

# **Worcestershire County Council**

Redditch Development Sites - Highway Impact  
and Accessibility Modelling Report

May 2011

**Halcrow Group Limited**

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# 1. Introduction

- 1.1 Halcrow have been commissioned by Worcestershire County Council (WCC) and Redditch Borough Council (RBC) to undertake a highway impact and accessibility assessment of a number of proposed residential and employment sites throughout Redditch Borough.
- 1.2 This work has been undertaken to assess two distinct areas; firstly to assess the highway impact of future developments on the Redditch highway network, highlighting those junctions which are likely to require mitigation in order to accommodate the future traffic. This will ensure that the developments do not have a detrimental impact on the highway network both within the local vicinity of the site/s, and throughout the town and its strategic junctions.
- 1.3 Secondly, this work will build on previous accessibility studies, assessing the sites against existing sustainability criteria, to understand how they interact with sustainable transport modes. Following these assessments, an accessibility Public Transport/Walk/Cycle 'strategy' matrix will be produced, highlighting an approach to raising accessibility standards for each potential individual development site and the town as a whole.
- 1.4 It should be noted that the above assessments have been undertaken at a strategic level, and whilst those junctions requiring mitigation will be outlined and a strategy put forward for each site, further work would will be required as part of any planning application to detail the extent and detail of any improvements.
- 1.5 The report details the methodology and analysis for these assessments, which have been completed on an individual and cumulative development basis. The work will highlight the necessary highway impacts and sustainability measures necessary to ensure all developments accord with relevant standards and local sustainability guidance, and do not have a detrimental impact on the highway network both within the local vicinity of the site/s, and throughout the town and its strategic junctions.
- 1.6 It is envisaged that this work will provide part of an evidence base to inform the Local Development Framework and in particular the Core Strategy Development Plan Document, highlighting those junctions likely to require future assessment and possible mitigation, as well as accessibility measures necessary to bring forward sustainable development throughout Redditch, proposing a high level mitigation strategy to ensure no detrimental impact is seen on the town's highway network.

- 1.7 The Redditch Development Model (RDM) is one of a series of Models developed by Halcrow Group Ltd for Worcestershire County Council, which look at a number of towns within Worcestershire. These Models have been produced to assist Worcestershire County Council in assessing the traffic impact and mitigation process resulting from proposed future Residential and Employment development sites throughout a number of Worcestershire towns.
- 1.8 The RDM shows the uplift in total traffic flow through a number of key road links and junctions within Redditch, as a result of new vehicle trips generated by proposed development sites. Through the analysis of these results, recommendations can then be provided as to which junctions require further, junction specific assessments using appropriate junction modelling software. A number of development sites have been incorporated into the RDM. Each will be modelled first on an individual basis, then collaboratively to understand their combined impact on junctions throughout Redditch.
- 1.9 The accessibility assessment firstly summarises the accessibility findings from the 2010 allocation study that assessed each site against each other (benchmarking) to assess quality of access to destinations of education, employment, health and retail (for residential sites) and levels of attraction (in terms of weighted opportunity of working aged people) for employment sites. The work then continues to analyse the network connectivity (bus, cycle and walk) between the development sites and the existing built up area. To conclude, a summary matrix has been produced that includes a high level accessibility strategy for improvement.
- 1.10 This Report continues by detailing the background to the study, before continuing by describing the sites to be considered as part of this assessment, in relation to development type, size and location. As this work is largely split into two areas; Highway Impact and Accessibility, the report is then splits into two distinct parts, firstly providing the methodology, assessment and results of the highway Impact assessment, and continuing by discussing the accessibility work methodology and findings. The report then brings together the two areas by providing a summary and recommendations.

## 2. Background

2.1 Halcrow were previously commissioned by Worcestershire County Council to develop a spreadsheet based traffic impact assessment tool for Redditch.

2.2 It has subsequently been requested by WCC and RBC that this spreadsheet model (also known as RDM – Redditch Development model) be used to assess the development implications of each of the above sites, assessing the highway impact of each site and those junctions likely to require improvements / mitigation in order to adequately deal with traffic from the development, subsequently proposing a high level mitigation strategy for each site. It is also requested that the RDM be used to assess the cumulative impact of all sites, to show those strategic junctions that will likely require mitigation due to the cumulative impact of traffic from a number of sites.

2.3 As part of this work it has also be requested that each site be assessed in relation to accessibility. Detailing the current accessibility parameters for each site, in relation to the existing town, and proposing (on a strategic level) the likely interventions required to ensure each site meets appropriate accessibility criteria necessary to ensure a sustainable development.

2.4 The purposes of this study are to:

- Show that the future development proposals for all sites can be brought forward without having a detrimental impact on the town and its surrounding highway network;
- Set out what each site needs to deliver in order to mitigate traffic impact (highlighting those junctions which require further assessment), reduce congestion and ensure adequate accessibility to/from the site by all modes;
- Highlight any strategic highway junctions that are likely to require improvements in order to bring forward all proposed sites within the town; and
- Produce a high level strategy in relation to traffic impact and accessibility, defining a clear approach for each development site and the town as a whole.

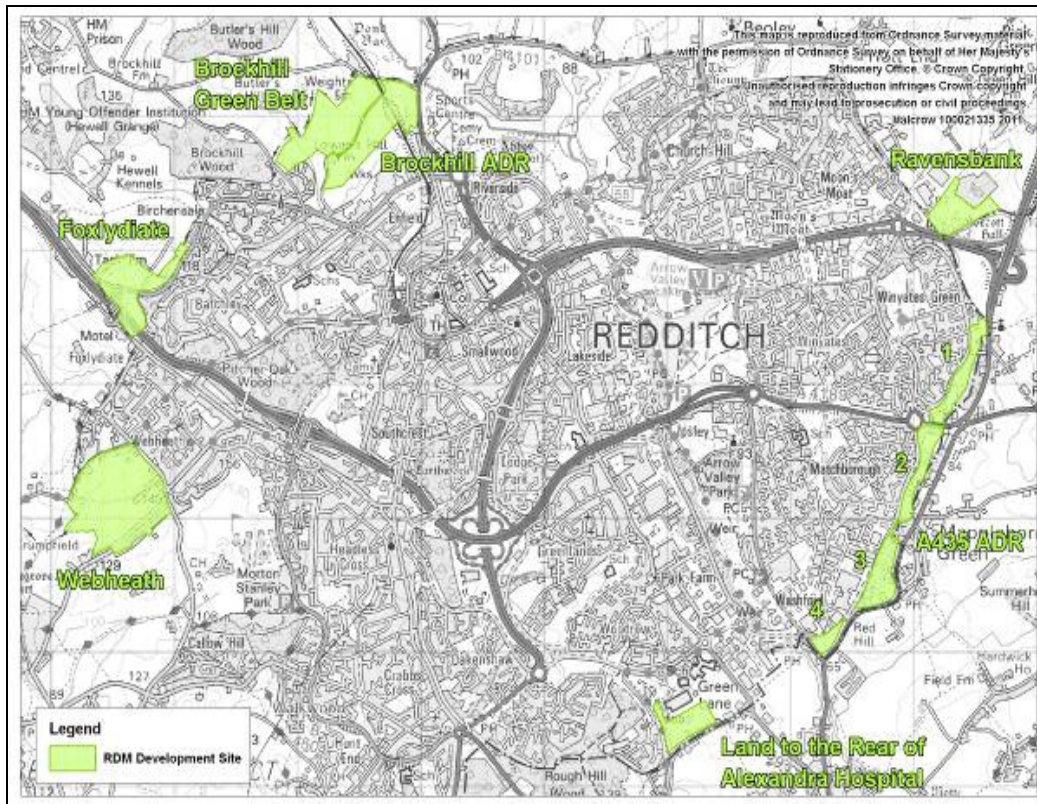
2.5 The developments presented in Table 2.1 below have been assessed as part of this work and are considered to constitute the major growth within Redditch to 2026, with Figure 2.1 overleaf showing their location in relation to the town.

**Table 2.1: Development Site Details**

Name	Size (dwellings/ha)	Type
Webheath ADR	600 dwellings	Residential
Foxlydiate Green Belt	150 dwellings	Residential
	2.5 ha	Employment
Brockhill Green Belt	400 dwellings	Residential
Brockhill ADR	425 dwellings	Residential
	5.3 ha	Employment
A435 ADR	(1) 175 dwellings	Residential
	(2) 175 dwellings	
	(3) 2 ha	Employment
	(4) 2 ha	
Land to the rear of the Alexandra Hospital	145 dwellings	Residential
	0.5 ha	Employment
Ravensbank ADR	10.3 ha	Employment

(ADR refers to an Area of Development Restraint – an area of land that has been allocated as being suitable for future growth)

**Table 2.2: Development Site Locations**





### **3. Highway Impact - The Redditch Development Model (RDM)**

- 3.1 The RDM has been developed to assess the impacts of specific development sites throughout Redditch, assessing the highway impact of each site and highlighting those junctions likely to require improvement or mitigation measures in order to maintain the junction's operation and performance. This work will also be used to inform the Local Development Framework and in particular the Core Strategy Development Plan Document in order to form part of the evidence base to demonstrate whether the sites are deliverable. The RDM utilises a variety of data sources to realistically assign new development traffic through the Redditch road network. The impact of this new development traffic is assessed through analysing the uplift in total traffic through a number of specified junctions.

#### **The RDM Development Sites**

- 3.2 The RDM contains a number of development sites (as detailed in the previous chapter). For clarity, these sites are listed below.

- Webheath – Residential;
- Foxlydiate Green Belt – Mixed Use;
- Brockhill Green Belt – Residential;
- Brockhill ADR – Mixed Use;
- A435 ADR - Residential and Employment (4 separate sites);
- Land to the rear of Alexandra Hospital – Mixed Use;
- Ravensbank ADR – Employment.

- 3.3 The RDM contains the facility for the user to 'turn on' or 'turn off' each development site individually; both in terms of the whole site and separate development types within each site. This enables the assessment of development traffic either on a site by site basis, a development type bases or collaboratively. This facility will be utilised as part of this Redditch development traffic impact assessment.

#### **The RDM Study Junctions**

- 3.4 A series of study junctions have been identified throughout the modelled network within the RDM. These junctions are those that are either likely to incur a high proportion of new development traffic or are strategically significant within the Redditch road network. Study Junctions are typically

those in close vicinity to a development site, but also include major network junctions located within and surrounding the town.

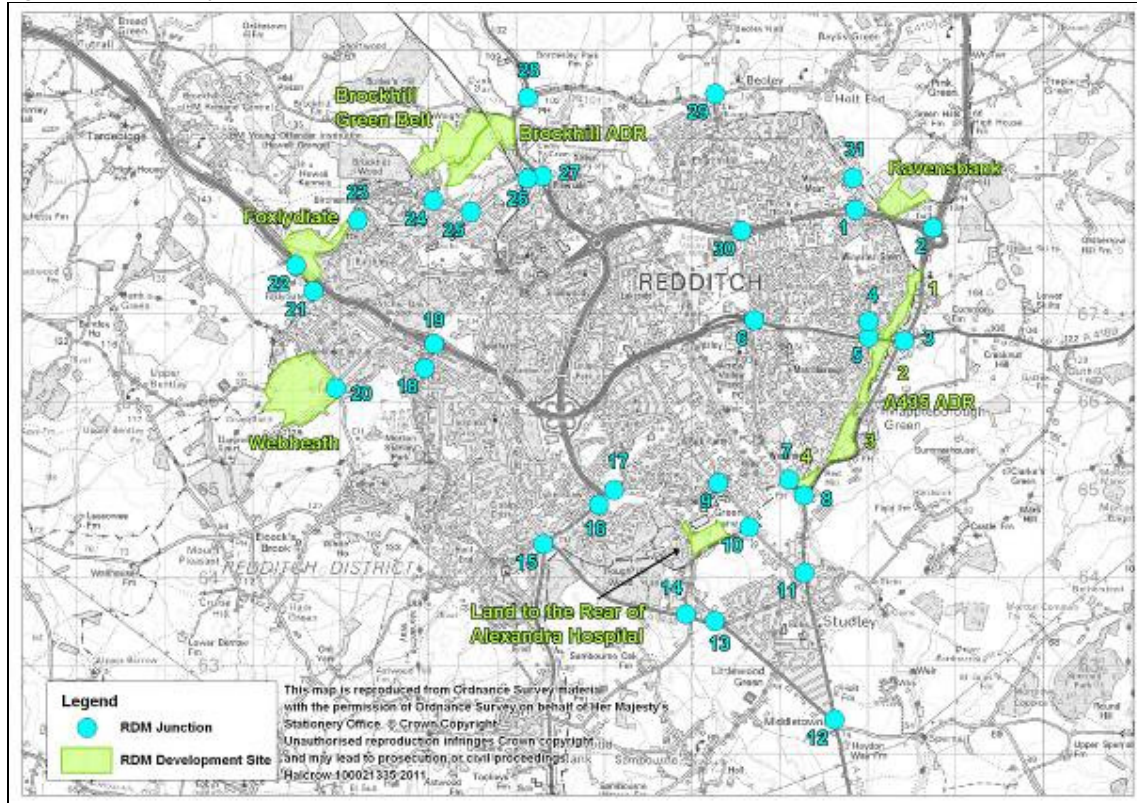
3.5

A total of 31 Study Junctions have been highlighted within the RDM (based on the location, scale of development proposed within the town and available traffic counts). These are detailed in Table 3.1 and shown within Figure 3.1 overleaf.

**Table 3.1: RDM Study Junction Details**

Junctions	Type	Arms	Arm Names
1	Roundabout	6	Ravensbank Drive/A4023/Alders Drive
2	Slip Junction	3	A4023/A435
3	Roundabout	4	A4189/A435
4	Priority	3	Alders Drive/Far Moor Lane
5	Roundabout	4	Alders Drive/A4189/Claybrook Drive
6	Roundabout	5	B4497/A4189
7	Roundabout	4	B4497/Claybrook Drive/Washford Drive
8	Priority	3	B4497/A435
9	Roundabout	4	Studley Road/Washford Drive/Woodrow Drive
10	Priority	3	Studley Road/Redditich Road/Green Lane
11	Priority	4	A435/Redditich Road/B4092
12	Priority	3	A435/A448
13	Priority	3	Station Road/A448
14	Priority	4	Green Lane/A448/B4092
15	Roundabout	5	Evesham Road/A441/A448/B4504
16	Roundabout	4	A441/Rough Hill Drive/Grangers Lane/Coldfield Drive
17	Roundabout	4	Greenlands Drive/Woodrow North/Woodrow Drive/Rough Hill Drive
18	Roundabout	4	B4504/Middle Piece Drive
19	Slip Junction	4	A448/B4504
20	Priority	4	Healthfield Road/Blackstitich Lane/Green Lane/Church Road
21	Priority	3	Birchfield Road/Foxlydiate Lane
22	Slip Junction	6	B4096/B4184/A448/Birchfield Road
23	Roundabout	4	B4184/Lily Green Lane/Parklands Close
24	Roundabout	4	Brockhill Lane/B4184/Salters Lane
25	Roundabout	3	B4184/Hewell Road
26	Signalised	4	B4184/Birmingham Road
27	Roundabout	5	A441/Bordesley Lane/Middlehouse Lane
28	Priority	3	A441/B4101
29	Priority	4	Icknield Street/B4101/B4497
30	Slip Junction	7	A4023/B4497/Moons Moat Drive
31	Roundabout	4	Ravensbank Drive/Lovage Road/Madeley Road

Figure 3.1: RDM Study Junctions



## The RDM Methodology

- 3.6 Independently sourced Traffic Count and Turning Data for the Study Junctions has been used, to create a 'Base' level of traffic representing existing traffic flows and turning movements. Where turning count data has not been made available link flow counts have been used, which has subsequently been assigned to junction turning movements through the use of 2001 Census Journey to Work data for the Redditch area. Where required, TEMPRO growth factors have been applied so that the base traffic flow through all RDM Study Junctions is representative of traffic levels in 2010.
- 3.7 The distribution and assignment of new development trips through the RDM network has been determined by referring to 2001 Census Journey to Work (JtW) data for the Redditch area. This provided the likely distribution and assignment of new residential or employment trips by understanding the predominant existing residential and employment origins and destinations throughout Redditch.
- 3.8 The new development traffic has subsequently been assigned to the Redditch road network with the resulting traffic flows and turning movements at each RDM Study Junction recorded. By comparing the total traffic flow with the new development trips assigned to the RDM against the base traffic flow, the uplift in traffic as a result of the development traffic can be assessed.

