP development.

### 7.2 Potential future activities

This report has set out a comprehensive listing of infrastructure and public transport service requirements in order to mitigate against the impact of the new development proposals contained in the BDCS/BDP. These requirements have been identified through reference to policy statements and work to assess the impact of additional journeys on the highway network.

The work has been based on information on proposed developments as identified in the BDCS/BDP in summer 2012 and guidance provided by Redditch Borough Council and Bromsgrove District Council regarding the proposed cross boundary sites to be taken forward in March 2013. It is recognised that this document has subsequently been the subject of consultation as a result of this there are likely to be changes going forward.

#### **How will we deal with changes to development assumptions?**

Under guidance from Planning Officers at BDC, changes to the development assumptions for the area may be necessary over the course of local plan period. Assuming any changes to these assumptions fit the 'development clusters', as used in the Vehicle Trip Generation Model, any changes to these assumptions can be

relatively easily incorporated into the model and the associated impact on the transport network assessed. Halcrow proposes no action to update the model is undertaken until guidance is received from Bromsgrove and Redditch Planning Authorities.

### **Feeding viability assessments into the transport elements of the IDP and assessment of “priorities”**

Halcrow could assist with the final wording to go forward into the IDP if required. Halcrow recognises that if the final document is structured in a different way, some assistance may be required to present our methodology and results in a consistent manner to other infrastructure requirements.

### **Phasing and delivery issues**

Iterations between planning data and the transport infrastructure requirements. Which development sites are most likely to occur first?

The list of proposed transport schemes focuses on key transport corridors linking the major settlements in Bromsgrove District. The results of the modelling provide indications of the key schemes required to support each of the proposed development sites. A further piece of analysis work, using the Vehicle/Trip Generation Model, could be carried out to provide an assessment of the transport schemes required to support each of the development sites in turn. The schemes proposed through the existing study aim to meet the cumulative demands on the transport network. A further stage would be to provide a breakdown of the schemes required to support each of the development sites in turn. However, it should be noted in some cases justification of large schemes may be more difficult when considering individual development sites compared to the total cumulative impact.

### **Funding opportunities**

This report has identified and costed a comprehensive schedule of transport infrastructure requirements. In providing these costs, no allowance has been made for any scheme that may already have funding secured, or schemes where funding has been allocated through LTP or other sources.

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# Appendix A

Modelling Assessment Tool; Contents and  
Description

DRAFT



## Technical note

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<b>Project</b>	<b>Bromsgrove and Redditch IDP</b>	<b>Date</b>	12 April 2013
<b>Subject</b>	Draft – Bromsgrove and Redditch IDP – Modelling Assessment Tool; Contents and Description – Appendix A	<b>Ref</b>	CTWALY600
<b>Author</b>	Halcrow Group Ltd		

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### 1 Introduction

- 1.1 This Technical Note forms Appendix A of the final Bromsgrove Development Plan – Transport Network Analysis and Mitigation Report and the Redditch Development Plan – Transport Network Analysis and Mitigation Report produced by Halcrow. This Technical Note sets out the development and assumptions used to develop the modelling tool (Vehicle/Trip Generation Model) used to assess and recommend transport infrastructure requirements to support housing and employment growth proposed through the Bromsgrove District Core Strategy (BDCS) and the Redditch Borough Core Strategy (RBCS).
- 1.2 This Technical Note focuses on the modelling work used to assess the development assumptions put forward in the BDCS and RBCS. Vehicle/Trip Generation Spreadsheet Highway models were developed for the AM and PM peak periods and development trip numbers were calculated for a 24 hour period in order to assess the number of trips made from proposed BDCS and RBCS development sites by sustainable modes of transport. A commentary of each of the major sections of the Vehicle/Trip Generation Model is provided as part of this Technical Note through the use of model screenshots.
- 1.3 This Technical Note describes the development of the Vehicle/Trip Generation Model used to assess the ‘Core Development’ Scenario and six ‘Cross Boundary’ scenarios. The ‘Cross Boundary’ scenarios include all of the development sites put forward through the ‘Core Development’ scenario and different combinations of additional sites on the north and west fringes of Redditch

### 2 Overview

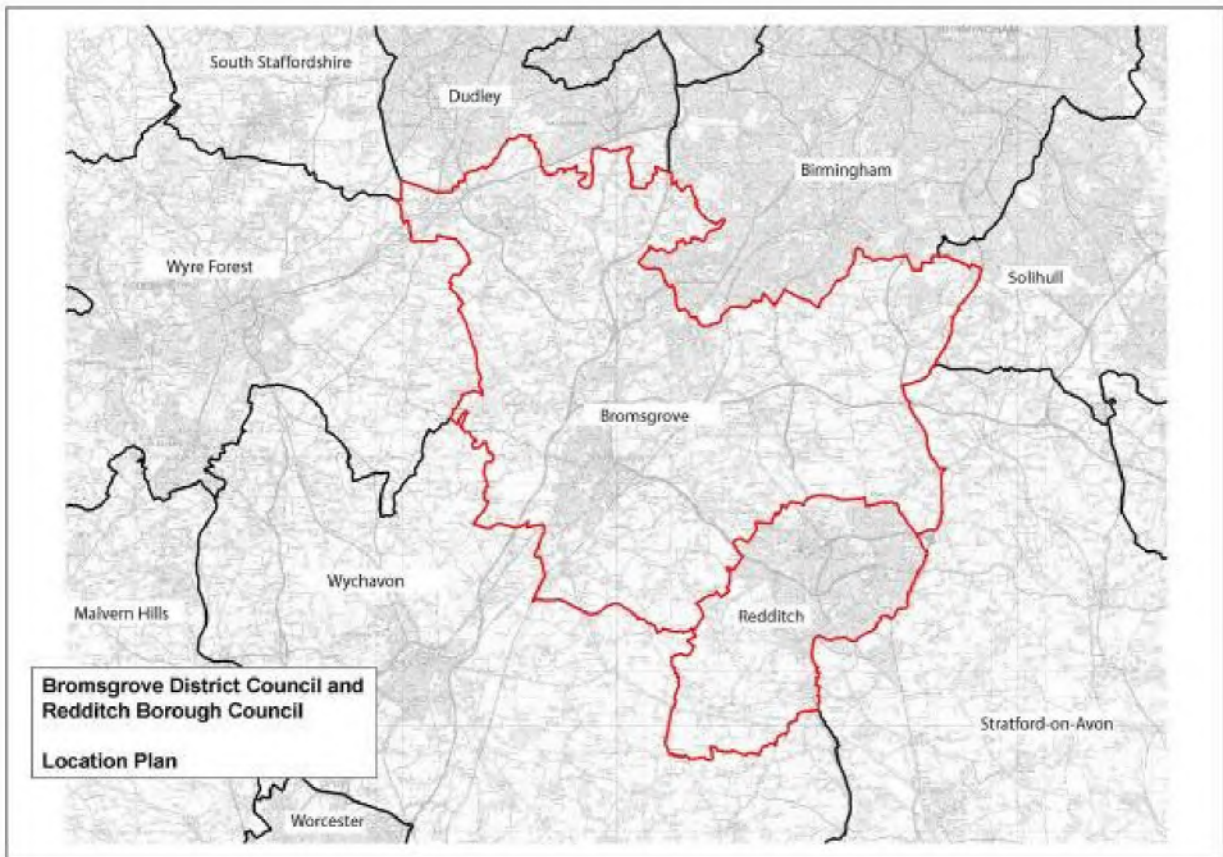
- 2.1 To meet the transport infrastructure objective of the BDCS and RBCS a means of identifying transport infrastructure required to mitigate the adverse impacts of traffic generated by the proposed development was required. WCC and Halcrow agreed that the most appropriate tool that could be available within the programme to contribute to the development of IDP recommendations is a spreadsheet gravity model (termed Vehicle/Trip Generation Model). The model is capable of assessing the trip generation and distribution from a large number of development sites in the Bromsgrove and Redditch Districts and producing a forecast year assessment scenario.

- 2.2 This Technical Note summarises the modelling work undertaken to gather the data required to build such a model and the model development process based on the 2030 development assumptions. It describes the content of the Vehicle/Trip Generation Model and the relevant assumptions agreed between Halcrow and WCC.
- 2.3 The Vehicle/Trip Generation Model assigns vehicle trips between each of the proposed development sites in Bromsgrove and Redditch Districts to a number of destinations, either located in Bromsgrove or Redditch Districts or in the towns/cities located around the circumference of the Bromsgrove and Redditch area. The destinations were agreed with WCC. The assignment of the trips was based upon the population size and employment numbers of each of these origins and destinations. The trip distribution of all development trips in the gravity model was calculated in line with current WebTAG guidance (TAG Unit 3.5.6 Values of Time and Vehicle Operating Costs, August 2012). All trips were assigned a route between each of the origin and destination zones. The routeing was assumed a single, fixed, assignment.
- 2.4 The AM peak and PM peak gravity models provide a means to assess the number of development trips predicted to be on the strategic highway network in Bromsgrove and Redditch Districts. The development trips assignment result, when combined with the existing traffic data, allows the assessment of individual link and junction performance with the additional development traffic. Thus, the results provide an indication of areas of the highway network in receipt of greatest impact (in terms of capacity, journey times and performance) as a result of the developments assumptions for Bromsgrove and Redditch.
- 2.5 In addition, the 24 hour spreadsheet model provides a tool to forecast the number of trips made by sustainable modes of transport from development sites to assist the appropriate identification of infrastructure. Sustainable modes of transport include walking, cycling and public transport.

### **3 Development Assumptions**

- 3.1 WCC provided Halcrow with a list of 'core' development sites for Bromsgrove District Council (BDC) and Redditch Borough Council (RBC) in 2012 (09/07/2012). See Figure 3.1 for a location plan of Bromsgrove and Redditch Districts.
- 3.2 Details of the six 'Cross Boundary' scenario tests and the associated development assumptions associated with those sites were supplied to Halcrow on 14/09/2013. Details of the 'Cross Boundary' scenario tests are shown on Table 3.1 and Figures 3.4 and 3.5.