3.9 Two time periods are assessed, the AM Peak (08:00-09:00) and the PM Peak (017:00-18:00).

3.10 The purpose of the RDM is to assess the impact of new development traffic at the study junctions, subsequently advising which junctions should be subject to further assessment using appropriate specialised junction modelling software such as ARCADY, PICADY or LINSIG. It is important to note that the RDM is for indicative purposes only, with the process considered to be an efficient and accurate 'filtering' process that highlights which study junctions should be subject to further and more detailed investigations.

3.11 Further information in regards to the methodology and application of the RDM is available within the Redditch Tool Methodology and Analysis Note attached at Appendix A.

The junctions set out within the RDM are considered to be the primary junctions in relation to each site, and will likely have the highest impact from any future development. A number of junctions within the model have also been included due to their strategic importance for the town; providing primary links to/from the town centre or providing strategic links to the surrounding national highway network. It is not possible to assess every junction within close proximity of a site; this will come at the next stage of the assessment and will be assessed on a site by site basis. However, it is considered that any further junctions are not likely to be effected to any great extent, as long as the current site access proposals and development quantum remains consistent with those set out within this report.

### **Development Trip Rates**

3.12 A series of trip rates have been applied to all RDM development sites through the interrogation of the TRICS database Version 2010(b) v6.6.2. The methodology employed is considered robust and the resulting trip rates have been approved by Worcestershire County Council for use in the RDM.

3.13 While the TRICS database provides trip rates for a number of different modes, as the RDM is designed to model the vehicular impact on the Redditch network, only the vehicle trip rates are relevant to this study.

### **Development Trips**

3.14 The number of new vehicle trips is calculated by multiplying the vehicle trip rates by the relevant development content for each development site. While this method remains true for residential development trips, employment development trips have been factored to represent the number of trips based on the actual development content extent (Gross Floor Area, GFA), rather than the total land taken for the development. By examining 'land take' and

actual GFA for employment development sites featured within the TRICS database, the derived factor was determined to be 0.5339 (further justification for this figure is detailed in the Redditch Tool Methodology and Analysis Note attached at Appendix A).

- 3.15 Taking into account the above, the new vehicular development trips for each RDM development site have been calculated; the results of which are displayed in Table 3.2 below.

**Table 3.2: New RDM Development Vehicle Trips**

Development Site		Time Period	Residential		Employment	
			Arrivals	Departures	Arrivals	Departures
Webheath		AM	83	169		
		PM	172	99		
Foxlydiate Green Belt		AM	21	42	115	15
		PM	43	25	14	98
Brockhill Green Belt		AM	56	112		
		PM	114	66		
Brockhill ADR		AM	59	119	243	32
		PM	122	70	31	207
A435 ADR	Sites 1 and 3	AM	24	49	92	12
		PM	50	29	12	78
	Sites 2 and 4	AM	24	49	92	12
		PM	50	29	12	78
Land to the rear of Alexandra Hospital		AM	20	41	23	3
		PM	41	24	3	20
Ravensbank ADR		AM			472	62
		PM			60	402

- 3.16 Halcrow considers the methodology to be robust given that no internalisation of trips (due to mixed land uses) or modal shift reductions (due to increased public transport provision / walking and cycling improvements) have been applied to the trip rates.

- 3.17 As this report is concerned with the development's impact on the local highway network, only the vehicle trips are to be modelled. Therefore, the vehicle trips stated within Table 3.2 above have been applied to the RDM representing the number of new vehicle trips to be generated as a result of each RDM development site.

## **4. Application of the RDM**

- 4.1 As outlined in the preceding chapters, the RDM is to be used to assess the traffic impact resulting from a number of development sites within Redditch. Each site is to be assessed first individually, then collaboratively. This will therefore show the traffic impact arising from each individual site and that site's 'contribution' to the overall uplift in traffic observed when all development sites are activated within the RDM. It maybe that a single site will have only minimal impact on a junction, but the cumulative impact of a number of sites may cause capacity issues at the junction, while it may also be the case that the traffic impact at a particular junction may be solely due to one particular development site.
- 4.2 For each assessment, all junctions incurring an uplift of over 5% in at least one of the modelled time periods will be presented and discussed. It is considered that uplifts of more than 10% are likely to have a significant and detrimental impact on junction performance and operation. Subsequently, to understand the impact of development trips on these junctions, the junction turning movements will be examined and discussed in more detail.
- 4.3 Following completion of the above work a strategy will be proposed to show the necessary junctions requiring further detailing modelling (i.e utilising LINSIG, ARCADY, PICADY), in order to bring forward each site. It will also provide a list of junctions likely to require mitigation due to the cumulative impact of all developments throughout the town. This information can be used to formulate the strategic highway impact strategy for the town as well as providing a clear indication to officers and if necessary third parties of the scale of highway improvements necessary to accommodate the future development.
- 4.4 It should be noted that this work will highlight the junctions requiring improvements, as well as the arms of the junctions having the greatest impact from development traffic. However, it will not detail the exact mitigation required, as this will require further detailed junction specific modelling through relevant modelling packages. Moreover, the study aims to show a high level assessment of junctions requiring mitigation, and proposing a strategy built upon this. The next stage of the work would be to assess the highlighted junctions in more detail, using appropriate junction modelling software (i.e. LINSIG, Arcady and Picady modelling) to show if any suitable mitigation schemes are required at specific junctions. This work can be undertaken on a site by site basis, and requested as compulsory for any subsequent planning application, or the work can be undertaken by WCC /

Halcrow to provide a series of mitigation proposals for junction improvements based on the impact of a single site or multiple sites.

## 5. Highway Impact - Individual Sites Assessment

- 5.1 This chapter presents the modelled traffic impact of each RDM development site on an individual basis.
- 5.2 All percentage uplift figures featured within this report have been colour coded using the following scheme:
- 0 to 5% uplift – no colour;
  - 5 to 10% uplift – Yellow;
  - 10 to 50% uplift – Orange;
  - Over 50% uplift – Red.
- 5.3 For each development site, an initial table has been presented, detailing the existing and new development trips through a number of specified junctions. The list of junctions within this table include all those modelled to incur an uplift in total traffic of at least 5% in the AM or PM Peak. Other junctions may also be included in this table whose inclusion will support the subsequent analysis.
- 5.4 Following this analysis, if deemed appropriate and necessary, those junctions modelled to likely be most affected by the new development trips have been assessed on an individual basis with the turning counts extracted from the RDM and presented and analysed.
- 5.5 It should be noted that Junctions 2, 19, 22 and 30 are grade separated junctions (GSJs). Therefore, it is possible that some development trips will pass straight through on the mainline carriageway and have no impact on the operation and performance of the junction itself. Therefore, it is important to disregard these development trips from the junction impact assessment. Appropriate table notation is provided where relevant.
- 5.6 Where appropriate, development site accesses have been considered on the most sensible and likely option, as for a number of cases a confirmed access strategy has not been finalised.
- 5.7 In order to reduce the volume of text and table size within this report, all junctions have been referred to by number from this point. It is therefore advised that Table 3.1 is referenced when reading the remainder of the report.

### Webheath; 600 Dwellings

- 5.8 The Webheath development is an entirely residential development located to the west of Redditch; with access proposed via Hill Top off Church Road.



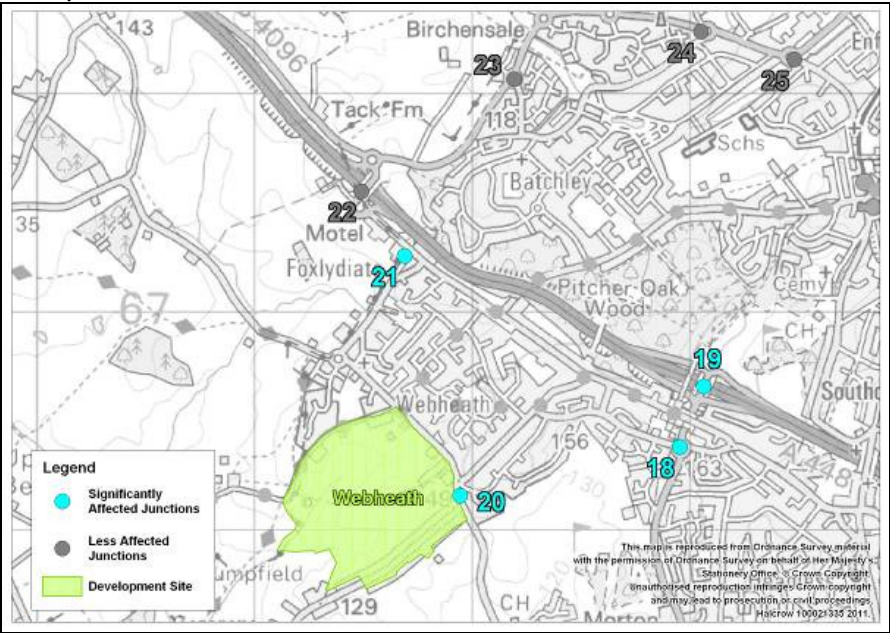
5.9 Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the Webheath development are shown in Table 5.1 and Figure 5.1.

Table 5.1: RDM Junction Impact resulting from the Webheath Development Site

Junctions	Existing Traffic		Webheath Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
18	3033	1884	195	202	6.41%	10.71%
19	2996* (9442)	1869* (5979)	192* (192)	199* (199)	6.41%	10.65%
20	133	74	480	505	360.08%	683.29%
22	2774* (8774)	1779* (5583)	34* (34)	36* (36)	1.23%	2.02%
21	709	407	34	36	4.81%	8.82%

\*Grade separated junction - bracketed figures represent all junction traffic (including through traffic on the mainline carriageway)

Figure 5.1: Location of RDM Junctions featured within Table 5.1 in regards to the Webheath Development



5.10 Based on the above model run results, it can be concluded that:

5.11 **Junction 20**

- High number of new development trips;
- Significant uplift in total traffic.

These uplifts are expected as Junction 20 provides direct access to/from the development, therefore all Webheath development traffic will pass through Junction 20.

The percentage uplift is accentuated due to the comparatively low level of exiting traffic through the junction, although it is still considered that the development traffic will have an impact on the operation and performance of the junction.

5.12

#### **Junctions 18 and 19**

- Significant uplift in total traffic;
- Uplift of over 10% in the PM Peak attributable to comparatively low level of existing traffic.

Observations can be attributed to non-development trip-ends within Redditch Town Centre or east Redditch as Junctions 18 and 19 form part of the most direct route between the development and these areas.

The development trip numbers indicate that the vast majority of development trips observed at Junction 18 also pass through Junction 19 as part of their journey.

5.13

#### **Junction 21 and 22**

- Junction 21 uplift of over 10% in the PM Peak attributable to comparatively low level of existing traffic.
- Substantially higher number of existing trips at Junction 22 prevents the uplift in total traffic from being considered significant.

Given the position of the Webheath development in relation to **Junctions 21 and 22**, it can be assumed that all development trips passing through Junction 21 also pass through Junction 22; forming trip-ends in north west Redditch or locations to the west of Redditch.

5.14

As significant uplifts in total traffic are observed through **Junctions 18, 19 and 20** as a result of the Webheath development in at least one of the modelled time periods, each junction will be assessed and analysed in more detail. This will be done by extracting and presenting the modelled turning counts through each junction. A significant uplift is also seen through **Junction 21**, however it is considered that this junction has adequately been discussed in the previous paragraph (5.10) and therefore no further assessment is required.

5.15

### Webheath Development Trips through Junction 18

The existing traffic and Webheath development traffic flows through Junction 18 by arm and turning movement are displayed in Table 5.2 below.

**Table 5.2: Study Junction 18 Webheath Traffic Uplift by Turning Movement**

Junction 18 Windmill Drive Roundabout		Existing Traffic		Webheath Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
B4504 North	Left	337	423	0	0	0.00%	0.00%
	Straight	327	729	0	0	0.00%	0.00%
	Right	55	145	61	124	110.98%	85.41%
Middle Piece Drive East	Left	2	6	0	0	0.00%	0.00%
	Straight	1	1	0	0	0.00%	0.00%
	Right	687	245	0	0	0.00%	0.00%
B4504 South	Left	1	1	1	2	82.44%	164.80%
	Straight	1109	239	0	0	0.00%	0.00%
	Right	1	1	0	0	0.00%	0.00%
Middle Piece Drive West	Left	482	88	131	75	27.14%	86.14%
	Straight	6	1	0	0	0.00%	0.00%
	Right	25	4	2	1	7.07%	23.52%

5.16

Based on the above table it can be concluded that:

- All development trips pass to/from Middle Piece Drive East as this arm provides the most direct route to/from the Webheath development.
- The vast majority of development trips pass between the B4504 North and Middle Piece Drive West. This turning movement incurs a significant uplift in total traffic within the AM and PM Peaks as a result of trip-ends accessed via Junction 19.
- Significant uplift in total traffic for turning movements between Middle Piece Drive West and the B4505 South. However, this percentage uplift is due to very low existing traffic flow.

5.17

### Webheath Development Trips through Junction 19

The existing traffic and Webheath development traffic flow through Junction 19 by arm and turning movement is displayed in Table 5.3 below.

**Table 5.3: Study Junction 19 Webheath Traffic Uplift by Turning Movement**

Junction 19 A448/B4505		Existing Traffic		Webheath Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
A448 West	A448 East	4197	1512	0	0	0.00%	0.00%
	B4504	539	872	0	0	0.00%	0.00%
A448 East	B4504	180	426	61	124	34.00%	29.03%
	A448 West	2249	2598	0	0	0.00%	0.00%
B4504	A448 West	873	309	0	0	0.00%	0.00%
	A448 East	1404	262	131	75	9.31%	28.83%

5.18

Based on the above table it can be concluded that:

- All development trips pass between the B4505 and the A448 East arms due to trip-ends within Redditch town centre or east Redditch.
- No Webheath development trips travel to/from the A448 East. Therefore, trip-ends located in the west of Redditch travel via a different route, most likely to be via Junctions 21 and 22.

Junction 18 is located to the south of Junction 19 via the B4504. By comparing the Webheath development traffic turning movements through Junction 18 (Table 5.2) it is clear that all Webheath development trips passing through Junction 19 also pass through Junction 18.

### Webheath Development Trips through Junction 20

5.19

The existing traffic and Webheath development traffic flow through Junction 20 by arm and turning movement are displayed in Table 5.4 below.

Table 5.4: Study Junction 20 Webheath Traffic Uplift by Turning Movement

Junction 20 Webheath Access			Existing Traffic		Webheath Traffic		Uplift	
			AM	PM	AM	PM	AM	PM
A	Church Road North	Straight	9	2	0	0	0.00%	0.00%
		Right	10	12	13	26	128.51%	221.36%
	Church Road South	Left	2	6	70	142	3004.14%	2189.40%
		Straight	6	1	0	0	0.00%	0.00%
	Webheath Developmen t	Left	12	2	27	15	213.09%	709.10%
		Right	27	5	145	84	535.72%	1782.73%
B	Church Road	Left	36	6	137	79	376.90%	1254.22%
		Straight	1	1	1	1	121.46%	69.29%
		Right	1	1	6	4	615.70%	351.24%
	Heathfield Road	Left	1	1	0	0	0.00%	0.00%
		Straight	3	9	0	0	0.00%	0.00%
		Right	9	8	66	133	766.26%	1755.12%
	Blackstitich Lane	Left	1	1	0	0	0.00%	0.00%
		Straight	1	1	1	1	59.03%	118.01%
		Right	1	1	0	0	0.00%	0.00%
	Green Lane	Left	1	1	4	8	378.63%	756.87%
		Straight	1	1	0	0	0.00%	0.00%
		Right	1	1	0	0	0.00%	0.00%
C	Green Lane North	Straight	3	9	6	4	205.23%	42.69%
		Right	1	1	0	0	0.00%	0.00%
	Green Lane South	Left	1	1	0	0	0.00%	0.00%
		Straight	1	1	3	6	299.24%	598.17%
	Crumpfilds Lane	Left	1	1	1	2	79.39%	158.70%
		Right	1	1	0	0	0.00%	0.00%

5.20

**Junction 20 (Webheath Access)** consists of three small junctions in close vicinity of one another; **Junction 20A, 20B and 20C**. Based on the above table the following operational conclusions have been drawn:

- It has been assumed within the RDM that Junction 20A will provide access to the Webheath development, therefore this junction will incur all new Webheath development trips.
- The majority of Webheath development trips pass between the Webheath Development and Church Road South arms of Junction 20A. All Webheath development trips to/from Church Road South will also pass through Junction 20B.
- Significant uplift in total traffic between the Church Road and Healthfield Road arms of Junction 20B
- Although significant uplifts in total traffic through Junction 20C, both the existing number of trips and new development trips are low enough for it to be considered that the Webheath development will have a negligible impact on the performance and operation of Junction 20C.

While the percentage uplifts for Junction 20A turning movements are accentuated due to the proportionately low existing base traffic flow, a clear difference in the number of new arrivals and departures between the AM and PM Peak is observed. This is a result of the exclusively residential content of the Webheath development, which generates a greater proportion of departures than arrivals in the AM Peak, with the opposite being true in the PM Peak.

A significant uplift in total traffic is observed between the Church Road and Healthfield Road arms of Junction 20B. While the percentage uplifts are accentuated due to the comparatively low level of existing traffic, the actual number of new development trips between is high enough for them to have a detrimental impact on the junction's performance and operation.

### **Conclusion**

- 5.21 Following review of the Webheath development through the RDM it is considered that **Junctions 18, 19, 20 and 21** are most likely to be affected by the development, and would therefore require further assessment and detailed modelling to assess the impact, and possible mitigation.

### **Foxlydiat Green Belt; 150 Dwellings and 2.5 Hectares Employment Land**

- 5.22 The Foxlydiat Green Belt development is a mixed residential and employment development located in the west of Redditch; accessed via the A4184 Brockhill Drive.
- 5.23 Although it is possible to model the residential and employment content of the Foxlydiat development separately within the RDM, it is anticipated that

both elements will be included within any forthcoming planning application, and have therefore been modelled together.

5.24

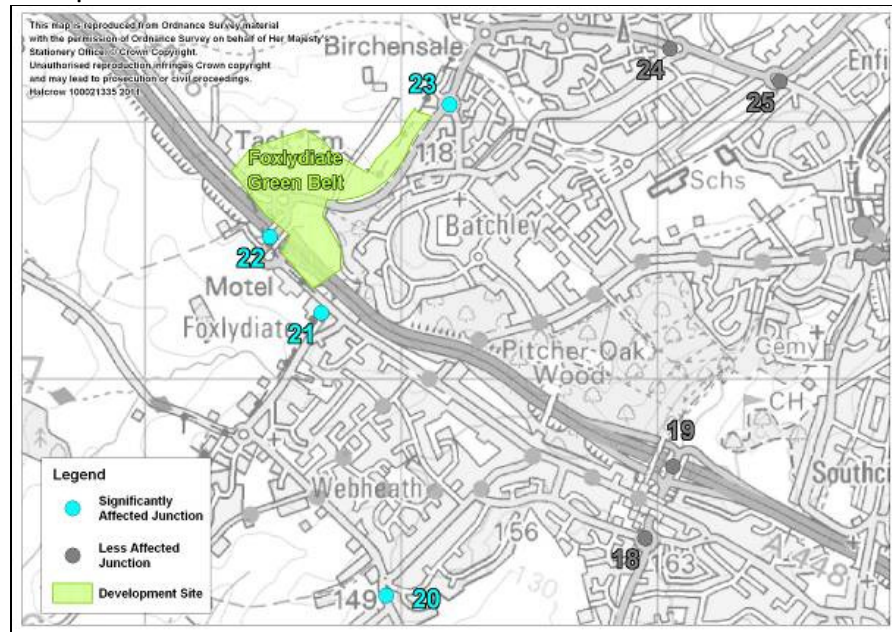
Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the combined Foxlydiat Green Belt residential and employment development are shown in Table 5.5 and Figure 5.2 below.

**Table 5.5: RDM Junction Impact resulting from the Foxlydiat Development Site**

Junctions	Existing Traffic		Foxlydiat Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
20	133	74	9	8	6.99%	11.50%
21	709	407	25	22	3.56%	5.51%
22	2774* (8774)	1779* (5583)	137* (137)	127* (127)	4.94%	7.13%
23	798	444	54	44	6.76%	9.86%

\*Grade separated junction - bracketed figures represent all junction traffic (including through traffic on the mainline carriageway)

**Figure 5.2: Location of RDM Junctions featured within Table 5.5 in regards to the Foxlydiat Development**



5.25

Based on the above model run results, it can be concluded that:

5.26

#### **Junctions 21, 22 and 23**

- Uplifts in total traffic of between 5 and 10%;
- Uplift considered significant through Junctions 21 and 22 in PM Peak only;
- Uplift through Junction 22 despite high level of existing traffic.

Despite marginally lower development trips in the PM Peak than the AM Peak the percentage uplift is higher due to a substantially lower amount of existing traffic in the PM Peak than the AM Peak.

Given that Junctions 22 and 23 are located in the immediate vicinity of the Foxlydiat development, it is considered that the Foxlydiat development will have an impact on these junctions' performance and operation. This is particularly important in regards to Junction 22 given that it forms part of the Redditch SRN and already accommodates a relatively high level of traffic.

5.27

#### Junction 20

- Uplifts in total traffic of over 10% in PM Peak;
- Percentage uplift accentuated due to the relatively low level of existing traffic;
- Impact largely due to the pull of traffic to the employment element of the development from the surrounding residential areas.

Given the low number of Foxlydiat development trips to be assigned through Junction 20 it can be considered that Foxlydiat development trips will have a negligible impact on the junction's performance and operation.

5.28

Due to the number of development trips and their proximity to the site, **Junctions 22 and 23** will be assessed and analysed in more detail. This will be done by extracting and presenting the modelled turning counts through each junction.

#### Foxlydiat Development Trips through Junction 22

5.29

The existing traffic and Foxlydiat development traffic flows through Junction 22 by arm and turning movement are displayed in Table 5.6 below.

**Table 5.6: Study Junction 22 Foxlydiat Traffic Uplift by Turning Movement**

Junction 22		Existing Traffic		Foxlydiat Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
B4096	B4184	51	62	1	1	1.58%	0.81%
	A448 South	1074	861	0	0	0.00%	0.00%
	Birchfield Road	30	82	0	0	0.00%	0.00%
	A448 North	1	1	0	0	0.00%	0.00%
B4184	A448 South	45	8	30	60	67.42%	772.80%
	Birchfield Road	1	1	4	18	393.10%	1736.68%
	A448 North	171	180	7	8	4.23%	4.35%
	B4096	83	24	1	1	0.61%	3.16%
A448 South	Birchfield Road	61	96	0	0	0.00%	0.00%
	A448 North	2620	2273	0	0	0.00%	0.00%
	B4096	178	69	0	0	0.00%	0.00%
	B4184	1	1	65	28	6256.27%	2681.91%
Birchfield Road	A448 North	243	111	0	0	0.00%	0.00%
	B4096	1	1	0	0	0.00%	0.00%
	B4184	1	1	21	4	2036.30%	395.26%
	A448 South	323	58	0	0	0.00%	0.00%
A448	B4096	1	1	0	0	0.00%	0.00%

North	B4184	461	164	8	7	1.73%	4.40%
	A448 South	3380	1530	0	0	0.00%	0.00%
	Birchfield Road	50	57	0	0	0.00%	0.00%

5.30

Based on the above table it can be concluded that:

- All development trips pass to/from the B4184 arm as the access to the Foxlydiate development site has been modelled to be located on this arm;
- The majority of development trips pass between the B4184 and A448 South arms due to trip-ends located in Redditch Town Centre or east Redditch.
- High percentage uplift in total traffic turning movements between the B4184 and Birchfield Road is due to a very low level of existing traffic.

Even though the number of new development trips through Junction 22 is relatively low compared to existing traffic flows through the whole junction, the strategic importance of the junction for journeys in the west of Redditch means that it is important to carefully consider the impact of new development trips.

Given the turning movements and subsequent uplifts in total traffic presented above it is considered that the Foxlydiate development will have an impact on the performance and operation of Junction 22. Further, as Junction 22 forms part of the Redditch SRN, the Highways Agency will be particularly concerned over the impact of new development trips.

### Foxlydiate Development Trips through Junction 23

5.31

The existing traffic and Foxlydiate development traffic flows through Junction 23 by arm and turning movement are displayed in Table 5.7 below.

Table 5.7: Study Junction 23 Foxlydiate Traffic Uplift by Turning Movement

Junction 23		Existing Traffic		Foxlydiate Traffic		Uplift	
Lily Green Roundabout		AM	PM	AM	PM	AM	PM
B4184 North	Left	2	6	0	0	0.00%	0.00%
	Straight	217	198	36	16	16.75%	8.34%
	Right	1	1	0	0	0.00%	0.00%
Lily Green Lane	Left	46	8	4	1	7.83%	6.92%
	Straight	1	1	0	0	0.00%	0.00%
	Right	1	1	0	0	0.00%	0.00%
B4184 South	Left	1	1	0	0	0.00%	0.00%
	Straight	422	174	14	24	3.20%	13.63%
	Right	19	38	1	3	2.74%	8.08%
Parklands Close	Left	50	9	0	0	0.00%	0.00%
	Straight	1	1	0	0	0.00%	0.00%
	Right	36	6	0	0	0.00%	0.00%



5.32

Based on the above table it can be concluded that:

- All development trips pass to/from the B4184 South arm as the access to the Foxlydiat development site has been modelled to be located on this arm;
- The vast majority of development trips pass between the B4184 South and B4184 North arms, therefore passing straight over the junction;
- A small proportion of development trips turn into/out of Lily Green Lane due to trip-ends located in the Batchley area of Redditch.

The directional trip movements observations through Junction 23 are a result of the predominant employment content of the Foxlydiat development site, whereby the development trip rates generate a higher number of arrivals in the AM Peak and departures in the PM Peak.

Even though the development trip turning movements presented above are predominately between two opposite arms, given the size of the junction and proximity to the development site, it is considered that the Foxlydiat development trips will have an impact on the performance and operation of Junction 23.

### **Conclusion**

5.33

Following review of the Foxlydiat development through the RDM it is considered that **Junctions 21, 22 and 23** are most likely to be affected by the development, and would therefore require further assessment and detailed modelling to assess the impact, and possible mitigation.

### **Brockhill Green Belt; 400 Dwellings**

5.34

The Brockhill Green Belt development is an entirely residential development located to the north of Redditch and accessed via Brockhill Lane.

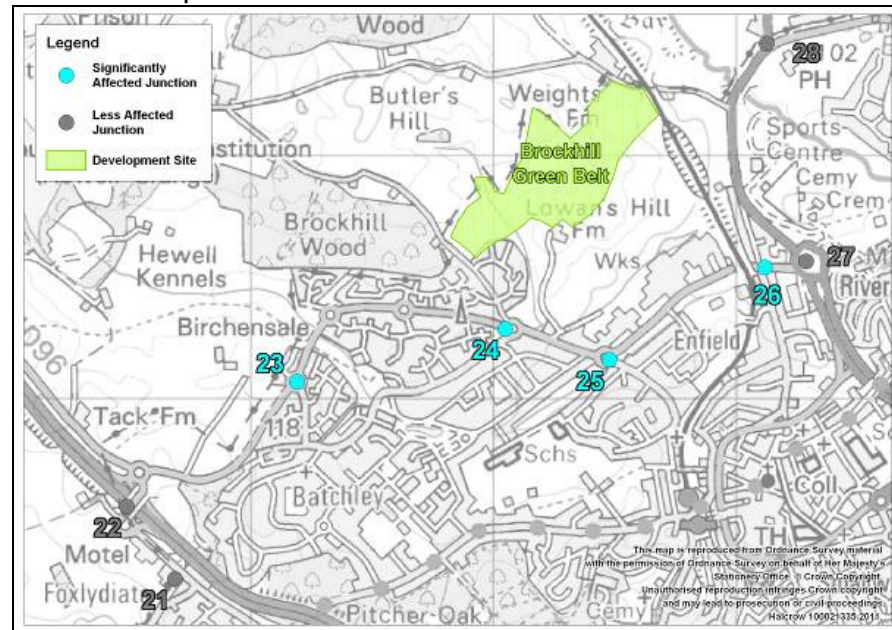
5.35

Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the Brockhill Green Belt development are shown in Table 5.8 and Figure 5.3 below.