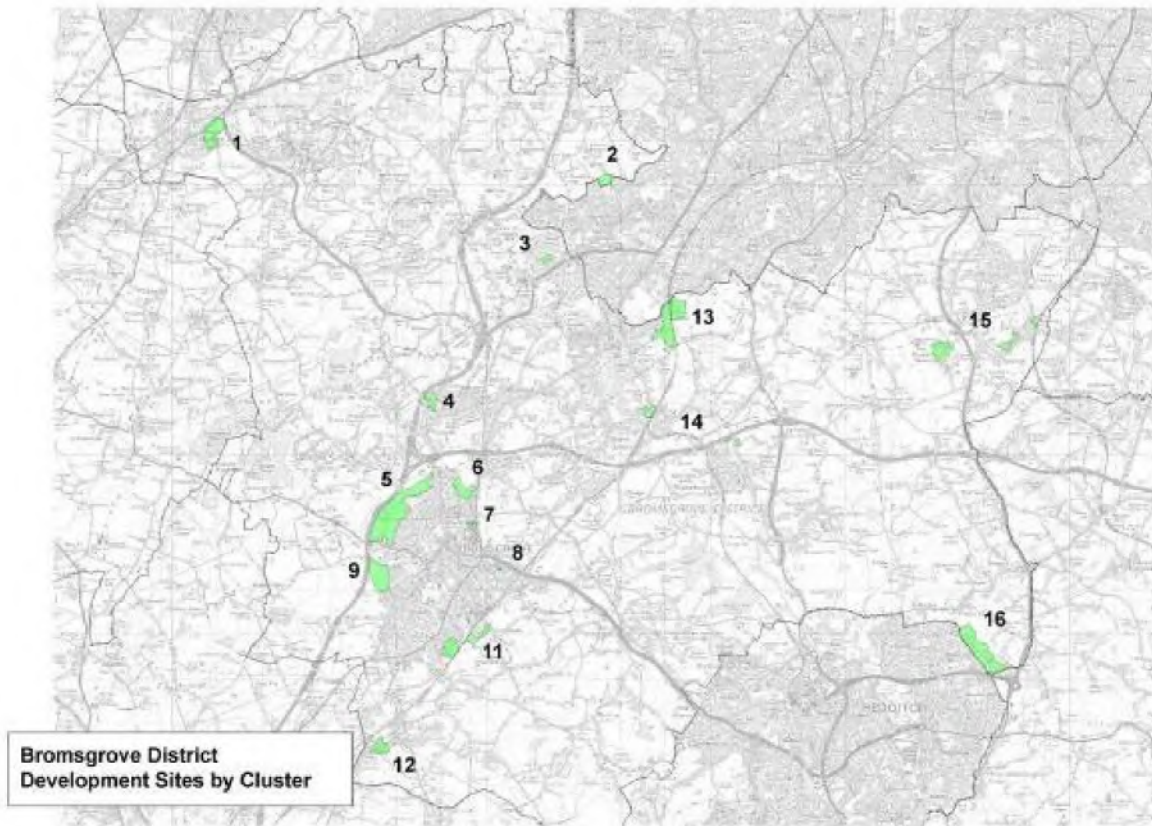
Figure 3.1 – Bromsgrove District Council and Redditch Borough Council Location Plan



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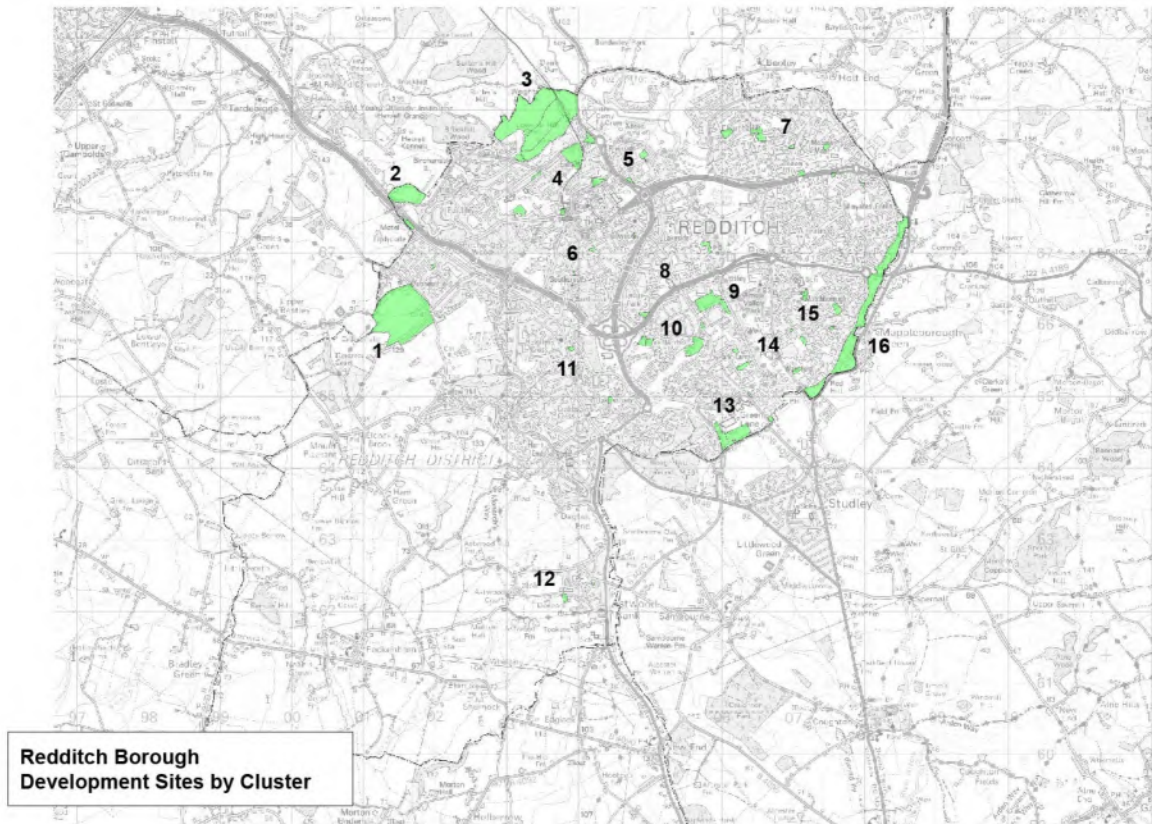
- 3.3 In order to keep the number of development locations to a manageable size, the individual sites were combined into 'clusters'. 'Clusters' were either taken as a single large development or as a combination of two or more development sites. The developments were grouped into 'clusters' based on their location in relation to the strategic road network, that being, 'clusters' loading onto the strategic road network at the same location/area were placed into a 'cluster' to represent that area. Large developments located away from, and likely to access the strategic road network away from, other development sites/clusters were not grouped with other development sites and were considered as a 'single site cluster'.
- 3.4 The designation of 'Clusters' was agreed between WCC and Halcrow. A detailed list of all the development sites proposed for Bromsgrove District Council and Redditch Borough Council and the designated 'clusters' is provided in Appendix D. The 'Clusters' are shown on Figures 3.2 to 3.3.

Figure 3.2 – Bromsgrove District Development Clusters – ‘Core Scenario’



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Figure 3.3 – Redditch Borough Development Clusters – ‘Core Scenario’



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Figure 3.4 – Bromsgrove and Redditch – ‘Cross Boundary Sites’ – Site Locations

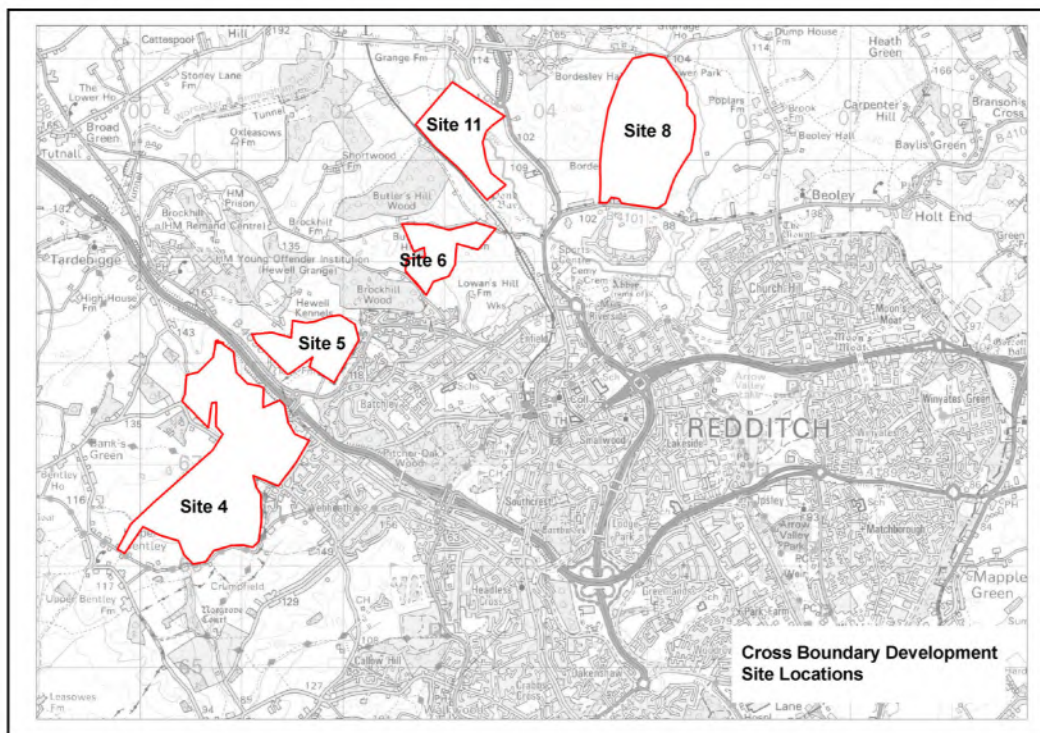
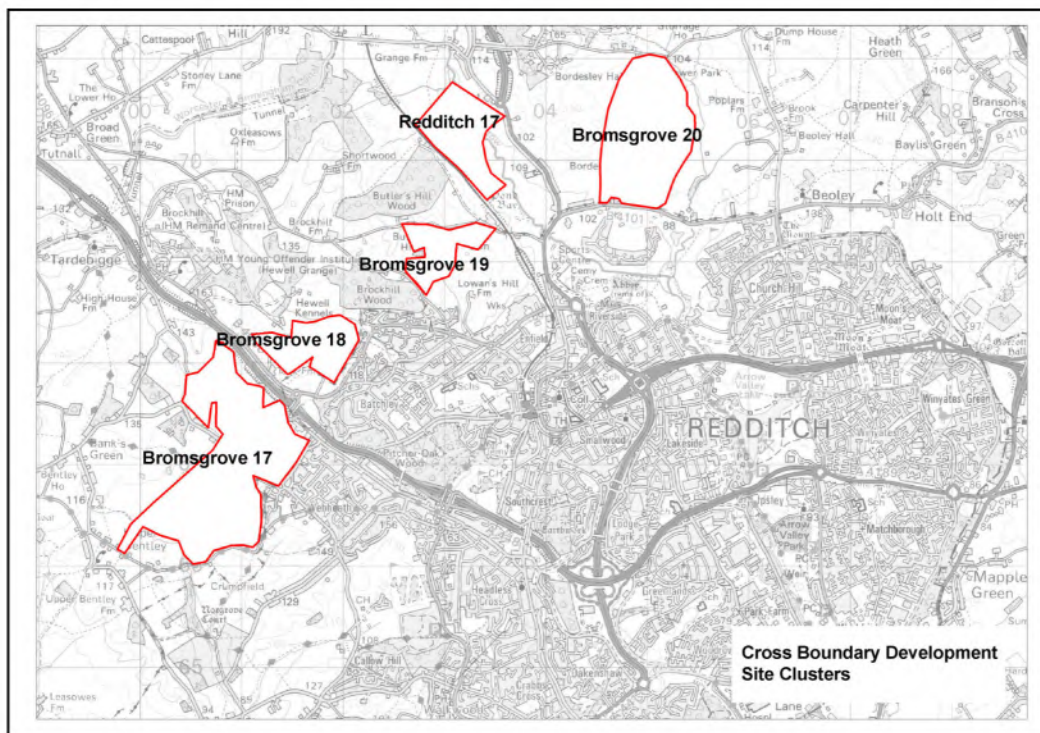