Table 5.8: RDM Junction Impact resulting from the Brockhill Green Belt Development Site

Junctions	Existing Traffic		Brockhill Green Belt Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
23	798	444	32	34	4.07%	7.68%
24	1197	659	158	167	13.16%	25.34%
25	1598	1561	121	129	7.59%	8.27%
26	1441	1591	117	123	8.11%	7.72%

Figure 5.3: Location of RDM Junctions featured within Table 5.8 in regards to the Brockhill Green Belt Development



5.36 Based on the above model run results, it can be concluded that:

#### 5.37 Junction 24

- Incurs the highest proportion and uplift from development traffic;
- Uplift in total traffic over 10% in both time periods.

These uplifts are expected as the access to the Brockhill Green Belt development has been modelled in the RDM to be located off Brockhill Lane, which is to the immediate north of Junction 24.

#### 5.38 Junctions 25 and 26

- Uplift of between 5 and 10% in both time periods;
- The junctions form part of the most direct route between the development and the A441 Alvechurch Highway.

Due to the one-way system through Redditch Town Centre, all development trip-ends within the Town Centre will also have been assigned to the route incorporating Junctions 25 and 26.

Trip-ends located between Junctions 25 and 26 or south east of Junction 25 account for the marginally lower number of development trips passing through Junction 26 compared to Junction 25.

5.39

### Junction 23

- Uplift in total traffic of between 5 and 10% in the PM Peak;
- The junction forms part of the most direct route between the development and the A448.

Despite similar development trip numbers within the two time periods, the percentage uplift in total traffic is higher in the PM Peak due to a substantially lower level of existing traffic.

5.40

As the most significant uplifts in total traffic is observed through **Junction 24** as a result of the Brockhill Green Belt development both modelled time periods, the junction will be assessed and analysed in more detail. This will be done by extracting and presenting the modelled turning counts through each junction. It is considered that the impact of development traffic on Junctions 23, 25 and 26 have been adequately discussed in the previous paragraphs and therefore no further assessment is required as part of this report. However this does not negate the need for further junction specific modelling on these junctions as part of any planning application for the site.

### Brockhill Green Belt Development Trips through Junction 24

5.41

The existing traffic and Brockhill Green Belt development traffic flow through Junction 24 by arm and turning movement are displayed in Table 5.9 below.

**Table 5.9: Study Junction 24 Brockhill Green Belt Traffic Uplift by Turning Movement**

Junction 24 Brockhill Roundabout		Existing Traffic		Brockhill Green Belt Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Brockhill Lane	Left	154	41	81	48	52.75%	117.89%
	Straight	6	1	1	0	9.27%	30.85%
	Right	12	2	24	14	190.99%	635.55%
B4184 East	Left	1	1	0	0	0.00%	0.00%
	Straight	158	336	0	0	0.00%	0.00%
	Right	55	63	40	81	72.91%	128.51%
Salters Lane	Left	12	2	0	0	0.00%	0.00%
	Straight	1	1	0	1	27.04%	54.04%
	Right	41	7	0	0	0.00%	0.00%
B4184 West	Left	63	11	12	23	18.26%	212.92%
	Straight	652	187	0	0	0.00%	0.00%
	Right	41	7	0	0	0.00%	0.00%

5.42

Based on the above table it can be concluded that:

- All development trips pass to/from the Brockhill Lane arm as the access to the Brockhill Green Belt development site has been modelled to be located off Brockhill Lane;

- The majority of development trips pass between the Brockhill Lane and B4184 East arms due to trip-ends located in Redditch Town Centre or east Redditch.
- There is a high percentage uplift in total traffic turning movements between Brockhill Lane and the B4184 West.
- The significant uplifts for Brockhill Lane/ Salters Lane turning movements is due to very low existing traffic levels.

5.43 While the percentage uplift for movements between Brockhill Lane and the B4184 West are accentuated due to the relatively low level of existing traffic, the combined impact on the junction from all Brockhill Lane/B4184 movements is considered to have a detrimental impact on the junction's performance and operation.

#### **Conclusion**

5.44 Following review of the Brockhill Green Belt development through the RDM it is considered that **Junctions 23, 24, 25 and 26** are most likely to be affected by the development, and would therefore require further assessment and detailed modelling to assess the impact, and possible mitigation.

### **Brockhill ADR; 425 Dwellings and 5.3 Hectares Employment Land**

5.45 The Brockhill ADR development is a mixed residential and employment development located to the north of Redditch; accessed via the A4184 Hewell Road.

5.46 Although it is possible to model the residential and employment elements of the development separately within the RDM, it is anticipated that both elements will be included within any forthcoming planning application, and have therefore been modelled together.

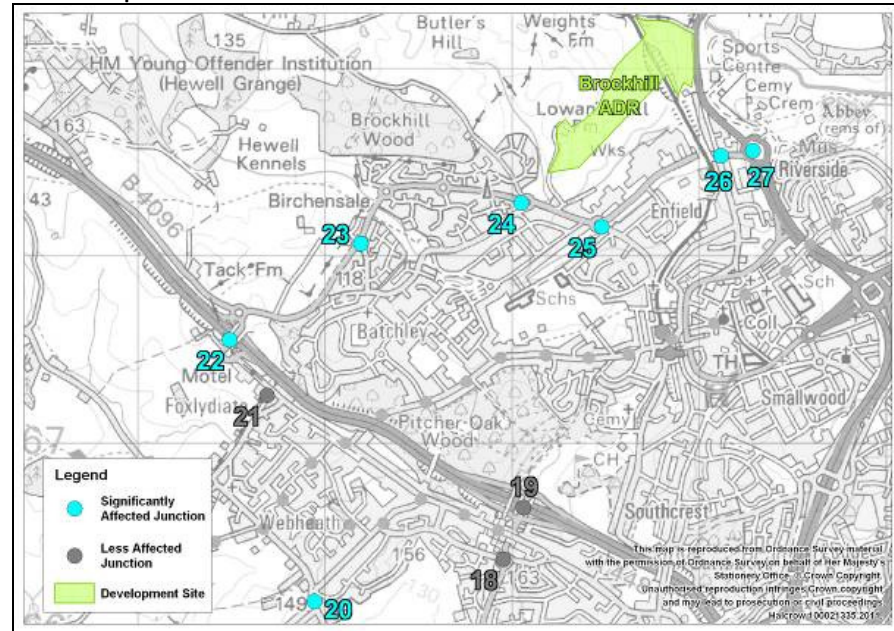
5.47 Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the mixed-use Brockhill ADR residential and employment development are shown in Table 5.10 and Figure 5.4 below.

**Table 5.10: RDM Junction Impact resulting from the Brockhill ADR Residential and Employment Development Site**

Junctions	Base Traffic		Brockhill ADR Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
20	133	74	14	12	10.32%	16.82%
21	709	407	20	18	2.79%	4.51%
22	2774* (8774)	1779* (5583)	100* (100)	91* (91)	3.62%	5.13%
23	798	444	102	93	12.77%	20.83%
24	1197	659	132	122	11.03%	18.52%
25	1598	1561	327	308	20.45%	19.74%
26	1441	1591	312	294	21.64%	18.48%
27	4221	2526	308	290	7.30%	11.49%

\*Grade separated junction - bracketed figures represent all junction traffic (including through traffic on the mainline carriageway)

**Figure 5.4: Location of RDM Junctions featured within Table 5.10 in regards to the Brockhill ADR Development**



5.48

Based on the above model run results, it can be concluded that:

5.49

#### **Junction 24 and 25**

- The Brockhill ADR development access has been considered to meet the highway network between Junctions 24 and 25, therefore having a primary impact on the two junctions;
- A higher proportion of new development trips are assigned through Junction 25 than Junction 24, due to the positioning of attractive destinations in relation to Junction 25.

5.50

#### **Junction 26 and 27**

- There are a similar number of development trips through Junction 26 and 27 as through Junction 25;
- There is a lower percentage uplift in total traffic through Junction 27 due to substantially higher existing levels of traffic.

The majority of development trips are adjudged to pass through Junction 25, 26 and 27 as these junctions form part of the most direct route between the Brockhill ADR development site and the A441 Alvechurch Highway and Redditch Town Centre.

5.51

#### **Junction 22 and 23**

- A significant uplift in total traffic is seen through Junction 23 in both time periods;
- An uplift of greater than 5% is only seen in the PM Peak through Junction 22 due to the high level of existing traffic.

The majority of development trips are adjudged to pass through both Junction 22 and 23 due to trip-ends being located in south west Redditch or west of Redditch via the A448.

5.52

#### **Junction 20**

- Impact largely due to the pull of traffic to the employment element of the development from the surrounding residential areas;
- Significant uplift in total traffic within both modelled time periods;
- Percentage uplift accentuated due to comparatively low level of existing traffic, therefore it is considered that the Brockhill ADR development will not have a detrimental impact on the performance and operation of Junction 20.

The above deduction is supported by the modelled flows through Junction 21, through which all development trips will have to pass on route to Junction 20. Junction 21 incurs a higher number of development trips than Junction 20, but the uplift in total traffic is lower due to a higher level of existing traffic.

5.53

As significant uplifts in total traffic are observed through **Junctions 23, 24, 25, 26 and 27** as a result of the Brockhill ADR development, each junction will be assessed and analysed in more detail. This will be done by extracting and presenting the modelled turning counts through each junction.

5.54

### Brockhill ADR Development Trips through Junction 23

The existing traffic and Brockhill ADR development traffic flows through Junction 23 by arm and turning movement are displayed in Table 5.11 below.

**Table 5.11: Study Junction 23 Brockhill ADR Traffic Uplift by Turning Movement**

Junction 23 Lily Green Roundabout		Existing Traffic		Brockhill ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
B4184 North	Left	2	6	0	0	10.51%	2.19%
	Straight	217	198	31	61	14.32%	30.74%
	Right	1	1	0	0	0.00%	0.00%
Lily Green Lane	Left	46	8	0	0	0.00%	0.00%
	Straight	1	1	0	0	0.00%	0.00%
	Right	1	1	0	0	11.49%	22.97%
B4184 South	Left	1	1	0	0	0.00%	0.00%
	Straight	422	174	71	31	16.69%	18.01%
	Right	19	38	0	0	0.00%	0.00%
Parklands Close	Left	50	9	0	0	0.00%	0.00%
	Straight	1	1	0	0	0.00%	0.00%
	Right	36	6	0	0	0.00%	0.00%

5.55

Based on the above table it can be concluded that:

- All development trips pass to/from the B4184 North arm as this is the most direct route between the development site and Junction 23;
- Almost all development traffic passes between the B4184 arms;
- An insignificant number of development trips pass between the Lily Green Lane or Parklands Close arms.

It is likely that the vast majority of development trips through Junction 23 will also pass through Junction 22, as this is part of their route to access trip-ends located in south west Redditch or west of Redditch via the A448.

5.56

### Brockhill ADR Development Trips through Junction 24

The existing traffic and Brockhill ADR development traffic flows through Junction 24 by arm and turning movement are displayed in Table 5.12 below.

**Table 5.12: Study Junction 24 Brockhill ADR Traffic Uplift by Turning Movement**

Junction 24 Brockhill Roundabout		Existing Traffic		Brockhill ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Brockhill Lane	Left	154	41	14	9	9.14%	22.91%
	Straight	6	1	0	0	0.00%	0.00%
	Right	12	2	0	0	0.00%	0.00%
B4184 East	Left	1	1	1	3	92.62%	256.83%
	Straight	158	336	33	63	21.18%	18.75%
	Right	55	63	8	12	14.36%	19.72%
Salters Lane	Left	12	2	0	0	0.00%	0.00%
	Straight	1	1	0	0	0.00%	0.00%
	Right	41	7	3	1	7.54%	13.73%
B4184 West	Left	63	11	0	0	0.00%	0.00%
	Straight	652	187	73	34	11.12%	18.00%
	Right	41	7	0	0	0.00%	0.00%

5.57

Based on the above table it can be concluded that:

- All development trips pass to/from the B4184 East arm as the modelled access point to the Brockhill ADR development site is located on the B4184 to the east of Junction 24;
- The majority of development traffic passes between the B4184 arms, resulting in a significant uplift in total traffic in both time periods;
- An insignificant number of development trips pass to/from the Brockhill Lane arm or the Salters Lane arm with the B4185 East.

By comparing the development trip turning movements within Table 5.11 and Table 5.12, it can be seen that the vast majority of development trips passing through the B4184 West arm of Junction 24 will also encounter Junction 23 as part of their route. This indicates that there are few non development trip-ends between Junctions 23 and 24, and these junctions form the most direct route for trip-ends located in south west Redditch or west of Redditch via the A448.

#### **Brockhill ADR Development Trips through Junction 25**

5.58

The existing traffic and Brockhill ADR development traffic flows through Junction 25 by arm and turning movement are displayed in Table 5.13<sup>1</sup> below.

**Table 5.13: Study Junction 25 Brockhill ADR Traffic Uplift by Turning Movement**

Junction 25 B4184 Hewell Road		Existing Traffic		Brockhill ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
B4184 Windsor Road	Left	104	64	0	0	0.00%	0.00%
	Right	213	520	208	106	97.74%	20.30%
Hewell Road	Straight	151	334	9	3	6.18%	0.98%
	Right	115	88	0	0	0.00%	0.00%
B4184 West	Left	660	353	106	191	16.09%	54.11%
	Straight	354	202	3	8	0.92%	4.12%

5.59

Based on the above table it can be concluded that:

- All development trips pass to/from the B4184 West arm as the modelled access point to the Brockhill ADR development site is located on the B4184 to the west of Junction 25;
- The majority of development traffic passes between the B4184 arms resulting in a significant uplift in total traffic in both time periods;
- An insignificant number of development trips are observed to pass to/from the Hewell Road arm for trip-ends located to the west of the Redditch Town Centre one-way system.

5.60

It is likely that the trip-ends for the majority of development trips passing through Junction 25 will be located within either Redditch Town Centre or destinations accessed via the A441 Alvechurch Highway. Junction 25 forms



part of the most direct route between these trip-end locations and the Brockhill ADR development site.

- 5.61 Detailed assessment of the turning movements through Junctions 26 and 27 (below) will further support this analysis.

### **Brockhill ADR Development Trips through Junction 26**

- 5.62 The existing traffic and Brockhill ADR development traffic flows through Junction 26 by arm and turning movement are displayed in Table 5.14<sup>1</sup> below.

**Table 5.14: Study Junction 26 Brockhill ADR Traffic Uplift by Turning Movement**

Junction 26 B4184 Birmingham Road		Existing Traffic		Brockhill ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Birmingham Road North	Left	20	19	0	0	0.00%	0.00%
	Straight	12	14	0	0	0.00%	0.00%
	Right	5	8	0	0	0.00%	0.00%
B4184 East	Left	288	263	0	0	0.00%	0.00%
	Straight	461	590	205	102	44.61%	17.29%
	Right	26	28	0	0	0.00%	0.00%
Birmingham Road South	Left	20	70	2	2	9.22%	2.82%
	Straight	5	16	0	0	0.00%	0.00%
	Right	116	198	0	0	0.00%	0.00%
B4184 West	Left	4	8	0	0	0.00%	0.00%
	Straight	426	318	103	188	24.12%	59.18%
	Right	59	59	2	2	3.41%	3.17%

- 5.63 Based on the above table it can be concluded that:

- The vast majority of development trips pass between the B4184 arms;
- There is a low proportion of development trips turning into/out of Birmingham Road South;
- Almost double the number of new development trips travel in the direction of the Brockhill ADR site in the AM Peak and the PM Peak, with the reverse being true for the opposite direction.
- There are no development trips entering or exiting Birmingham Road North. As this is a no through road, no trip-ends are located on this route.

The same direct B4184 turning movement trends observed through Junction 26 were also observed through Junctions 23, 24 and 25.

The directional trip movements observations through Junction 26 are a result of the predominant employment content of the Brockhill ADR development site, whereby the development trip rates generate a higher number of arrivals in the AM Peak and departures in the PM Peak.

Junction 26 is an signallised junction and the vast majority of trips pass directly between the two major arms, therefore it is considered that regardless of the

<sup>1</sup> Note that the Existing Traffic flows through Junction 26 are based on actual traffic counts rather than 2001 Census data; further information is provided within the RDM Developer Note produced in November 2010.

relatively high quantity of new development trips passing through the junction, the Brockhill ADR site will likely not have a significant impact on the performance and operation of Junction 26, although it is advised that further detailed junction specific modelling is undertaken to confirm this.

### **Brockhill ADR Development Trips through Junction 27**

5.64

The existing traffic and Brockhill ADR development traffic flows through Junction 27 by arm and turning movement are displayed in Table 5.15 below.

**Table 5.15: Study Junction 27 Brockhill ADR Traffic Uplift by Turning Movement**

Junction 27 A441 Riverside		Existing Traffic		Brockhill ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
A441 North	Left	115	109	0	0	0.00%	0.00%
	Straight	693	228	0	0	0.00%	0.00%
	Right	790	455	58	52	7.40%	11.47%
Bordesley Lane	Left	226	88	0	0	0.00%	0.00%
	Straight	19	3	14	2	72.41%	76.77%
	Right	176	67	0	0	0.00%	0.00%
A441 South	Left	688	169	133	47	19.40%	27.99%
	Straight	294	279	0	0	0.00%	0.00%
	Right	82	57	0	0	0.00%	0.00%
B4184	Left	732	616	53	58	7.22%	9.37%
	Straight	12	2	2	12	19.58%	538.94%
	Right	395	454	47	119	12.01%	26.20%

5.65

Based on the above table it can be concluded that:

- All development trips travelling through Junction 27 pass to/from the B4184 as this provides the most direct route between the junction and the Brockhill ADR development site;
- The majority of development trips pass between the B4184 and A441 South for trip-ends in Redditch Town Centre or southern and eastern areas of Redditch;
- A significant uplift is seen in relation to the turning movements between the B4184 and the A441 North in both time periods;
- The highest percentage increase in total traffic was observed for movements between the B4184 and Bordesley Lane, although these percentage figures are accentuated due to low existing traffic;
- The overall impact of development trips on Junction 27 is considered to likely have a detrimental impact on the junction's performance and operation.

The additional turning movements between the B4184 and A441 South will be a result of trip ends within Redditch Town Centre or southern and eastern areas of Redditch. Those involving the A441 North will be due to trip-ends located north of Redditch via the A441 or in the northern Church Hill area of Redditch via Dagnall End Road. The turning movements involving Bordesley

Lane are a result of trip-ends within the Riverside and Abbeydale areas of Redditch.

Given both the high number of new development trips and significant percentage uplifts observed for turning movements throughout Junction 27, it is likely that the Brockhill ADR development site will have a detrimental impact on the performance and operation of Junction 27.

### **Conclusion**

5.66 Following review of the Brockhill ADR development through the RDM it is considered that **Junctions 22, 23, 24, 25, 26 and 27** are most likely to be affected by the development, and would therefore require further assessment and detailed modelling to assess the impact, and possible mitigation.

5.67 It should be noted that junctions 22, and 27 are part of the Redditch Strategic Road Network (SRN) and therefore any potential impact will be of concern to the Highways Agency (HA). It is therefore recommended that any potential impact should be discussed with the HA, and any likely mitigation agreed.

### **A435 ADR; Two 175 Dwelling Residential (Sites 1 and 2) and Two 2 Hectare Employment Developments (Sites 3 and 4)**

5.68 The A435 ADR development is a mixed residential and employment development consisting of four individual sites, with adjacent boundaries. These four sites are located in the east of Redditch adjacent to the A435.

5.69 At present it is unclear as to whether these sites will be progressed individually or collaboratively. Therefore, each site will be applied to the RDM and the result analysed first individually, then together to represent the combined traffic impact of all four potential A435 ADR developments.

5.70 It should be noted that junctions 3, 5, 6 and 8 are part of the Redditch Strategic Road Network (SRN) and therefore any potential impact will be of concern to the Highways Agency (HA). It is therefore recommended that any potential impact should be discussed with the HA, and any likely mitigation agreed.

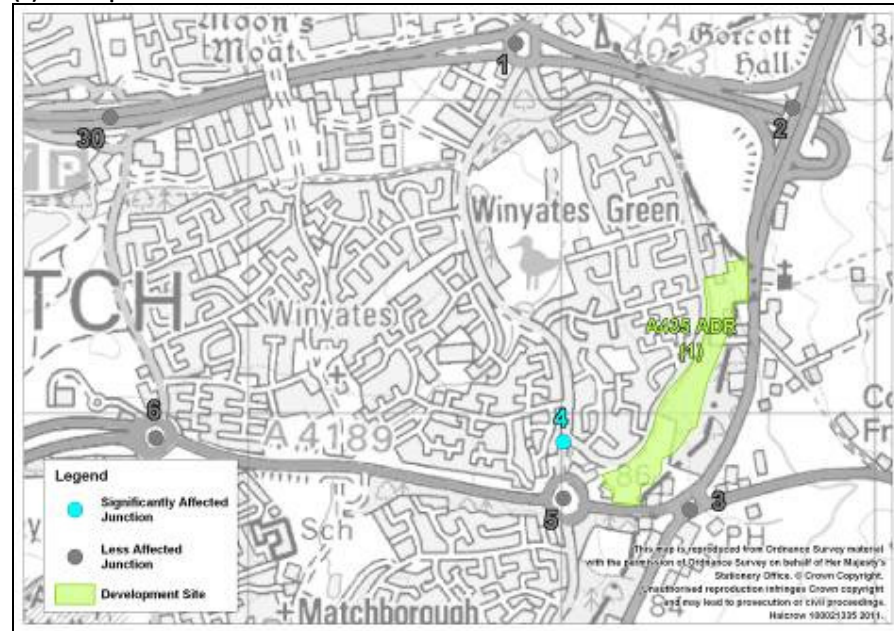
### **A435 ADR (1) – 175 Dwellings**

5.71 The A435 ADR (1) site is a 175 dwelling residential development, proposed to be accessed off Far Moor Lane. Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the A435 ADR (1) development are displayed in Table 5.16 and Figure 5.5 below.

**Table 5.16: RDM Junction Impact resulting from the A435 ADR (1) Residential Development Site**

Junctions	Base Traffic		A435 ADR (1) Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
1	9464	6020	24	23	0.26%	0.38%
3	5593	3540	26	27	0.46%	0.77%
4	583	281	57	57	9.73%	20.40%
5	3906	2134	49	51	1.25%	2.41%
6	5535	3155	17	18	0.30%	0.56%

**Figure 5.5: Location of RDM Junctions featured within Table 5.16 in regards to the A435 ADR (1) Development**



5.72

Based on the above model run results, it can be concluded that:

5.73

#### **Junction 4**

- The only RDM junction to incur a significant uplift in total traffic in both time periods as a result of A435 ADR (1) development;
- This junction is located in close vicinity to the development site.

The impact on Junction 4 is expected given that the modelling access to the development site is in close vicinity to the junction and is part of the most direct route between the development site and the A4189 Warwick Highway. It should be noted that a number of possible options exist for an access into the site; Far Moor Lane was considered as a suitable access, however should this change it is likely that the impact on junction 5 will be greater than currently observed (see below).

5.74

#### **Junction 5**

- Located in close vicinity to the development site;
- High level of existing traffic prevents a significant uplift in total traffic.

Due to the size and level of existing traffic through Junction 5, A435 ADR (1) development traffic is not considered to have a detrimental impact on the performance and operation of the junction, however with it being the first main junction that development traffic meets on exiting the development it is considered necessary for further assessment to be undertaken as part of any planning application.

5.75

#### **Junctions 1, 3 and 6**

- All these junctions are located relatively close to the development site;
- Despite incurring a number of new development trips, the high existing traffic levels result in the percentage uplift in total traffic to be insignificant in terms of its impact on the operation and performance of the three junctions

5.76

While a consistent analysis would examine the A435 ADR (1) development trip turning movements through **Junction 4** in detail, this is not necessary given the information provided in Table 5.16 and subsequent analysis detailed above. It is clear that the vast majority of new development trips passing through Junction 4 will be between the Far Moor Lane and Alders Drive South arms. The development access site is located on Far Moor Lane, while the A4189 is accessed at Junction 5 immediately to the south of Junction 4 on Alders Drive.

#### **Conclusion**

5.77

Following review of the A435 ADR(1) residential development through the RDM it is considered that along with the site access, **Junctions 3, 4, 5 and 6** are most likely to be affected by the development, and would therefore require further assessment and detailed modelling to assess the impact, and possible mitigation.

#### **A435 ADR (2) – 175 Dwellings**

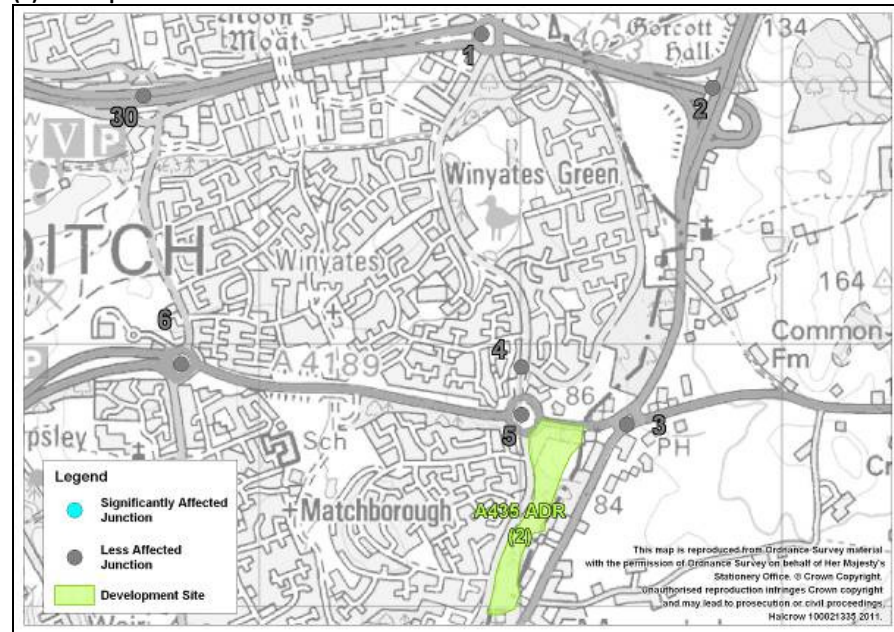
5.78

The A435 ADR (2) site is a 175 dwelling residential development, proposed to be accessed off Claybrook Drive. Following assessment within the RDM, no junctions were modelled to experience a significant uplift in traffic as a result of new A435 ADR (2) development trips. However, many junctions do incur a proportion of new development trips, but not enough to cause an uplift in total traffic of more than 5% in either modelled time period. Table 5.17 provides the modelled distribution of A435 ADR (2) development trips assigned to RDM junctions located in the vicinity of the A435 ADR (2) development as shown within Figure 5.6.

**Table 5.17: RDM Junction Impact resulting from the A435 ADR (2) Residential Development Site**

Junctions	Base Traffic		A435 ADR (2) Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
1	9464	6020	17	18	0.18%	0.30%
2	6886* (10422)	4503* (6737)	17* (35)	18* (37)	0.25%	0.39%
3	5593	3540	38	42	0.68%	1.18%
4	583	281	5	5	0.94%	1.89%
5	3906	2134	61	54	1.57%	2.51%

**Figure 5.6: Location of RDM Junctions featured within Table 5.17 in regards to the A435 ADR (2) Development**



5.79

Based on the above model run results, it can be concluded that:

- The majority of local junctions to the A435 ADR (2) development site have high existing levels of traffic;
- **Junction 5** incurs the greatest proportion of new A435 ADR (2) development traffic, which is to be expected given that the access to the new development has been modelled as being on Claybrook Drive immediately to the south of Junction 5;
- All trips passing through **Junction 1 and 2** will also pass through **Junction 3** as part of their routing;
- Development trips through Junction 4 are a result of trip-ends located in the Winyates Green area of Redditch.

No RDM junctions have been modelled as experiencing a significant uplift in total traffic is due to the majority of local junctions to the A435 ADR (2) development site having high existing traffic flows.

Junctions 1 and 2 incur exactly the same number of new A435 ADR (2) development trips. Taking into account the location of the development in relation to Junctions 1 and 2, it can be assumed that all new A435 ADR (2) development trips passing through Junction 1 will also pass through Junction 2 as part of their route. Taking this into account, it can also be assumed that these same trips will also pass through Junction 3.

### Conclusion

5.80 Following review of the A435 ADR(2) residential development through the RDM it is considered that no junctions will experience a significant uplift in traffic (greater than 5%). However, this is largely due to the existing high traffic volumes at the modelled junctions. It is therefore considered that that due to the volume of existing traffic flows and the location of the junctions that any impact, no matter how small, should be assessed and that along with the site access, **Junctions 3 and 5 and 6** require further assessment and possibly detailed modelling to assess any impact, and possible mitigation.