Table 3.1 - Bromsgrove and Redditch – ‘Cross Boundary Sites’ – Site details

Scenarios	Residential Dwellings	Employment (ha)
1) Sites 4 & 5	3843	1.85
2) Sites 5, 6, 11 & 4 (Heyford only)	3229	1.85
3) Site 8	4053	3.7
4) Site 4 & 5 *	3200	
5) Site 8*	3200	
7) Sites 4 & 6	3400	
8) Sites 6 & 8	3400	

Figure 3.5 - Bromsgrove and Redditch Development Clusters – ‘Cross Boundary Sites’



3.5 WCC also provided Halcrow with ‘windfall’ and ‘commitment’ figures for the two districts. The development being allowed for as windfalls and commitments was added to the Clusters included in the Bromsgrove District and Redditch Borough development allocations in order to reflect the magnitude of development planned for the area.

## 4 Phasing and Likelihood

4.1 The Bromsgrove and Redditch development assumptions were tested as an ‘all development’ scenario. That is, all sites were included in the modelling work to create one future year scenario.

4.2 This scenario was assessed against a ‘Do- Minimum base case’, as taken from observed ATC and Turning Count data from 2008-2012 in order to determine the impact of the specific Bromsgrove and Redditch proposed development growth.

4.3 An assessment of background growth and the relationship between the cumulative impact of development and background growth was considered. A means of comparing the calculated traffic flows from the Vehicle/Trip Generation Model against Temprow growth factors was developed and is discussed later in this Technical Note.

## 5 Trip Generation

5.1 The Vehicle/Trip Generation Model includes functions to calculate the anticipated number of trips for all modes of transport and takes into account the geographical location of each of the sites in applying appropriate trip rates. Total (all modes) trip generation rates were sourced

from the TRICS database. Table 5.1 shows the trip generation rates to be used for the residential development sites.

Table 5.1 – Residential Trip Rates (all modes)

	Arrivals		Departures	
	AM Peak	PM Peak	AM Peak	PM Peak
Bromsgrove	0.235	0.636	0.837	0.377
Redditch	0.246	0.636	0.842	0.381
Hagley	0.250	0.724	0.820	0.372
Catshill	0.250	0.724	0.820	0.372
Barnt Green	0.279	0.760	0.926	0.382
Astwood Bank	0.279	0.760	0.926	0.382
Wythall	0.258	0.679	0.829	0.371
Longbridge	0.235	0.636	0.837	0.377

- 5.2 The functionality to test a range of multiple employment types within each of the modelled development ‘clusters’ was built into the Vehicle/Trip Generation model. As a result, a number of additional Vehicle Trip Rates were required and sourced from the TRICS database and are shown in Table 5.2.

Table 5.2 – Employment Trip Rates (all modes)

	Arrivals		Departures	
	AM Peak	PM Peak	AM Peak	PM Peak
B1 (Bromsgrove)	2.861	0.319	0.305	2.499
B2 (Bromsgrove)	0.915	0.240	0.512	0.685
B8 (Bromsgrove)	0.077	0.009	0.012	0.034
B1 (Redditch)	1.961	0.204	0.176	1.709
B2 (Redditch)	0.594	0.198	0.344	0.498
B8 (Redditch)	0.179	0.062	0.054	0.175
A3	2.444	10.286	0.889	9.714
A1	3.476	3.776	3.167	3.638
C1	0.424	0.78	0.825	0.529
A1	3.476	3.776	3.167	3.638
D2	0	4.582	0	4.335

- 5.3 The ‘Cross Boundary’ sites were applied the same trip generation factors as those sites put forward through the ‘Core Development’ Scenario.

## 6 Mode Split

- 6.1 The total number of trips from each of the development sites was calculated using the trip rates set out in Section 5. The trip totals were then distributed between the origins and destinations using the gravity model functions as set out in Section 7. Once the number of trips between origins and destinations were calculated, relevant mode split factors for that particular origin and destination pairing were applied to calculate the number of trips by each mode.



6.2 Census Journey to Work data was used as a reference for the percentage of trips by each mode between each of the origins and destination pairings.

6.3 The mode split factors applied for the origin and destination pairs are shown in Table 6.1.

Table 6.1 – Origin and Destination Mode Split Ratios

	Light Rail	Train	Bus	Taxi	Car Driver	Car Passenger	Motorcycle	Bicycle	On Foot	Other
Bromsgrove - Bromsgrove	0%	0%	2%	0%	54%	7%	0%	5%	32%	
Bromsgrove - Central Redditch	0%	0%	7%	0%	84%	5%	0%	2%	0%	2%
Bromsgrove - Outer Redditch	0%	0%	7%	0%	84%	5%	0%	2%	0%	2%
Bromsgrove - Central Birmingham	0%	14%	3%	0%	78%	2%	0%	1%	0%	2%
Bromsgrove - Outer Birmingham Conurbation	0%	14%	3%	0%	78%	2%	0%	1%	0%	2%
Bromsgrove - Worcester	0%	7%	6%	0%	75%	6%	0%	6%	0%	
Bromsgrove - other surrounding towns	0%	7%	7%	0%	75%	11%	0%	0%	0%	
Hagley - Birmingham/Dudley/Kidderminster/Worcester/Sandwell	0%	13%	4%	0%	79%	4%	0%	0%	0%	
Hagley - other surrounding towns	0%	10%	1%	0%	73%	12%	0%	4%	0%	
S Birmingham Conurb - Central Birmingham	0%	12%	4%	0%	77%	4%	0%	2%	0%	1%
S Birmingham Conurb - Outer Birmingham Conurb	0%	12%	4%	0%	77%	4%	0%	2%	0%	1%
S Birmingham Conurb - Other Surrounding Towns	0%	8%	7%	0%	77%	6%	0%	2%	0%	
S Birmingham Conurb - Other Surrounding Towns	0%	8%	7%	0%	77%	6%	0%	2%	0%	
Outer Redditch - Central Redditch	0%	0%	15%	0%	53%	8%	1%	4%	19%	
Outer Redditch - Outer Redditch	0%	0%	15%	0%	53%	8%	1%	4%	19%	
Central Redditch - Bromsgrove	0%	0%	5%	0%	79%	15%	0%	1%	0%	
Outer Redditch - Bromsgrove	0%	0%	5%	0%	79%	9%	2%	3%	0%	2%
Redditch - Central Birmingham	0%	22%	4%	0%	72%	2%	0%	0%	0%	
Redditch - Outer Birmingham Conurbation	0%	22%	4%	0%	72%	2%	0%	0%	0%	
Redditch - other surrounding towns	0%	0%	5%	0%	81%	10%	0%	4%	0%	

## 7 Trip Distribution

7.1 The trip distribution was calculated using the Vehicle/Trip Generation gravity model functionality. The gravity model uses data on the size of destination zones (population and employment data) and time and distance between origin and destination sites to assess the relative attractiveness of different locations.

7.2 The generalised cost functions, used by the gravity model to calculate the number of trips between all origins and destinations, were calculated according to WebTAG guidance. The population and employment numbers were calibrated to determine the number of trips between origins and destinations on the basis of relative attractiveness of different locations.

7.3 The WebTAG guidance equation used to distribute the development trips between origins and destinations calculates the generalised cost of trips through a function of the Value of Time and Vehicle Operating Cost. In order to inform these functions, the time and distance between all origins and destinations was taken from the Multimaps website to ensure a consistent approach. As the distance and time functions were used to distribute the development trips around the network, to ensure consistency, the same method for obtaining the distance and time taken to route between all the origins and destinations was utilised.