### A435 ADR (3) – 2ha Employment

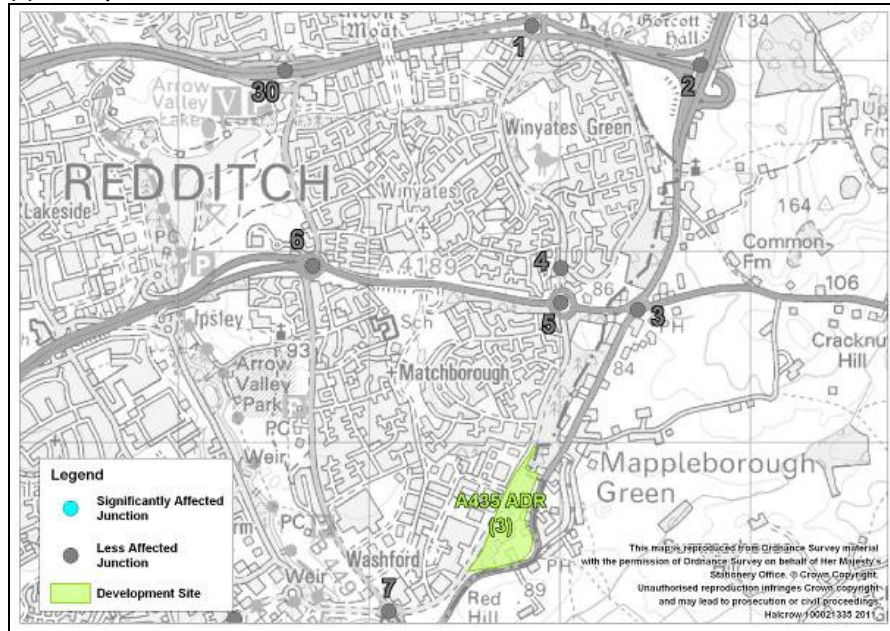
5.81 The A435 ADR (3) site is a 2 hectare employment development, proposed to be accessed off Claybrook Drive and located immediately to the south of the A435 ADR (2) development site. As with the A435 ADR (2) development site, following assessment within the RDM, no junctions were modelled to experience a significant uplift in traffic as a result of new A435 ADR (3) development trips. However, many Junctions do incur a proportion of new development trips, but not enough to cause an uplift in total traffic of more than 5% in either modelled time period. Table 5.18 provides the modelled distribution of A435 ADR (3) development trips assigned to RDM junctions located in the vicinity of the A435 ADR (3) development as shown within Figure 3.1.

**Table 5.18: RDM Junction Impact resulting from the A435 ADR (3) Employment Development Site**

Junctions	Base Traffic		A435 ADR (3) Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
<b>1</b>	9464	6020	17	15	<b>0.18%</b>	<b>0.24%</b>
<b>2</b>	6886* (10422)	4503* (6737)	17* (31)	15* (28)	<b>0.24%</b>	<b>0.33%</b>
<b>3</b>	5593	3540	33	29	<b>0.59%</b>	<b>0.82%</b>
<b>5</b>	3906	2134	81	66	<b>2.08%</b>	<b>3.09%</b>
<b>6</b>	5535	3155	44	7	<b>0.80%</b>	<b>0.21%</b>
<b>8</b>	1968	1472	19	16	<b>0.95%</b>	<b>1.11%</b>



**Figure 5.7: Location of RDM Junctions featured within Table 5.18 in regards to the A435 ADR (3) Development**



5.82

Based on the above model run results, it can be concluded that:

- Due to the nature of an employment site, junction impact can often be seen on junctions in surrounding residential areas due to the pull of trips from these areas as the site is considered an employment destination;
- A greater number of development trips are generated by the A435 ADR (3) than the A435 ADR (1) or (2) sites due to the site being proposed for employment;
- **Junction 5** incurs the greatest proportion of new A435 ADR (3) development traffic;
- Trip-ends located in Redditch Town Centre will pass through **Junction 6** as part of their route;
- Similar to trends seen for A435 ADR (2) development trips, all trips passing through **Junction 1 and 2** will also pass through **Junction 3** as part of their route;
- Trip-ends located in the Woodrow, Oakenshaw and Crabbs Cross areas of south Redditch will pass through **Junction 8** as part of their route.

Junction 5 is in close vicinity to the A435 ADR (3) development site and forms part of the most direct route between the development and Redditch Town Centre as well as providing access to the A4189 and A435 via Junction 3.

Again, Junctions 1 and 2 incur exactly the same number of new A435 ADR (3) development trips and it can again be assumed that all development trips passing through Junction 1 will also pass through Junctions 2 and 3 as part of their route to/from the development.



## Conclusion

5.83

Following review of the A435 ADR(3) employment development through the RDM it is considered that no junctions will experience a significant uplift in traffic (greater than 5%). However, this is largely due to the existing high traffic volumes at the modelled junctions. It is therefore considered that that due to the volume of existing traffic flows and the location of the junctions that any impact, no matter how small, should be assessed and that along with the site access, **Junctions 3, 5 and 8** require further assessment and possibly detailed modelling to assess any impact, and possible mitigation.

## A435 ADR (4) – 2ha Employment

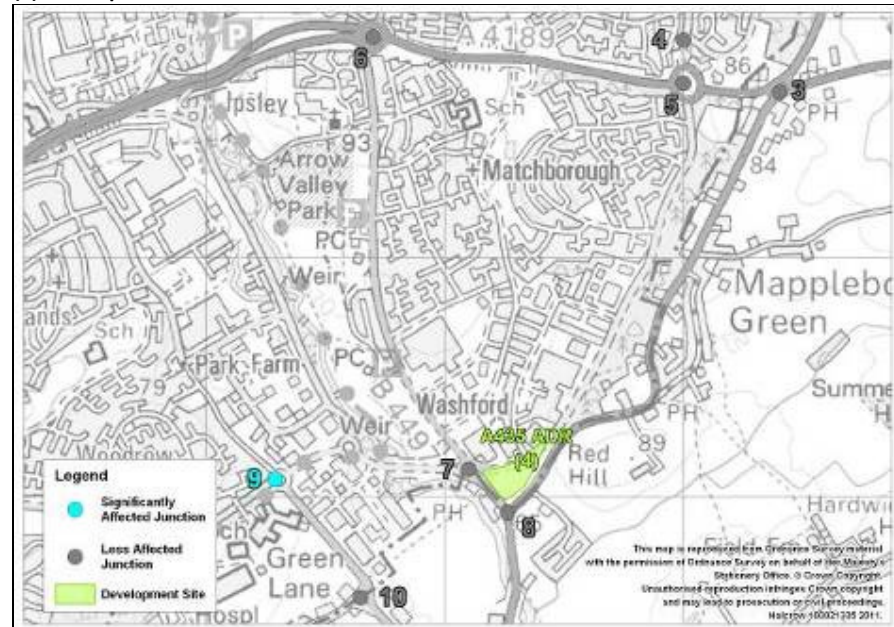
5.84

The A435 ADR (4) site is a 2 hectare employment development, proposed to be accessed off Claybrook Drive. Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the A435 ADR (4) development are displayed in Table 5.19 and Figure 5.8 below.

**Table 5.19: RDM Junction Impact resulting from the A435 ADR (4) Employment Development Site**

Junctions	Base Traffic		A435 ADR (4) Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
5	3906	2134	26	23	0.68%	1.07%
6	5535	3155	25	22	0.45%	0.69%
7	1968	1472	75	65	3.80%	4.43%
8	2583	1848	6	5	0.23%	0.27%
9	765	314	19	16	2.46%	5.23%

**Figure 5.8: Location of RDM Junctions featured within Table 5.19 in regards to the A435 ADR (4) Development**



5.85 Based on the above model run results, it can be concluded that:

5.86 **Junction 9**

- Due to the nature of an employment site, junction impact can often be seen on junctions in surrounding residential areas due to the pull of trips from these areas as the site is considered an employment destination – as is the case with Junction 9;
- The junction is seen to incur a significant uplift in total traffic within the PM Peak;
- PM Peak uplift attributable to a comparatively low level of existing traffic.

The uplift in the PM peak is attributable to the comparatively low level of existing traffic in this time period compared to the AM Peak and occurs despite the actual number of development trips passing through the junction being lower in the PM Peak than the AM Peak.

5.87 **Junction 7 and 8**

- Junction 7 incurs the highest proportion of development traffic, although no significant uplift in total traffic in either modelled time period;
- A proportion of development trips through Junction 8 are considered to also pass through Junction 7 as part of their route.

A high proportion of development trips through Junction 7 are expected given the access to the A435 ADR (4) development site is located immediately to the east of Junction 7 on Claybrook Drive.

By taking into account the development trip flows assigned to Junction 8, it can be considered that the majority of development trips assigned through Junction 7 pass between Claybrook Drive and the B4497 North or Washford Drive arms.

5.88 **Junction 5 and 6**

- A similar number of development trips pass through Junctions 5 and 6, however likely routing trends finds these similarities to be coincidental;
- A substantial level of existing traffic flows are seen through these junctions, however the A435 ADR (4) development site is not considered to have a detrimental impact on their performance and operation.

Junctions 5 and 6 incur a similar numbers of A435 ADR (4) development trips, however, due to the location of the development site it is possible that the most direct route between Junction 6 and the development is via Junction 7 (B4497 Washford) rather than Junction 5. Therefore it cannot be assumed that all trips assigned to Junction 6 are also assigned to Junction 5 and it is coincidence that the numbers of new development trips through each junction are so similar.

5.89 Taking into account the above analysis, position of the development site and complex nature of the local road network, **Junctions 7 and 9** are to be assessed in further detail by extracting and presenting the modelled turning counts through each junction.

#### 5.90 **A435 ADR (4) Development Trips through Junction 7**

The existing traffic and A435 ADR (4) development traffic flows through Junction 7 by arm and turning movement are displayed in Table 5.20.

**Table 5.20: Study Junction 7 A435 ADR (4) Traffic Uplift by Turning Movement**

Junction 7 A4497 Washford		Existing Traffic		A435 ADR (4) Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
B4497 North	Left	1	1	25	3	2365.82%	306.56%
	Straight	312	500	0	0	0.00%	0.00%
	Right	64	135	0	0	0.00%	0.00%
Claybrook Drive	Left	48	8	1	4	1.37%	53.02%
	Straight	48	8	5	31	9.70%	376.83%
	Right	31	5	3	21	9.97%	387.06%
B4497 South	Left	197	81	0	0	0.00%	0.00%
	Straight	754	175	0	0	0.00%	0.00%
	Right	17	16	5	1	29.66%	4.27%
Washford Drive	Left	135	43	0	0	0.00%	0.00%
	Straight	13	22	37	5	288.31%	22.06%
	Right	348	477	0	0	0.00%	0.00%

5.91 Based on the above table it can be concluded that:

- All development trips pass to/from the Claybrook Drive arm;
- Clear directional trip trends by time period are seen due to development content;
- A relatively even split in direction of approach/departure is observed from Junction 7 in respect to the B4497 North and Washford Drive arms;
- A significant uplift for turning movements to/from the B4497 arm is accentuated due to low level of existing traffic;
- The overall impact on Junction 7 from A435 ADR (4) development trips is considered likely to have a detrimental impact on the performance and operation of the junction.

The exclusive employment content of the A435 ADR (4) development site is reflected by the turning movement numbers to/from Claybrook Drive in the two modelled time periods, as there is a higher proportion of turning movements towards Claybrook Drive in the AM Peak representative of journeys to work. The opposite is true within the PM Peak.

The development trips are split relatively evenly between turning movements to/from the B4497 North and Washford Drive, but the uplift in total traffic for these two turning movements to/from Claybrook Drive are seen to be significant in both directions and both time periods. Detailed routing analysis

within the RDM finds that the vast majority of non-development trip ends for B4497 North turning movements will be located in the Matchborough and Ipsley residential areas of Redditch accessed via the B4497. It is likely that the non-development trip-ends for the Washford Drive turning movements are located in the southern residential areas of Redditch and a proportion will also pass through Junction 9.

Although the overall uplift in total traffic through Junction 7 was not initially observed to be significant, given the above analysis of the turning movements through the junction, it is subsequently considered that the A435 ADR (4) will have a detrimental impact on the performance and operation of Junction 7. The predominant area of conflict is anticipated to be within the AM Peak as a result of turning movements into Claybrook Drive from Washford Drive limiting access to the junction for vehicles entering from the B4497 North arm.

#### A435 ADR (4) Development Trips through Junction 9

5.92

The existing traffic and A435 ADR (4) development traffic flows through Junction 9 by arm and turning movement are displayed in Table 5.21.

**Table 5.21: Study Junction 9 A435 ADR (4) Traffic Uplift by Turning Movement**

Junction 9 Studley Road Roundabout		Existing Traffic		A435 ADR (4) Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Studley Road North	Left	1	1	0	0	42.35%	5.49%
	Straight	1	1	0	0	0.00%	0.00%
	Right	1	1	0	0	0.00%	0.00%
Washford Drive	Left	1	1	0	0	0.00%	0.00%
	Straight	61	169	2	14	3.36%	8.17%
	Right	1	1	0	0	5.35%	35.63%
Studley Road South	Left	1	1	0	0	0.00%	0.00%
	Straight	118	35	0	0	0.00%	0.00%
	Right	1	1	0	0	0.00%	0.00%
Woodrow Drive	Left	6	1	0	0	0.00%	0.00%
	Straight	560	99	16	2	2.90%	2.15%
	Right	12	2	0	0	0.00%	0.00%

5.93

Based on the above table it can be concluded that:

- The vast majority of development trips pass straight over the junction between the Washford Drive and Woodrow Drive arms;
- Only the directional turning movement between Washford Drive and Woodrow Drive in the PM Peak is observed to incur a significant uplift in total traffic.

Turning movements between Washford Drive and Woodrow Drive in the PM Peak are likely to be due to trip-ends located in the residential areas of Oakenshaw, Headless Cross and Crabbs Cross.

Whilst the impact of development traffic on Junction 9 is only seen on a small number of turning movements at the junction, these are considered to be

significant. It is therefore considered that further assessment of the Junction should be undertaken, however if ample spare capacity is observed at the turning movements affected by the development traffic it is likely that no further detailed modelling will be required.

### Conclusion

5.94

Following review of the A435 ADR(4) employment development through the RDM, it is considered that whilst a significant uplift in traffic is only seen through Junction 9, due to the further analysis undertaken on Junction 7, and the proximity of Junction 8 to the site, that **Junctions 7, 8 and 9** should be considered for further assessment and detailed modelling to assess any impact, and possible mitigation.

### Cumulative Impact of all A435 ADR sites

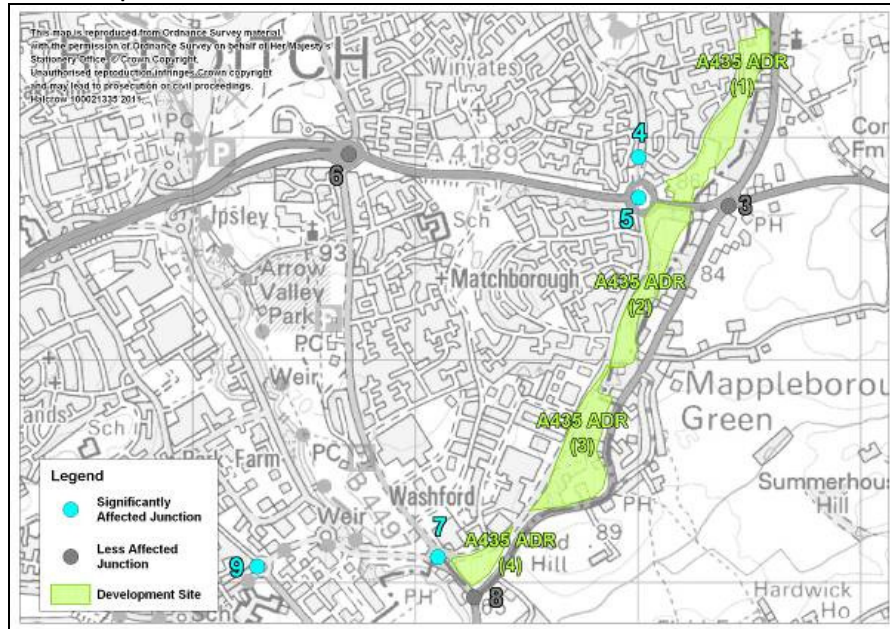
5.95

Due to the location of the four A435 ADR development sites, sharing adjacent boundaries, it is considered necessary to assess the cumulative impact of the sites; to show their total impact on the surrounding highway network, and to ensure that any mitigation is apportioned fairly between the sites. Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the combined traffic impact from all A435 ADR development sites are displayed in Table 5.22 and Figure 5.9 below.

**Table 5.22: RDM Junction Impact resulting from all A435 ADR Development Sites**

Junctions	Base Traffic		All A435 ADR Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
<b>3</b>	5593	3540	118	116	<b>2.10%</b>	<b>3.26%</b>
<b>4</b>	583	281	70	69	<b>11.93%</b>	<b>24.55%</b>
<b>5</b>	3906	2134	218	194	<b>5.58%</b>	<b>9.07%</b>
<b>6</b>	5535	3155	103	64	<b>1.87%</b>	<b>2.04%</b>
<b>7</b>	1968	1472	104	91	<b>5.28%</b>	<b>6.18%</b>
<b>9</b>	765	314	28	25	<b>3.67%</b>	<b>7.82%</b>

**Figure 5.9: Location of RDM Junctions featured within Table 5.22 in regards to all Four A435 ADR Developments**



5.96 A benefit of having assessed the A435 ADR sites separately and collaboratively is that the development trip numbers presented within Table 5.22 can be allocated, or associated, with a particular or number of A435 ADR development sites based on the corresponding results presenting in Table 5.16 to Table 5.19.

5.97 Based on the above model run results, it can be concluded that:

5.98 **Junction 4**

- Significant uplift of over 10% in both time periods;
- Uplift in total traffic can be predominately attributed to the A435 ADR (1) development site.

As presented within Table 5.16, the majority of development trips can be attributed to the A435 ADR (1) site. This is expected as the access to the A435 ADR (1) site has been modelled as located immediately to the east of Junction 4 on Far Moor Lane.

5.99 **Junction 5**

- Incurs the highest proportion of combined A435 ADR development trips;
- High existing level of traffic limits the uplift in total traffic to be between 5 and 10% in both time periods;
- Development trips attributable to the A435 ADR (1), (2) and (3) development site;

Following consideration of the single A435 ADR site results and analysis, these development trips are predominately due to A435 ADR sites (1), (2) and (3),

with the latter actually assigning the highest proportion of new development trips through Junction 5. For these three A435 ADR sites, Junction 5 provides access to the A4189, which will form part of the most direct route for all non-development trip-ends located throughout Redditch and beyond.

5.100

#### Junction 7

- Significant uplift in total traffic despite a relatively high level of existing traffic;
- Combined impact likely to have a significant impact on the performance and operation of Junction 7.

The traffic impact from A435 ADR (4) was adjudged to have a significant impact on the performance and operation of junction 7. With the addition of the other A435 ADR development sites, this detrimental impact will be exacerbated.

5.101

#### Junction 9

- Uplift in total traffic of over 5% in the PM Peak only predominately due to the disproportionately low level of existing traffic in the PM Peak compared to the AM Peak.

Single site analysis informs that the development trips assigned to Junction 9 are predominately due to the A435 ADR (4) site and that the combined traffic impact from the A435 ADR development sites will not have a detrimental impact on the performance and operation of Junction 9.

5.102

**Junctions 3 and 6** incur a relatively high proportion of the combined A435 ADR site traffic, however due to the high level of existing traffic at these junctions, the uplift in total traffic is below 5% for both time periods.

5.103

As significant uplifts in total traffic are observed through **Junctions 4, 5 and 7** as a result of the combined A435 ADR development sites, each junction will be assessed and analysed in more detail. This will be done by extracting and presenting the modelled turning counts through each junction.

#### All A435 ADR Development Trips through Junction 4

5.104

The existing traffic and combined A435 ADR development traffic flows through Junction 4 by arm and turning movement are displayed in Table 5.26 below.

**Table 5.23: Study Junction 4 Combined A435 ADR Traffic Uplift by Turning Movement**

Junction 4 Far Moor Lane		Existing Traffic		All A435 ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Alders Drive North	Left	1	1	1	2	84.29%	168.49%
	Straight	352	63	6	3	1.73%	3.97%
Far Moor Lane	Left	142	25	35	20	24.50%	82.54%
	Right	1	1	7	4	679.12%	387.42%
Alders Drive South	Straight	54	118	3	6	5.89%	5.00%
	Right	32	73	17	34	54.05%	46.84%



5.105

Based on the above table it can be concluded that:

- The majority of development trips are observed between the Far Moor Lane and Alders Drive South arms;
- Development trips directly between the Alders Drive arms can be solely attributed to the A435 ADR (2), (3) and (4) development sites;
- A significant uplift in total traffic from Alders Drive is observed, and is accentuated due to low existing traffic levels;
- The detrimental impact on the performance and operation of Junction 4 resulting from the A435 ADR (1) development site is exacerbated through the addition of the A435 ADR (2), (3) and (4) development trips.

The high proportion of turning movements between the Far Moor Lane and Alders Drive South arms are expected given the presence of the A435 ADR (1) development immediately to the east of Junction 4 on Far Moor Lane. The uplift in total traffic for this turning movement is considered to be significant in both time periods and in both directions.

The significant percentage uplift figures presented within Table 5.26 for the direct Alders Drive turning movements are accentuated by the low existing traffic flows. Additionally, as this turning movement is the straight-on movement between the major arms at a priority junction, these development trips are less likely to affect the performance and operation of the Junction.

Taking into account the above, given the significant uplift in turning movements between a minor and a major arm at a priority junction, the A435 ADR development sites are considered to have a detrimental impact on the performance and operation of Junction 4, with the A435 ADR (1) site generating the majority of new development trips.

### All A435 ADR Development Trips through Junction 5

5.106

The existing traffic and combined A435 ADR development traffic flows through Junction 5 by arm and turning movement are displayed in Table 5.24 below.

**Table 5.24: Study Junction 5 Combined A435 ADR Traffic Uplift by Turning Movement**

Junction 5 A4189 Winyates		Existing Traffic		All A435 ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Alders Drive	Left	287	50	18	10	6.13%	20.40%
	Straight	14	2	12	6	87.30%	248.37%
	Right	194	36	11	7	5.89%	18.50%
A4189 East	Left	76	178	61	34	80.42%	18.90%
	Straight	1221	828	0	0	0.00%	0.00%
	Right	64	145	8	17	13.10%	11.69%
Claybrook Drive	Left	139	30	17	42	12.38%	140.51%
	Straight	1	1	6	12	622.12%	1101.57%
	Right	376	71	31	55	8.17%	77.03%
A4189 West	Left	26	55	6	12	22.37%	21.10%
	Straight	1485	702	0	0	0.00%	0.00%
	Right	25	36	47	0	192.06%	0.00%



5.107

Based on the above table it can be concluded that:

- The majority of development trips entering/existing Junction 5 via the claybrook Drive arm are as a result of the location of the A435 ADR (2), (3) and (4) sites;
- The majority of movements into/out of Claybrook drive are from/to the A4189 East and West arms with significant uplifts in total traffic being observed;
- No development trips are seen to pass directly between the A4189 arms;
- The combined A435 ADR traffic impact is considered to have a detrimental impact on the performance and operation of Junction 5.

For all turning movements into/out of Claybrook Drive, there is a significant uplift in total traffic as a result of the A435 ADR development sites. The same is true for all turning movements into/out of Alders Drive, although the number of development trips performing these turning movements is lower as only the A435 ADR (1) site is located north of Junction 5 via Alders Drive.

As Junction 5 forms part of the SRN within Redditch, the existing traffic flows are relatively high. Despite this, with the addition of all A435 ADR development trips significant uplifts in total traffic throughout the junction are observed. As a result, it is considered that the A435 ADR development sites will have a detrimental impact on the performance and operation of Junction 5.

### All A435 ADR Development Trips through Junction 7

5.108

The existing traffic and combined A435 ADR development traffic flows through Junction 7 by arm and turning movement are displayed in Table 5.25 below.

**Table 5.25: Study Junction 7 Combined A435 ADR Traffic Uplift by Turning Movement**

Junction 7 B4497 Washford		Existing Traffic		All A435 ADR Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Studley Road North	Left	1	1	29	6	2746.34%	560.55%
	Straight	312	500	0	0	0.00%	0.00%
	Right	64	135	0	0	0.00%	0.00%
Washford Drive	Left	48	8	5	11	9.53%	128.66%
	Straight	48	8	8	40	17.10%	482.70%
	Right	31	5	6	25	18.62%	456.39%
Studley Road South	Left	197	81	0	0	0.00%	0.00%
	Straight	754	175	0	0	0.00%	0.00%
	Right	17	16	10	1	59.33%	8.54%
Woodrow Drive	Left	135	43	0	0	0.00%	0.00%
	Straight	13	22	47	8	365.39%	38.25%
	Right	348	477	0	0	0.00%	0.00%

5.109

Based on the above table it can be concluded that:

- All development trips enter/exit Junction 7 via the Washford Drive arm;
- A significant uplift in total traffic is observed turning into/out of Washford drive in both time periods;
- The majority of trips travel between the Washford Drive and Woodrow Drive arms;
- A clear directional trend in development trip turning movements is observed;
- The combined traffic impact of the A435 ADR sites is considered to have a significant impact on the performance and operation of Junction 7.

There is a clear directional variation between time periods, with there being a much higher proportion of development trips entering Washford Drive in the AM Peak than there are exiting. The opposite is true within the PM Peak. This is due to the exclusive employment content of A435 ADR sites (3) and (4), both of which are located to the north of Junction 7 on Washford Drive. Therefore, the majority of non-development trip-ends to these developments are likely to be in the residential areas of south Redditch such as Ipsley and Woodrow. This also explains the distribution of development trips between the arms of Junction 7.

Junction 7 was modelled to incur a significant uplift in total traffic as a result of only the A435 ADR (4) development trips. The addition of the three other A435 ADR development trips to the RDM network accentuates this uplift. Building upon the above and earlier analysis, it is therefore considered that the combined traffic impact of all A435 ADR development sites will have a detrimental impact on the performance and operation of Junction 7.

### Conclusion

5.110

Following review of the cumulative impact of all four A435 ADR development sites through the RDM, Junctions 4, 5, 7 and 9 are observed to have a significant impact by development traffic. Whilst junctions 3, 6 and 8 are seen to have a lower impact, due to either the proximity of the Junction to the proposed site access/s, or the strategic nature of the junction, further assessment is required. It is therefore proposed that **Junctions 3, 4, 5, 6, 7, 8 and 9** should be considered for further assessment and detailed modelling to assess any impact, and possible mitigation.

5.111

It should be noted that junctions 3, 5, 6 and 8 are part of the Redditch Strategic Road Network (SRN) and therefore any potential impact will be of concern to the Highways Agency (HA). It is therefore recommended that any potential impact should be discussed with the HA, and any likely mitigation agreed.

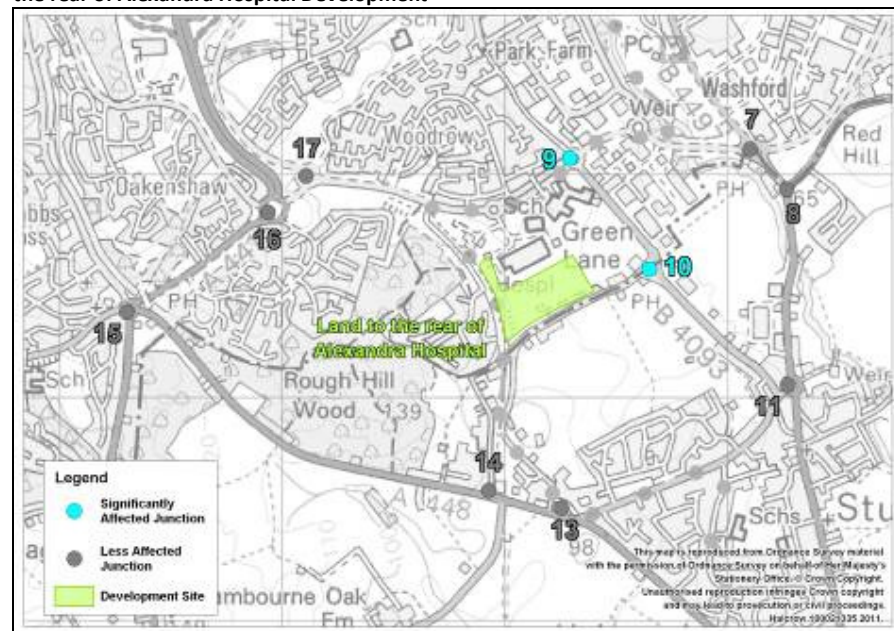
## Land to the rear of Alexandra Hospital; 145 Dwelling Residential and 0.5 Hectares Employment Land

- 5.112 The Land to the rear of Alexandra Hospital (hereon referred to as Alexandra) development is a mixed residential and employment development located to the south of Redditch; currently modelled as being accessed off Green Lane.
- 5.113 Although it is possible to model the residential and employment contents of the Alexandra development separately within the RDM, it is anticipated that both elements will be included within any forthcoming planning application, and have therefore been modelled together.
- 5.114 Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the Alexandra development are displayed in Table 5.26 and Figure 5.10 only.

**Table 5.26: RDM Junction Impact resulting from the Alexandra Residential and Employment Development Site**

Junctions	Base Traffic		Alexandra Development Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
9	765	314	32	33	4.22%	10.51%
10	134	41	57	56	42.28%	137.05%
11	1896	1157	25	23	1.29%	2.00%
14	3904	2545	35	37	0.90%	1.46%

**Figure 5.10: Location of RDM Junctions featured within Table 5.26 in regards to the Land to the rear of Alexandra Hospital Development**



5.115 Based on the above model run results, it can be concluded that:

5.116 **Junction 10**

- Incurs both the greatest proportion of development trips and experiences the highest uplift in total traffic.

This uplift in total traffic is expected as it is in close vicinity to the development site, although the percentage uplift observed within the PM Peak uplift is accentuated due to the proportionately lower level of existing traffic compared to the AM Peak.

5.117 **Junctions 9 and 11**

- All trips that pass through Junction 10 also pass through either Junction 9 or 11 as part of their trip as no trip-ends exist between them;
- Junction 9 incurs an uplift in total traffic of over 10% in the PM Peak;
- A greater proportion of development trips are assigned to Junction 9 than Junction 11.
- Due to the high level of existing traffic through Junction 11 the percentage uplift in total traffic is low. However, due to Junction 11 being a heavily used junction it is considered that any increase is likely to result in capacity issues and should be assessed.