7.4 An example of the assignment table of the origin and destination zones in the gravity model is shown in Figure 7.1.

Table 7.1 – Vehicle/Trip Generation Model Assignment Trip Matrix Example (Note: Numbers shown are for indicative purposes only)

Trip Assignment: Destination of Residential Trips in AM Peak		DESTINATION							
ORIGIN	Total	Bromsgrove Town Centre	Bromsgrove Technology Park	Bromsgrove Birmingham Rd	Bromsgrove Perryfields	North East Redditch Ravensbank	Longbridge	Redditch Town Centre	
	Trips								
Bromsgrove - Cluster 1	324	3	1	4	0	1	10	5	
Bromsgrove - Cluster 2	85	1	0	1	0	0	6	1	
Bromsgrove - Cluster 3	57	1	1	2	0	0	7	1	
Bromsgrove - Cluster 4	100	6	1	8	1	0	5	3	

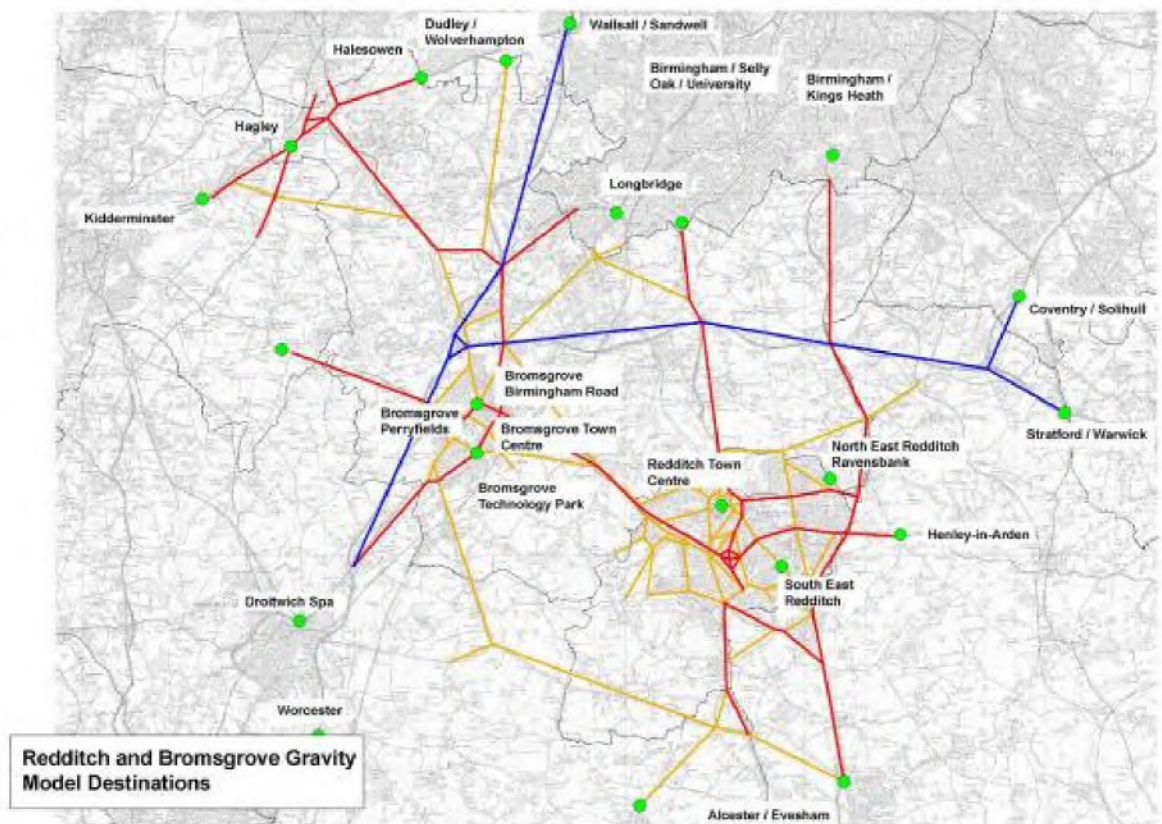
7.5 The origin zones are the series of 'clusters' made up of the development sites. These 'clusters' include either one large development site or a combination of smaller development sites.

7.6 The number of clusters by each district is as follows for the 'Core Development' Scenarios:

- Bromsgrove – 16 development clusters (Figure 3.2); and
- Redditch – 16 development clusters (Figure 3.3).

7.7 The 'Cross Boundary' Development Clusters were allocated into five additional clusters as shown on Figure 3.5. The destination zones are the larger populated towns within Bromsgrove and Redditch Districts and key attractors beyond the District boundaries but within reasonable journey time/commutable distance. These are shown on Figure 7.1.

Figure 7.1 – Vehicle/Trip Generation Model Destination Zones

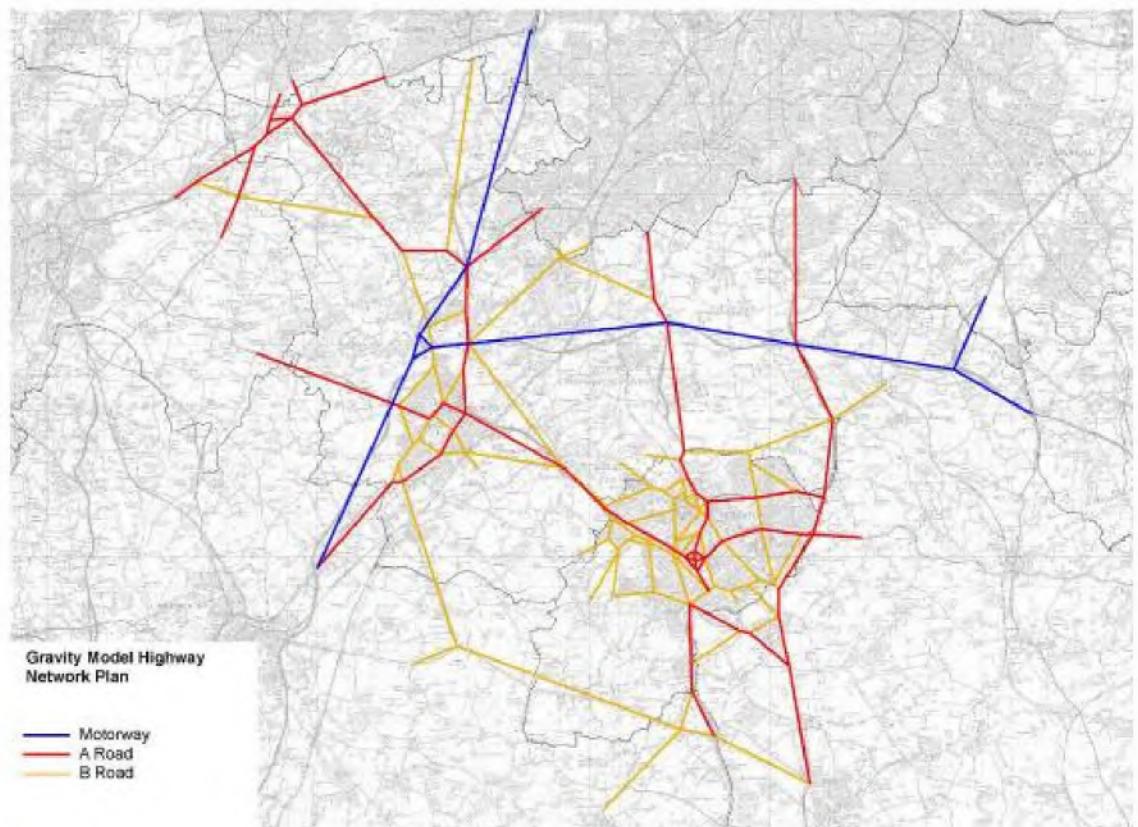


- 7.8 Four trip distribution matrices were calculated for both the AM and PM peak models. The four trip matrices were for the following;
- Residential Site Departure Trips;
  - Residential Site Arrival Trips;
  - Employment Site Departure Trips; and
  - Employment Site Arrival Trips.
- 7.9 The Bromsgrove and Redditch Local Plan development clusters were referred to as 'origins', and the major population and employment centres within and surrounding Bromsgrove and Redditch Districts were referred to as 'destinations'. However, to accommodate the relevant trip rates, the origins and destinations were reversed in the trip matrices where necessary. The 'Departure' trip matrices have assumed the Bromsgrove and Redditch Districts development sites are the 'origins', and the major population and employment centres within and surrounding Bromsgrove and Redditch Districts are the 'destinations'. The 'Arrival' trip matrices have assumed the major population and employment centres within and surrounding Bromsgrove and Redditch Districts are the 'origins' and the Bromsgrove and Redditch Districts development sites are the 'destinations'.
- 7.10 For the AM peak model, trips included in the Residential Site Departure Trip Matrix were calculated using the employment numbers trip attractor at their destinations as the appropriate balancing factor. The Employment Site Arrival Trip Matrix was calculated using the population number as a function of their origin as the balancing factor. For the AM peak 'counter movements', these being Residential Site Arrival Trips and Employment Site Departure Trips, an average of the population size and employment number functions was used to calculate the trip distribution.
- 7.11 For the PM peak model, the assumptions used in the AM peak model were transposed. That is, trips included in the Residential Site Arrival Trip Matrix were calculated using the employment numbers at their origin and trips included in the Employment Site Departure Trip Matrix were calculated using the population size of their destination. For the PM peak 'counter movements', these being Residential Site Departure Trips and Employment Site Arrival Trips, an average of the population size and employment number functions were used to calculate the trip distribution.
- 7.12 WebTAG guidance was applied to calculate a generalised cost for all trips between all origins and destinations based on Value of Time and Vehicle Operating Costs. For further information regarding the generalised cost calculations refer to WebTAG guidance (TAG Unit 3.5.6 Values of Time and Vehicle Operating Costs, August 2012).

## 8 Single, Fixed, Route Assignment

- 8.1 The trips between all origin and destination zones were calculated using the Vehicle/Trip Generation Model. The sum of all four trip matrices for each time period were summed up and applied to the strategic highway network in Bromsgrove and Redditch Districts. The highway links included, as agreed, between Halcrow and WCC are as shown in Figure 8.1.
- 8.2 The routeing pattern between origin and destination zones was based on an all or nothing assignment. That is, all trips between an origin and a destination will follow the same route on a single, fixed, assignment routeing pattern. Routes between all origins and destinations which make the journey in the reverse direction will be assumed to follow in same routeing pattern but in reverse.

Figure 8.1 – Gravity model highway network



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## 9 Background Growth

- 9.1 Background growth for the AM and PM peak periods was considered through an analysis of Tempro Data. Tempro data provides a predicted background growth and is available for sub-

areas within the area covered by the Bromsgrove and Redditch Districts, as shown in Tables 9.1 and 9.2.

9.2 Tables 9.1 and 9.2 also show, by way of example, selected main highway links from the spreadsheet model and the growth experienced on the links as a result of the assessment of impact of development traffic.

Table 9.1 – AM Peak Background Growth Analysis

<b>AM Peak Background Growth Analysis</b>			
<b>Name</b>	<b>Tempro AM Growth Factor</b>	<b>Spreadsheet Gravity Model Network Link</b>	<b>Spreadsheet Gravity Model Network Growth</b>
Bromsgrove	1.0410	A38 Birmingham Road (NB)	1.492
		Fininstall Road (EB)	1.091
		Perryfields Lane (SB)	3.710
		Whitford Road/Fox Lane (NB)	1.919
Redditch	1.0009	A441 Birmingham Road (NB)	1.363
		B4497 Battens Drive (NB)	1.196
		A441 Evesham Road (Astwood Bank) (NB)	1.084
		B4184 Windsor Road (EB)	2.007

Table 9.2 – PM Peak Background Growth Analysis

<b>PM Peak Background Growth Analysis</b>			
<b>Name</b>	<b>Tempro AM Growth Factor</b>	<b>Spreadsheet Gravity Model Network Link</b>	<b>Spreadsheet Gravity Model Network Growth</b>
Bromsgrove	1.0470	A38 Birmingham Road (NB)	1.982
		Fininstall Road (EB)	1.047
		Perryfields Lane (NB)	3.104
		Whitford Road/Fox Lane (NB)	1.199
Redditch	1.0202	A441 Birmingham Road (NB)	1.650
		B4497 Battens Drive (NB)	1.270
		A441 Evesham Road (Astwood Bank) (NB)	1.133
		B4184 Windsor Road	2.511

9.3 Comparing the two increase proportions it can be seen that the development related increase is greater than the TEMPRO increase. This means that the increase in demand as a result of Bromsgrove and Redditch development exceeds the TEMPRO increase. Increases contained in TEMPRO are largely a function of the summation of additional development, with a smaller proportion a result of, for example, longer journeys and mode change. Also, it is noted that the highway impact assessment work undertaken has focussed on the main routes. It is recognised that local routes will act as feeder routes to this network, and on these location routes (if the same analysis was undertaken) TEMPRO could, but not always, exceed development growth.

9.4 It is therefore considered, as this analysis was conducted at sufficient a strategic level, that the development traffic increases adequately reflect overall traffic increases.

## 10 Cumulative Impact

- 10.1 The cumulative impact of the development trips will be assessed at key junctions, as identified and agreed between WCC and Halcrow, using the Vehicle/Trip Generation Model trip matrices and the result of applying these to highway network included in the model using the single, fixed, assignment process. The Vehicle/Trip Generation model outputs traffic flows for each of the links approaching the key junctions for both the AM and PM peak periods. A comparison of these link flows against current traffic flow data provides an indication of the anticipated future year performance of the junctions.
- 10.2 A generic capacity was assumed for each junction type based on those used the development of the Worcester Transport Model (WTM). This capacity was included in the model to allow the comparison of the model flows against the capacity of the junction thus providing an indication of whether the junction will operate either below, at, or above capacity. Table 10.1 shows the assumed capacities applied across the network. These capacities were assessed with reference to the WTM.

Table 10.1 – Junction Capacities per Junction Type

Junction Type	Capacity
Priority Junction Mainline 1 Lane Approach	1200
Priority Junction Mainline 2 Lane Approach	2500
Priority Junction Give Way Approach 1 Lane	300
Priority Junction Give Way Approach 2 Lane	500
Signal Junction Mainline 1 Lane Approach	600
Signal Junction Mainline 2 Lane Approach	1000
Signal Junction Mainline 3 Lane Approach	1400
Signal Junction Give Way Approach 1 Lane	400
Signal Junction Give Way Approach 2 Lane	800
Roundabout Junction 1 Lane Approach	800
Roundabout Junction 2 Lane Approach	1200
Roundabout Junction 3 Lane Approach	1500
Roundabout Junction 4 Lane Approach	1800
Mini - Roundabout Junction 1 Lane Approach	400
Motorway Mainline 3 Lanes	5700

- 10.3 The requirement for a mitigation measure (scheme) was driven by the identification of junctions which are shown to operating at, or over capacity in the gravity model in the AM peak and PM peak periods, based upon the data parameters included in Table 10.1.

## 11 Concluding remarks

- 11.1 The Vehicle/Trip Generation Model developed provides an area wide assessment tool showing the transport impacts for Bromsgrove and Redditch Districts. This Technical Note has described the methodology adopted to build the Model and has noted the assumptions made during this process.
- 11.2 In terms of analysis of the highway network, the Vehicle/Trip Generation Model was used to identify the junctions predicted to be under pressure as a result of the development proposals

put forward for the Bromsgrove and Redditch areas. In order to further the design of any mitigation measures it is recommended that more detailed assessments are undertaken on a more local basis.

- 11.3 In terms of analysis of the sustainable modes, the model demonstrates requirements for walk, cycle and PT infrastructure and services to accommodate forecast demand and mitigate/limit impact of forecast vehicle trips generation.

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# Appendix B

## Bromsgrove and Redditch – Planning Data

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GIS Ref	SiteRef	Location	Development Quantum	
			Residential Dwellings Units	Employment Hectares
	ALV6	Alvechurch, Land adj Crown Meadow		27
	BDC102	7 & 9 Worcester Road, Hagley		12
	BDC163	Finstall Training Centre, Stoke Road, Birmingham		12
	BDC168A	The Council House Burcot Lane, Bromsgrove		51
	BDC168A	Alvechurch, Birmingham Rd/Old Rectory Lane		27
	BDC189	Hagley ADR BDC35B, BDC51, BDC189, BDC189		311
	BDC192	All Saints Vicarage, Burcot Lane, Bromsgrove		12
	BDC195	Banner Foods, 6 Finstall Road, Bromsgrove		12
	BDC199	Polymerlatex, Westonhall Road, Stoke Prior		200
	BDC20	BROM 2 Perryfields	1350	5
	BDC201	Regents Park Road, The Oakalls, Bromsgrove		39
	BDC221	Longbridge Cotton Centre		0
	BDC222	Bromsgrove Technology Park		5.3
	BDC223	Wythall Green Business Park		6.1
	BDC224	Ravenbank ADR		1.18
	BDC65	The Avenue, Rubery		68
	BDC66	Wythall, Bleakhouse Farm		176
	BDC73	Longbridge East Works		750
	BDC80	BROM 3 Whitford Road		500
	BDC81A	BROM1 Norton Farm		318
	BDC85	Wagon Works, Bromsgrove		212
	BDC86	Wythall, Selsdon Close		76
	BDC9	45-47 Woodrow Lane, Catshill		6
	BDC92	Bartn Green, Kendal End Road		88
	BDC93	Catshill, Church Lane		80
	BDC95	50, 52 & 54 Red Lion Street, Alvechurch		10
	FR4	Frankley, Egghill Lane		66
LP02 - Brush factory, Evesham Road, Cradley	LP02	Brush Factory, Evesham Road, Crabbs Cross (LP124)		4
LP03 - Rear of 144-162 Easemore Road	LP03	Rear of 144-162 Easemore Road (LP135)		19
LP05 - Windsor Gas Works (LP147)	LP05	Windsor Gas Works (LP147) **see completions**		6
LP06 - Mayfield Works	LP06	Mayfields Works		23
LP13 - Land off Tons Close	LP13	Land off Tons Close		6
LPX02 - Adjacent Castleditch Lane / Pheasant Lane	LPX02	Adjacent Castleditch Lane / Pheasant Lane		16
LPX04 - Former Claybrook School, Matchborough	LPX04	Former Claybrook School, Matchborough		36
LPX05 - Land at Millfields, Fire Station & RO Fire Station	LPX05	Land at Millfields, Fire Station and RO Fire Station		35
LPX06 - Former Ipsley School Playing Field	LPX06	Former Ipsley School playing field		31
LPX07 - South of Scout Hut, Oskenshaw	LPX07	South of scout hut, Oskenshaw Road		32
CS01 - Church Hill District Centre	CS01	Church Hill District Centre		57
CS03 - Matchborough District Centre	CS03	Matchborough District Centre		17
WYG04 - Marfield Farm School	WYG04	Marfield Farm School		79
WYG06 - High Trees, Dark Lane (09/259)	WYG06	High Trees, Dark Lane (09/259)		5
RB03 - Widney House, Bromsgrove Road	RB03	Widney House, Bromsgrove Road		58
LA02 - Land off Winhill Drive (08/305)	LA02	Land off Winhill Drive (08/305)		15
UCS 2.16 - Rear of Sandycroft Close	UCS 2.16	Rear of Sandycroft Close		8
UCS 8.38 - Dingleside Middle School & Playing Field	UCS 8.38	Dingleside Middle School & playing field and land rear of 1-11 Auxerre A		220
2010/03 - Loxley Close	2010/03	Loxley Close		10
2010/05 - Clifton Close	2010/05	Clifton Close		6
2010/07 - Prospect Hill	2010/07	Prospect Hill		71
2010/09 - Rear of Alexandra Hospital	2010/09	RO Alexandra Hospital		145
2010/10 - A435 ADR	2010/10	A435 ADR		184
2010/11 - Brockhill ADR	2010/11	Brockhill ADR		582
2010/12 - Webtheath ADR	2010/12	Webtheath ADR		600
2010/13 - Brockhill Green Belt	2010/13	Brockhill East Green Belt		400
2010/14 - Foxydate Green Belt	2010/14	Brockhill West Green Belt		150
2010/27 - Sandycroft, West Avenue	2010/27	Sandycroft, West Avenue		10
2011/02 - St Stephen's School Playing Field	2011/02	St Stephen's School Playing Field (part)		22
2011/03 - Brockhill East	2011/03	Brockhill East (10/008)		14
2011/04 - Dorothy Terry House	2011/04	Former Dorothy Terry House, Evesham Road (10/137)		41
2011/05 - Wellington Works	2011/05	Wellington Works, Astwood Bank (10/154)		7
2011/06 - Birchfield Road	2011/06	Birchfield Road		22
2012/01 - Hewell Road Baths	2012/01	Former Hewell Road swimming baths		14
2012/02 Lowan's Hill Farm	2012/02	Lowan's Hill Farm, Brockhill (11/087)		6
IN 15	IN 15	Woolaston Road, Park Farm North		0.4
IN 19	IN 19	Studley Road (Aeropus), Park Farm (N)		1.44
IN 20	IN 20	Old Forge Drive, (BACO) Park Farm North		1.32
IN 24	IN 24	Windsor Road Gas Works, Enfield		0.9
IN34	IN34	Merse Road, Moons Moat North		0.65
IN 37	IN 37	Bartlett Road, Washford		0.62
IN 38	IN 38	A4, 47, 52 Heming Road, Washford		0.22
IN 52	IN 52	Shawbank Road, Lakeside		1.03
IN 54	IN 54	Palmers Road, Moons Moat East		0.29
IN 58	IN 58	Crossgate Road, Park Farm North		1.1
IN59	IN59	A9, Greenlands Business Centre, Studley Road, Park Farm North		0.38
IN 61	IN 61	Studley Road, Green Lane, Park Farm South		0.43
IN 67	IN 67	Land at Brockhill		6.6
IN 69	IN 69	Land to the Rear of the Alexandra Hospital Strategic Site		2
IN 73	IN 73	Land at Union Street		0.19
IN 80	IN 80	Land At Winyates Way And Moons Moat Drive		0.64
IN 81	IN 81	Land at Brockhill, East of Railway (Eastern Section of ADR)		3.5
IN 82	IN 82	A435 Segment 2		10.44
IN 83	IN 83	Land bound by Kingham Close and Far Moor Lane		0.19
IN 84	IN 84	Land off Pipers Road		0.22
IN 85	IN 85	Land Fronting Matchborough Way		0.6
IN 87	IN 87	Edward Street		0.48
		Winyates Green Triangle (Stratford)		12
		Land at Gorcott (Stratford)		7.47
RA1	KFC - 2012/025/FUL	Maclean House, Clews Road		
RA2	Astwood Farm - 2012/148/COU	Building F, Astwood Business Park, Astwood Farm, Astwood Lane		
RA3	Sainsbury's extension - 2011/219/FUL	Alvechurch Highway, Redditch		
RA4	Patrol Station - 2011/258	Land at Teardrop Site, Bordesley Lane, Redditch		
RA5	Pub & Hotel - 2011/296	Land at Teardrop Site, Bordesley Lane, Redditch		
RA6	Town Centre (additional retail)	Town Centre		
BA1	Sainsburys	Birmingham Road		
BA2	New Fire & Police Station	Slideslow Drive		
BA3	Former Market Hall Site (TC8)	St Johns Street		
BA4	Birmingham Road / Stourbridge Road (TC15)	Junction of Birmingham Rd/Stourbridge Rd		
<b>WINDFALL DISTRIBUTION</b>				
Alvechurch			2	36
Bartn Green			2	36
Belbroughton			1	18
Bentley Paunceloft			0	0
Booley			1	18
Bournheath			0	0
Bromsgrove			14	252
Catshill and North Marlbrook			2	36
Client			1	18
Cofton Hackett			0	0
Dodford with Grafton			0	0
Finstall			0	0
Frankley			0	0
Hagley			2	36
Hunnington			0	0
Lickey and Blackwell			1	18
Romsley			0	0
Rubery			1	18
Stoke Prior			1	18
Tutnall and Cobby			0	0
Wythall			2	36
ABBEY			0	0
ASTWOOD BANK & FECKENHAM			1	18
BATCHLEY & BROCKHILL			1	18
CENTRAL			1	18
CHURCH HILL			1	18
CRABBS CROSS			1	18
GREENLANDS			1	18
HEADLESS CROSS & OAKENSHAW			1	18
LODGE PARK			1	18
MATCHBOROUGH			1	18
WEST			1	18
WINYATES			1	18
<b>CROSS BOUNDARY SITES</b>				
Site 4				2800
Site 6				600



## Appendix C

Predicted number of trips from development sites by mode

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<b>24 Hour Trip Totals</b>	<b>VEHICLE TRIPS</b>	<b>BUS TRIPS</b>	<b>BICYCLE TRIPS</b>	<b>PED TRIPS</b>
Bromsgrove - Cluster 1	2872	123	37	36
Bromsgrove - Cluster 2	681	59	21	27
Bromsgrove - Cluster 3	444	37	15	32
Bromsgrove - Cluster 4	841	78	0	0
Bromsgrove - Cluster 5	11033	774	303	1655
Bromsgrove - Cluster 6	1946	134	60	327
Bromsgrove - Cluster 7	375	25	14	79
Bromsgrove - Cluster 8	238	16	8	43
Bromsgrove - Cluster 9	3060	212	93	512
Bromsgrove - Cluster 10	3876	254	145	834
Bromsgrove - Cluster 11	3808	260	122	674
Bromsgrove - Cluster 12	2153	201	0	0
Bromsgrove - Cluster 13	6588	487	310	1233
Bromsgrove - Cluster 14	1643	149	37	0
Bromsgrove - Cluster 15	3378	307	88	0
Bromsgrove - Cluster 16	5252	850	260	863
Bromsgrove - Cluster 17	16849	2047	638	1672
Bromsgrove - Cluster 18	0	0	0	0
Bromsgrove - Cluster 19	3500	486	146	444
Bromsgrove - Cluster 20	0	0	0	0
Redditch - Cluster 1	3767	458	143	374
Redditch - Cluster 2	1124	147	44	128
Redditch - Cluster 3	12964	1729	517	1535
Redditch - Cluster 4	1372	212	62	210
Redditch - Cluster 5	1933	287	85	276
Redditch - Cluster 6	351	54	16	52
Redditch - Cluster 7	2791	460	135	471
Redditch - Cluster 8	885	135	40	132
Redditch - Cluster 9	1145	189	57	194
Redditch - Cluster 10	1701	268	83	267
Redditch - Cluster 11	820	121	38	115
Redditch - Cluster 12	4352	476	239	336
Redditch - Cluster 13	2139	351	104	359
Redditch - Cluster 14	805	155	45	172
Redditch - Cluster 15	854	166	49	185
Redditch - Cluster 16	15234	2934	860	3251
Redditch - Cluster 17	0	0	0	0
Redditch - Cluster 18	0	0	0	0
Redditch - Cluster 19	0	0	0	0
Redditch - Cluster 20	0	0	0	0



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## Appendix D

### Infrastructure Delivery Plan – Scheme Tables

## Bromsgrove Development Plan

### Sustainable Transport Schemes

#### **Bromsgrove Town Bus Operations - Routes and Frequencies**

Note: Gold and Silver Bus Routes/Roadside Infrastructure referenced as per Worcestershire County Council Passenger Transport Infrastructure Best Practice Report (November 2007)

Location	Potential Scheme	Costs
Bromsgrove Town Centre Services to link developments - 'Clover-leaf'	Silver Standard Bus Route, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 800,000.00
<b>SUB TOTAL</b>		<b>£ 800,000.00</b>

#### **Bromsgrove Inter-Urban Bus Operations - Routes and Frequencies**

Note: Gold and Silver Bus Routes/Roadside Infrastructure referenced as per Worcestershire County Council Passenger Transport Infrastructure Best Practice Report (November 2007)

Location	Potential Scheme	Costs
Inter-Urban - Service 144 - Birmingham to Worcester (via Bromsgrove and Catshill)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 2,200,000.00
Inter-Urban - Service X3 - Kidderminster to Redditch (via Bromsgrove)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,320,000.00
Inter-Urban - Service 143 - Birmingham to Redditch (via Bromsgrove and Catshill)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,680,000.00
Inter-Urban - Service 145 - Bromsgrove to Redditch (via Longbridge)	Gold Standard Bus Routes, Service Frequency; Mon-Sat (15 mins), Evenings and Sundays; min half hourly Periods of Operation; Mon-Sat (0600-1900), Evenings (1900-2300), Sundays (0800-2000)	£ 1,200,000.00
<b>SUB TOTAL</b>		<b>£ 6,400,000.00</b>

## Bromsgrove Development Plan Local Development Plan

## Sustainable Transport Schemes

## Bromsgrove

Location	Context	Magnitude	Consequence	Potential Scheme	Costs	With Contingencies	Total Cost (inc OB)
Cluster 5	Cycle Route 5 routes through Perryfields providing access route for pedestrians and cyclists to town centre and Bromsgrove Rail Station	Potential for approximately 1660 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 300 cycle trips to and from development cluster over 24 hour period Potential for approximately 770 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Signing strategy to link Perryfields Development site to Cycle Route 5 through residential streets such as Green Road, Carol Avenue, Grayhott Close, Junction Road and Willow Road Provision for 2 Gold Standard Bus Stops	£ 45,000.00	£ 65,250.00	£ 100,000.00
Cluster 5	No existing pedestrian/cycle crossing facility on Perryfields Road in proximity to Sidemoor First School and Nursery	Potential for approximately 1660 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 300 cycle trips to and from development cluster over 24 hour period Potential for approximately 770 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Provide a Toucan crossing	£ 35,000.00	£ 50,750.00	£ 80,000.00
Cluster 5	Perryfields Road in its existing form is considered as an on road cycle route although cyclists are warned to take special care on this section of route. Vehicle traffic flows on this section will increase due to development trips, therefore the existing facilities for cyclists should be improved	Potential for approximately 1660 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 300 cycle trips to and from development cluster over 24 hour period Potential for approximately 770 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Provide a shared use pedestrian/cycle path adjacent to Perryfields Road to link Kidderminster Road with Stourbridge Road	£ 677,000.00	£ 981,650.00	£ 1,420,000.00
Cluster 6	Development site to west of Birmingham Road between Cycle Route 2 which links to Cycle Route 5 north towards Casthill and Cycle Route 1 which links south towards Bromsgrove town centre	Potential for approximately 330 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 60 cycle trips to and from development cluster over 24 hour period Potential for approximately 130 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Scheme to link through development site to directly connect Cycle Routes 1 and 2 via Elm Grove and Public Footpath to the north, to link Barnsley Hall Drive and provide signage Provision for 2 Gold Standard Bus Stops	£ 292,000.00	£ 423,400.00	£ 610,000.00
Cluster 7	Development sites located between Burcot Lane and Sideslow Drive in proximity to Cycle Route 1	Potential for approximately 80 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 10 cycle trips to and from development cluster over 24 hour period Potential for approximately 20 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Signing Strategy to provide directions from development site to Cycle Route 1 Provision for 2 Gold Standard Bus Stops	£ 38,000.00	£ 55,100.00	£ 80,000.00
Cluster 8	Development sites located south of Bromsgrove Highway and in proximity to Cycle Route 5 on Chesworth Road	Potential for approximately 40 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 10 cycle trips to and from development cluster over 24 hour period Potential for approximately 20 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Cycle scheme to connect Regents Park Road/Green Park Road to Cheshworth Road/Conlith Road via Firstall First School Provision for 2 Gold Standard Bus Stops	£ 99,000.00	£ 143,550.00	£ 210,000.00
Cluster 9	Development site located to the west of Whitford Road. Sustainable transport links to town centre via Sanders Park	Potential for approximately 510 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 90 cycle trips to and from development cluster over 24 hour period Potential for approximately 210 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Potential to create designated walk / cycle route from the development site to the town centre via Sanders Park - upgrade existing path Provision for 2 Silver Standard Bus Stops	£ 266,000.00	£ 385,700.00	£ 560,000.00
Cluster 9	No existing crossing facility on Whitford Road to access development site	Potential for approximately 510 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 90 cycle trips to and from development cluster over 24 hour period Potential for approximately 210 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Provide a Toucan crossing	£ 35,000.00		£ 100,000.00
Cluster 11	Development sites located both east and west of the railway line. The cluster of development sites is joined by a pedestrian footbridge over the railway line at Railway Walk, present only link to town centre via a recognised cycle/pedestrian route is via Cycle Route 5 but this is a long route from this location and off the desire line.	Potential for approximately 670 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 120 cycle trips to and from development cluster over 24 hour period Potential for approximately 260 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Improved signage for pedestrians and cyclists via Railway Walk, Newton Avenue and Sherwood Road. Toucan pedestrian crossing at the A38 junction with Charlford Road and a signed pedestrian/cycle path linking Charlford Road with Conway Road (behind South Bromsgrove High School) to provide a link towards the town centre. Provision for 2 Gold Standard Bus Stops	£ 246,000.00	£ 356,700.00	£ 520,000.00
Bromsgrove	Provision for additional dropped kerbs at various locations around the town centre and residential areas	Potential to increase the number of cycle and pedestrian trips in Bromsgrove	Existing pedestrian and cycle infrastructure in poor condition can prevent use	Providing additional crossing facilities in the form of controlled dropped kerbs will increase the attractiveness of travelling by sustainable modes on certain routes and at key junctions and in turn increase the connectivity across the town	£ 50,000.00	£ 72,500.00	£ 110,000.00
Bromsgrove	Poor cycle parking provision in town centre	Potential to increase the number of cycle trips to Bromsgrove Town Centre	Lack of adequate cycle storage facilities in Town Centre may prevent cycle trips to Bromsgrove and in turn increase trips into the Town Centre by sustainable modes	Provide additional cycle parking infrastructure in Bromsgrove town centre	£ 4,000.00	£ 5,800.00	£ 10,000.00
Bromsgrove	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to Bromsgrove Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of Cycle Route 5 to provide directions to Bromsgrove Railway station	£ 15,000.00	£ 21,750.00	£ 40,000.00
Bromsgrove	Requirement to provide additional infrastructure along the New Road corridor to prioritise the route for sustainable modes	Potential to increase the number of cycle and pedestrian trips in Bromsgrove	Existing pedestrian and cycle infrastructure in poor condition without appropriate signage can prevent use	Providing additional facilities for cyclists and pedestrians along the New Road corridor improve the attractiveness of the key route linking the town centre and the railway station. Includes additional dropped kerbs, a Toucan Crossing, informal crossings and additional street signage	£ 70,000.00	£ 101,500.00	£ 150,000.00
Bromsgrove	Lack of information for cyclists and pedestrians around the town	Potential to increase the number of cycle and pedestrian trips in Bromsgrove	Lack of appropriate facilities for sustainable transport users will not increase the number of non-car trips	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Bromsgrove. Suggest: at cycle storage facility, bus station and railway station. Provision of Gold Standard Bus Shelters at nearest bus stops to the information kiosks	£ 105,000.00	£ 152,250.00	£ 220,000.00
Bromsgrove	Perception of a poor built environment and public realm in and around Bromsgrove town centre	Potential to increase the number of cycle and pedestrian trips in Bromsgrove	Existing pedestrian and cycle infrastructure in poor condition without appropriate signage can prevent use	Public realm enhancement scheme - including improvements to High Street, Church Street, Mill Lane, School Drive, Worcester Road and Market Place	£4,656,800 (Total Budget)	£4,656,800 (Total Budget)	£4,656,800 (Total Budget)
<b>SUB TOTAL</b>					<b>£ 6,633,800.00</b>	<b>£ 1,239,750.00</b>	<b>£ 8,866,800.00</b>

**Hagley**

Location	Context	Magnitude	Consequence	Potential Scheme	Costs	With Contingencies	Total Cost (inc OB)			
Cluster 1	Concerns over current proposals for the Hagley ADR site and walk and cycle access from the development site to Hagley town centre across the A456	Potential for approximately 40 pedestrian trips to and from development cluster over 24 hour period Potential for approximately 40 cycle trips to and from development cluster over 24 hour period Potential for approximately 120 PT trips to and from development cluster over 24 hour period	Not providing links to existing sustainable transport networks from proposed development sites can prevent trips due to a lack of connectivity	Provision of a Toucan crossing over the A456 at the south western corner of the development site. This will also provide access to the Hagley Primary School.	£	43,000.00	£	62,350.00	£	90,000.00
Hagley	Poor cycle parking provision at West Hagley Railway Station	Potential to increase the number of cycle trips to West Hagley Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide additional cycle parking infrastructure at West Hagley Railway Station	£	10,000.00	£	10,000.00	£	20,000.00
Hagley	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to West Hagley Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of cycle routes to West Hagley Railway Station	£	8,000.00	£	11,600.00	£	20,000.00
Hagley	Lack of information for cyclists and pedestrians around the town	Potential to increase the number of cycle and pedestrian trips in Hagley	Lack of appropriate facilities for sustainable transport users will not increase the number of non car trips	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Hagley. Suggested site: railway station. Provision of a Gold Standard Bus Shelter at nearest bus stop to the information kiosks	£	35,000.00	£	50,750.00	£	80,000.00
<b>SUB TOTAL</b>					<b>£</b>	<b>96,000.00</b>	<b>£</b>	<b>134,700.00</b>	<b>£</b>	<b>210,000.00</b>

**Longbridge**

Location	Context	Magnitude	Consequence	Potential Scheme	Costs	With Contingencies	Total Cost (inc OB)			
Longbridge	Poor cycle parking provision at Longbridge Railway Station	Potential to increase the number of cycle trips to Longbridge Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide additional cycle parking infrastructure at Longbridge Railway Station	£	10,000.00	£	14,500.00	£	30,000.00
Longbridge	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to Longbridge Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of cycle routes to Longbridge Railway Station	£	8,000.00	£	11,600.00	£	20,000.00
Longbridge	Lack of information for cyclists and pedestrians at Railway Station	Potential to increase the number of cycle trips to Longbridge Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Longbridge. Suggested site: railway station. Provision of a Gold Standard Bus Shelter at nearest bus stop to the information kiosks	£	35,000.00	£	50,750.00	£	80,000.00
<b>SUB TOTAL</b>					<b>£</b>	<b>53,000.00</b>	<b>£</b>	<b>76,850.00</b>	<b>£</b>	<b>130,000.00</b>

**Barrt Green / Alvechurch**

Location	Context	Magnitude	Consequence	Potential Scheme	Costs	With Contingencies	Total Cost (inc OB)			
Barrt Green	Poor cycle parking provision at Barrt Green Railway Station	Potential to increase the number of cycle trips to Barrt Green Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide additional cycle parking infrastructure at Barrt Green Railway Station	£	10,000.00	£	14,500.00	£	30,000.00
Barrt Green	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to Barrt Green Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of cycle routes to Barrt Green Railway Station	£	8,000.00	£	11,600.00	£	20,000.00
Barrt Green	Lack of information for cyclists and pedestrians around the town	Potential to increase the number of cycle trips to Barrt Green Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Barrt Green. Suggested site: railway station. Provision of a Gold Standard Bus Shelter at nearest bus stop to the information kiosks	£	35,000.00	£	50,750.00	£	80,000.00
Barrt Green	Lack of wheelchair access to Barrt Green Railway Station	Potential to increase the number of cycle trips to Barrt Green Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	New ramped access pedestrian footbridge to provide access to all platforms for wheelchair users	£		£		£	1,805,000.00
Alvechurch	Poor cycle parking provision at Alvechurch Railway Station	Potential to increase the number of cycle trips to Alvechurch Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide additional cycle parking infrastructure at Alvechurch Railway Station	£	10,000.00	£	14,500.00	£	30,000.00
Alvechurch	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to Alvechurch Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of cycle routes to Alvechurch Railway Station	£	8,000.00	£	11,600.00	£	20,000.00
Alvechurch	Lack of information for cyclists and pedestrians around the town	Potential to increase the number of cycle trips to Alvechurch Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Alvechurch. Suggested site: railway station. Provision of a Gold Standard Bus Shelter at nearest bus stop to the information kiosks	£	35,000.00	£	50,750.00	£	80,000.00
Alvechurch	Lack of parking at Alvechurch Railway Station	Potential to increase the number of cycle trips to Alvechurch Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Expansion to existing car park at Alvechurch Railway Station - 100 additional car parking spaces	£	200,000.00	£	290,000.00	£	420,000.00
Redditch / Alvechurch / Barrt Green / Birmingham	Redditch - Birmingham Railway Line/Service	Network Rail Scheme	Network Rail Scheme	Enhancements to the existing rail infrastructure and service	£		£		£	Network Rail Scheme
<b>SUB TOTAL</b>					<b>£</b>	<b>306,000.00</b>	<b>£</b>	<b>443,700.00</b>	<b>£</b>	<b>2,485,000.00</b>

**Wythall**

Location	Context	Magnitude	Consequence	Potential Scheme	Costs	With Contingencies	Total Cost (inc OB)			
Wythall	Poor cycle parking provision at Wythall Railway Station	Potential to increase the number of cycle trips to Wythall Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide additional cycle parking infrastructure at Wythall Railway Station	£	10,000.00	£	14,500.00	£	30,000.00
Wythall	No car parking available at Wythall Railway Station	Potential to increase the number of cycle trips to Wythall Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide 100 vehicle space car park facility at Wythall Railway Station	£	200,000.00	£	290,000.00	£	420,000.00
Wythall	Bus stops located outside Wythall Railway Station are in need of upgrading	Potential to increase the number of cycle trips to Wythall Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Provide two new high standard bus shelters with RTI system outside Wythall railway station	£	30,000.00	£	30,000.00	£	50,000.00
Wythall	Need for improved cycle / pedestrian signage to the railway station	Potential to increase the number of cycle trips to Wythall Railway Station	Lack of appropriate facilities for sustainable transport users at the Rail Station will not increase the number of non-car trips made to the site	Improved signing of cycle routes to Wythall Railway Station	£	8,000.00	£	11,600.00	£	20,000.00
Wythall	Lack of information for cyclists and pedestrians around the town	Potential to increase the number of cycle and pedestrian trips in Wythall	Lack of appropriate facilities for sustainable transport users will not increase the number of non car trips	Installation of information kiosks displaying cycle route maps, suggested pedestrian routes etc at key locations in Wythall. Suggested site: railway station.	£	20,000.00	£	29,000.00	£	50,000.00
<b>SUB TOTAL</b>					<b>£</b>	<b>268,000.00</b>	<b>£</b>	<b>375,100.00</b>	<b>£</b>	<b>570,000.00</b>

## Bromsgrove - Proposed Highway Schemes

Location	Existing Situation	Context	Magnitude	Consequence	Optimum Scheme	Costs	With Contingencies	Total Cost (inc OB)
A38 (Worcester Road/Redditch Road) / B4094 (Worcester Road)	Roundabout Junction	Junction located on A38 linking Bromsgrove with Droitwich and Worcester	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on a key route from Bromsgrove to Droitwich and Worcester	Implement signalised junction to replace existing roundabout	£ 340,000.00	£ 865,300.00	£ 1,250,000.00
A38 (Redditch Road) / Hanbury Road	Signalised Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Upgrade signal junction to install MOVA	£ 15,000.00	£ 38,175.00	£ 60,000.00
A38 (Redditch Road) / Austin Road / Buntstord Park Road	Roundabout Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Implement signalised junction to replace existing roundabout	£ 670,000.00	£ 1,705,150.00	£ 2,460,000.00
A38 (Redditch Road) / Buntstord Drive	Roundabout Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Implement signalised junction to replace existing roundabout	£ 490,000.00	£ 1,247,050.00	£ 1,800,000.00
A38 / Stoke Road	Signalised Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Signal Optimisation Scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
A448 (Bromsgrove Highway) / A38	Roundabout Junction	Junction located on key A38/A448 intersection	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38/A448 intersection linking Bromsgrove and Redditch	Signalised Roundabout junction. Signals in operation on A38 and eastern A448 approach. Operated using MOVA. Provide a 'hamburger' section through the junction to link the westbound A448 approach with the northbound A38 at the north of the junction	£ 2,540,000.00	£ 6,464,300.00	£ 9,310,000.00
M42 Junction 1 / A38	Signalised Roundabout Junction	Junction located on A38 corridor linking Bromsgrove with the strategic road network and the Birmingham Conurbation	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A38 route from Bromsgrove to the strategic road network and the Birmingham Conurbation	Close off access to existing signalised roundabout from B4096 (Alcester Road) - requires supporting TRO. Re-direct traffic via School Lane (Lickey End). Signal optimisation scheme at junction. Implement signalised junction on A38/School to accommodate diverted traffic resulting from scheme proposal at M42 Junction 1. Scheme will require a school safety zone and supporting TRO	£ 309,000.00	£ 786,405.00	£ 1,140,000.00
M5 Junction 4 / A38 (Birmingham Road)	Signalised Roundabout Junction	Junction located on A38 corridor linking Bromsgrove with the strategic road network and the Birmingham Conurbation	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A38 route from Bromsgrove to the strategic road network and the Birmingham Conurbation	Additional approach lane on the A38 Halesowen Road approach to the junction. Will require extensive civils work	£ 318,645.38	£ 810,952.49	£ 1,170,000.00
A448 (Kidderminster Road) / Whitford Road / Perryfields Lane	Priority Junction (Crossroads)	Junction located on the A448 west of Bromsgrove	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on a key route into Bromsgrove town centre from Kidderminster and residential areas on the edge of the town	This junction is being investigated by the Perryfields Road and Whitford Road development sites allocated within the plan	£ 335,000.00	£ 852,575.00	£ 1,230,000.00
B4091 (Stourbridge Road) / Bamsley Hall Road	Roundabout Junction	Junction located on the B4091 north west of Bromsgrove	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on a key route into Bromsgrove town centre and residential areas on the edge of the town	This junction is being investigated by the Perryfields Road development site allocated within the plan	£ 1,003,000.00	£ 2,552,635.00	£ 3,680,000.00
A448 (The Strand and Market Street) / Stourbridge Road / Birmingham Road	Signalised Junction	Junction located on key route into Bromsgrove town centre	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will routes into Bromsgrove town centre	Signal Optimisation Scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
B4184 (New Road / Finstall Road)	Mini-Roundabout	Provides access to Bromsgrove Railway Station	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will routes into Bromsgrove town centre	Replace mini roundabout with signalised junction	£ 90,000.00	£ 229,050.00	£ 330,000.00
B4091 (Rock Hill) / Fox Lane	Priority Junction	Junction located on key route into Bromsgrove town centre	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will routes into Bromsgrove town centre	This junction is being investigated by the Whitford Road development site allocated within the plan.  Site constrained by The Greyhound Pub, Select and Save Local Convenience Store and The Cheap Car Trade Centre (Car Dealership). Vehicles are also parked close to the junction adjacent to the southbound carriageway.  Replace existing junction with signalised junction to improve output of vehicles from Fox Lane onto B4091 (Rock Hill). TRO required to prevent parking adjacent to the southbound carriageway. Junction to be operated using MOVA control. Remove existing pedestrian crossing north of junction and incorporate all movement crossing facility at proposed junction.	£ 208,000.00	£ 529,360.00	£ 770,000.00
A448 Kidderminster Road / St John Street / B4091 (Hanover Street)	Mini-Roundabout	Junction located on key route into Bromsgrove town centre	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will routes into Bromsgrove town centre	Junction is constrained by adjacent properties.  Replace existing junction with signalised junction. Additional eastbound approach lane into the junction on Kidderminster Road this will require some civils work to reconfigure the existing kerblines and a reduction in the width of the footways. Remove existing pedestrian crossing north of junction and incorporate all movement crossing facility at proposed junction.	£ 305,000.00	£ 776,225.00	£ 1,120,000.00
A448 (Market Street) / B4184 Market Place	Priority Junction	Junction located on key route into Bromsgrove town centre	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will routes into Bromsgrove town centre	Junction is constrained by adjacent properties.  Replace existing junction layout with a signalised junction. Re-position traffic island and retain the southbound 'Give Way' into Market Place. Remove both existing pedestrian crossings in proximity to junction and provide an all red phase and pedestrian crossing facilities at the junction. Extend northbound right turn lane to allow additional stacking capacity.	£ 405,000.00	£ 1,030,725.00	£ 1,490,000.00
A38 / B4184 (New Road)	Signalised Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Signal Optimisation Scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
A38 (Birmingham Road) / Birmingham Road	Signalised Junction	Junction located on A38 corridor through Bromsgrove	Model indicates junction to be performing over capacity in 2030	Cogestion on this route will impact on key A38 corridor through Bromsgrove which links residential and employment developments and forms part of the strategic road network through the town	Signal Optimisation Scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
<b>SUB TOTAL</b>						<b>£ 7,088,645.38</b>	<b>£ 18,040,602.49</b>	<b>£ 26,050,000.00</b>



**Hagley - Proposed Highway Schemes**

Location	Existing Situation	Context	Magnitude	Consequence	Optimum Scheme	Costs	With Contingencies	Total Cost (inc OB)
A456 (Kiddeminster Road) / A491 (Hagley Road)	Signalised Junction	Junction located at intersection of the A456/A491	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A456 and A491 routes through the town	Signal optimisation scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
A456 (Kiddeminster Road) / A491 (Stourbridge Road)	Roundabout Junction	Junction located at intersection of the A456/A491	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A456 and A491 routes through the town	Signalisation of roundabout on the A456 and A491 approaches	£ 240,000.00	£ 610,800.00	£ 880,000.00
A456 (Worcester Road) / A450 (Worcester Road)	Signalised Junction	Junction located on A456 corridor through Hagley	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A456 and A450 routes through the town	Signal optimisation scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
A456 Kiddeminster Road / Development access	Priority Junction - assumed to be provided as a minimum scheme by developer	Junction located on A456 corridor through Hagley	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A456 route through the town	Any priority junction provided by the developer must be upgraded to a signalised junction. Note: costs allow for upgrade of priority junction to a signalised junction	£ 90,000.00	£ 229,050.00	£ 330,000.00
A456 (Worcester Road) / B4187 (Worcester Road)	Signalised Junction	Junction located on A456 corridor through Hagley	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on the key A456 route through the town	Signal optimisation scheme	£ 15,000.00	£ 38,175.00	£ 60,000.00
Station Road	Issue with parked vehicles causing congestion - particularly in AM peak period due to school traffic	Highway issues outside a school	Model indicates junction to be performing over capacity in 2030	Lack of a scheme at this location may have consequences for the safety of pedestrians outside the school entrance	School Safety Zone Traffic Management Scheme and supporting TRO	£ 13,000.00	£ 33,085.00	£ 50,000.00
<b>SUB TOTAL</b>						<b>£ 388,000.00</b>	<b>£ 987,460.00</b>	<b>£ 1,440,000.00</b>

**A491 Corridor - Proposed Highway Schemes**

Location	Existing Situation	Context	Magnitude	Consequence	Optimum Scheme	Costs	With Contingencies	Total Cost (inc OB)
A491 (Sandy Lane) / B4551 (Money Lane)	Priority Junction	Junction located on route between Bromsgrove/M42/M5 and Hagley/Stourbridge	Model indicates junction to be performing over capacity in 2030	Congestion at this junction will impact on route linking Bromsgrove/M5-M42 with Hagley and Stourbridge	Junction safety scheme to narrow down the approach to the A491 from the B4551	£ 100,000.00	£ 254,500.00	£ 370,000.00
<b>SUB TOTAL</b>						<b>£ 100,000.00</b>	<b>£ 254,500.00</b>	<b>£ 370,000.00</b>

**HGV - Lorry Park**

Location	Existing Situation	Context	Magnitude	Consequence	Optimum Scheme	Costs	With Contingencies	Total Cost (inc OB)
To be confirmed	Lack of suitable overnight parking facility for HGV's				Provision of an overnight parking facility for approx 25 HGV's	£ 500,000.00	£ 1,272,500.00	£ 1,840,000.00
<b>SUB TOTAL</b>						<b>£ 500,000.00</b>	<b>£ 1,272,500.00</b>	<b>£ 1,840,000.00</b>