While development trip numbers through Junction 9 are relatively similar between the two time periods, a substantially higher amount of existing traffic in the AM peak results in the uplift in total traffic to be less than 5% in the AM peak period.

The level of development traffic through junction 9 is considered to be moderate, and is considered likely not to have a detrimental impact on the performance and operation of Junction. However, due to Junction 11 being a heavily used junction and part of the strategic route to the east of the town, it is considered that further assessment should be undertaken to clarify any impact on the junction.

5.118 **Junction 14**

- This is a priority junction located to the south of the development and provides direct access to/from the Alexandra development and the A448;
- A relatively high level of existing traffic results in a low percentage uplift in total traffic.

Due to a high existing level of traffic, the percentage uplift in total traffic resulting from the Alexandra development trips is deemed not to be significant. Further, as filter lanes are provided on the major arms of the junction, it is anticipated that the addition of new development trips will not have a major impact on the flow of the major link.

However, due to Junction 14 being a heavily used junction and part of the strategic east-west route through the town, it is considered that further assessment should be undertaken to clarify any impact on the junction.

5.119

Taking into account the above analysis and explanations, it is considered that in order to further understand the development impact on **Junctions 9 and 10**, that both junctions should be assessed in more detail. The detailed analysis of Junctions 9 and 10 will be completed by extracting and presenting the modelled turning counts through each junction.

### Land to the rear of Alexandra Hospital Development Trips through Junction 9

5.120

The existing traffic and Alexandra development traffic flows through Junction 9 by arm and turning movement are displayed in Table 5.27 below.

**Table 5.27: Study Junction 9 Alexandra Traffic Uplift by Turning Movement**

Junction 9		Existing Traffic		Alexandra Traffic		Uplift	
Studley Road Roundabout		AM	PM	AM	PM	AM	PM
Studley Road North	Left	1	1	0	0	0.00%	0.00%
	Straight	1	1	0	0	16.93%	17.26%
	Right	1	1	0	0	0.00%	0.00%
Washford Drive	Left	1	1	12	11	1191.05%	1086.66%
	Straight	61	169	0	0	0.00%	0.00%
	Right	1	1	0	0	0.00%	0.00%
Studley Road South	Left	1	1	3	5	327.52%	475.90%
	Straight	118	35	0	0	0.16%	0.51%
	Right	1	1	11	13	1038.77%	1218.15%
Woodrow Drive	Left	6	1	0	0	0.00%	0.00%
	Straight	560	99	0	0	0.00%	0.00%
	Right	12	2	5	3	42.65%	155.92%

5.121

Based on the above table it can be concluded that:

- The majority of existing turning movements are to/from Woodrow Drive;
- The majority of Alexandra development trips are to/from the Studley Road South arm;
- A large proportion of development trips that are subject to turning movements have a very low level of existing traffic, therefore the percentage uplift in total traffic is accentuated.

The actual number of development trips passing through Junction 9 is observed to be low, and it is considered likely that any impact will be marginal. However, due to the location of the junction in relation to the town it is considered that further detailed modelling should be undertaken to ensure that the junction operates satisfactory at present and that it can accommodate the increase in traffic flows, albeit this increase is small.

## Land to the rear of Alexandra Hospital Development Trips through Junction 10

5.122

The existing traffic and Alexandra development traffic flows through Junction 10 by arm and turning movement are displayed in Table 5.28 below.

**Table 5.28: Study Junction 10 Alexandra Traffic Uplift by Turning Movement**

Junction 10 Green Lane East		Existing Traffic		Alexandra Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Studley Road	Straight	12	2	0	0	0.00%	0.00%
	Right	1	1	18	15	1719.84%	1424.66%
Redditch Road	Left	1	1	11	11	1034.71%	1039.62%
	Straight	118	35	0	0	0.00%	0.00%
Green Lane	Left	1	1	14	18	1383.99%	1710.97%
	Right	1	1	14	12	1325.60%	1165.91%

5.123

Based on the above table it can be concluded that:

- All development trips travel to/from the Green Lane arm, which is also the minor arm of this priority junction;
- There is a low existing level of traffic which accentuates the percentage uplift in total traffic, but it is still considered that the development trips will have a significant impact on the junction.

The turning movement trends through Junction 10 are expected as the access to the Alexandra development site has been modelled to the west of Junction 10 on Green Lane.

Green Lane is the minor arm at this priority junction. While a filter lane is provided for right turn movements from Studley Road, right turn movements from Green Lane are likely to encounter difficulties. As a result, it can be considered that the Alexandra development will have a significant impact on the performance and operation of Junction 10.

## Conclusion

5.124

Following review of the Alexandra residential and employment development through the RDM, it is considered that whilst a significant uplift in traffic is only seen through Junctions 9 and 10; due to the analysis undertaken on Junctions 11 and 14, and the location of these junctions which form a part of the strategic road network throughout Redditch, that along with the site access, **Junctions 9, 10, 11 and 14** should be considered for further assessment and detailed modelling to assess any impact, and possible mitigation.

## Ravensbank ADR; 10.3 Hectares Employment Land

5.125 The Ravensbank ADR development is a significantly sized employment development located to the north east of Redditch; currently proposed to be accessed off Hedera Road.

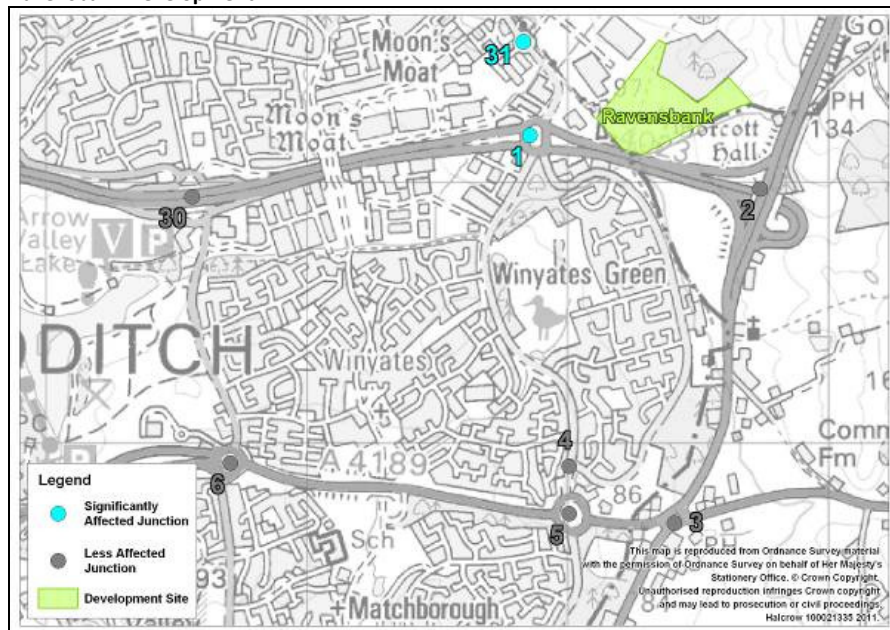
5.126 Following assessment of the likely development traffic impact on the offsite highway network, the RDM junctions modelled to be most affected by the Ravensbank development are displayed in Table 5.29 and Figure 5.11 below.

**Table 5.29: RDM Junction Impact resulting from the Ravensbank ADR Development Site**

Junctions	Base Traffic		Ravensbank Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
1	9464	6020	502	433	5.31%	7.19%
2	6886* (10422)	4503* (6737)	178* (178)	155* (155)	2.58%	3.44%
30	3467* (8555)	2083* (4994)	103* (289)	85* (247)	2.97%	4.06%
31	4629	3269	522	450	11.28%	13.76%

\*at junction counts only, bracketed figures represent all junction traffic

**Figure 5.11: Location of RDM Junctions featured within Table 5.29 in regards to the Ravensbank Development**



5.127 Based on the above model run results, it can be concluded that:

### 5.128 Junction 31

- High number of new development trips;
- Significant uplift in total traffic of over 10% in both modelled time periods despite a relatively high level of existing traffic.

These uplifts are expected as **Junction 31** provides access between the Ravensbank development and the wider Redditch road network. Therefore Junction 31 will incur all Ravensbank development traffic.

5.129

#### **Junction 1**

- Majority of Ravensbank development trips pass through Junction1;
- Significant uplift in total traffic of over 5% in both modelled time periods despite a relatively high level of existing traffic.

5.130

The development trips displayed in Table 5.29 indicate that the vast majority of development trips that pass through Junction 31, also pass through Junction 1 as part of their route.

5.131

#### **Junctions 2 and 30**

- These are both grade separated junctions and are key junctions forming part of the strategic east west link to/from Redditch town centre;
- All development trips through Junction 2 turn onto/off the A435 North or South;
- Through Junction 30, the majority of development traffic pass straight between the A4023 arms.

The development trips that actually complete a turning movement at Junctions 2 and 30 have not been modelled to cause a significant uplift in total traffic, however the strategic nature of these junctions and the current high traffic volumes warrant further investigation on the junctions.

5.132

It is worth noting that all RDM junctions featured within Table 5.29 are the four closest junctions to the Ravensbank development site. The traffic impact trends discussed above are therefore typical following the distribution and assignment of new development trips throughout the surrounding road network.

5.133

Taking into account the above analysis, as a significant uplift in total has been modelled to occur through **Junctions 1 and 31**, these junctions will be assessed and analysed in more detail by extracting and presenting the modelled turning counts through each junction.

#### **Ravensbank Development Trips through Junction 1**

5.134

The existing traffic and Ravensbank development traffic flows through Junction 1 by arm and turning movement are displayed in Table 5.30 below.



**Table 5.30: Study Junction 1 Ravensbank Traffic Uplift by Turning Movement**

Junction 1 A4023 Moons Moat		Existing Traffic		Ravensbank Traffic		Uplift	
		AM	PM	AM	PM	AM	PM
Ravensbank Drive	A4023 East	662	1169	20	134	3.01%	11.49%
	Far Moor Lane	14	21	1	5	5.14%	21.99%
	Alders Drive	3	7	2	16	90.21%	218.97%
	A4023 West	371	831	32	213	8.53%	25.62%
	Moons Moat Drive	1	1	1	6	91.88%	611.72%
A4023 East	Far Moor Lane	86	124	0	0	0.00%	0.00%
	Alders Drive	45	108	0	0	0.00%	0.00%
	A4023 West	1366	1335	0	0	0.00%	0.00%
	Moons Moat Drive	283	86	0	0	0.00%	0.00%
	Ravensbank Drive	1429	425	158	21	11.04%	4.87%
Far Moor Lane	Alders Drive	1	1	0	0	0.00%	0.00%
	A4023 West	203	66	0	0	0.00%	0.00%
	Moons Moat Drive	1	1	0	0	0.00%	0.00%
	Ravensbank Drive	51	9	5	1	10.79%	8.16%
	A4023 East	280	120	0	0	0.00%	0.00%
Alders Drive	A4023 West	82	14	0	0	0.00%	0.00%
	Moons Moat Drive	5	1	0	0	0.00%	0.00%
	Ravensbank Drive	27	5	19	2	68.64%	51.88%
	A4023 East	170	34	0	0	0.00%	0.00%
	Far Moor Lane	1	1	0	0	0.00%	0.00%
A4023 West	Moons Moat Drive	1	1	0	0	0.00%	0.00%
	Ravensbank Drive	1707	454	257	34	15.07%	7.43%
	A4023 East	2390	850	0	0	0.00%	0.00%
	Far Moor Lane	35	49	0	0	0.00%	0.00%
	Alders Drive	41	25	0	0	0.00%	0.00%
Moons Moat Drive	Ravensbank Drive	14	24	8	1	55.93%	4.13%
	A4023 East	192	257	0	0	0.00%	0.00%
	Far Moor Lane	1	1	0	0	0.00%	0.00%
	Alders Drive	1	1	0	0	0.00%	0.00%
	A4023 West	1	1	0	0	0.00%	0.00%

5.135

Based on the above table it can be concluded that:

- All turning movements involve the Ravensbank Drive arm;
- Significant uplifts are observed for turning movements between Ravensbank Drive and Alders Drive or Moons Moat Drive although the percentage figures are accentuated due to low levels of existing traffic;
- The majority of development trips are observed to/from the A4023 arms;

The turning movement trends are expected as Junction 31 is located on Ravensbank Drive, which provides direct access to the Ravensbank development site.

The majority of Ravensbank development trips passing through Junction 1 travel between Ravensbank Drive and the A4023 East and West. There are marginally more turning movements to/from the A4023 West arm than the

A4023 East as a result of the likely non-development trip-ends located within Redditch Town Centre.

### Ravensbank Development Trips through Junction 31

5.136

The existing traffic and Ravensbank development traffic flows through Junction 31 by arm and turning movement are displayed in Table 5.31 below. As Junction 31 consists of two small junctions in close vicinity to one another; these have therefore been separated and assessed as Junctions 31A and 31B.

**Table 5.31: Study Junction 31 Ravensbank Traffic Uplift by Turning Movement**

Junction 31 Ravensbank			Existing Traffic		Ravensbank Traffic		Uplift	
			AM	PM	AM	PM	AM	PM
A	Ravensbank Drive North	Left	16	5	16	2	95.12%	41.94%
		Straight	189	47	0	0	0.00%	0.00%
	Acanthus Road	Left	1	1	0	0	0.00%	0.00%
		Right	7	11	2	13	28.05%	116.71%
	Ravensbank Drive South	Straight	118	255	0	0	0.00%	0.00%
		Right	1	1	0	0	0.00%	0.00%
B	Ravensbank Drive North	Left	1	1	2	0	198.28%	25.69%
		Straight	886	1707	0	0	0.00%	0.00%
	Ravensbank Business Park	Left	162	321	56	374	34.20%	116.58%
		Right	1	1	0	2	25.06%	166.83%
	Ravensbank Drive South	Straight	2735	798	0	0	0.00%	0.00%
		Right	509	121	447	59	87.68%	48.47%

5.137

Based on the above table it can be concluded that:

- No development trips pass between the Ravensbank Drive arms within Junctions 31A or 31B as a result of the location of the development site.
- Junction 31B incurs a higher proportion of Ravensbank development trips than Junction 31A;
- All development traffic passing through Junction 31B enters/exits the junction via the Ravensbank Business Park arm;

Development trips passing through Junction 31A are likely to be a result of trip ends located in north Church Hill, while Junction 31B forms part of the most direct route between the development site and the A4023 via Junction 1.

In relation to Junction 31B, the vast majority of development traffic passes between the Ravensbank Business Park and Ravensbank Drive South arms. This turning movement incurs a large number of development trips and is modelled to experience a significant uplift in total traffic.

5.138

Taking into account the above, it is considered that the high volume of new Ravensbank development trips through Junction 31B will have a significant impact on the performance and operation of the junction.

5.139

Despite a significant uplift in total traffic observed through Junction 31A, due to the existing traffic levels seen to be relatively low, it is anticipated that the

junction will be able to adequately accommodate the additional traffic from the development. However, due to the close proximity of the two junctions it is considered necessary to further model both junctions in order to confirm the above findings and ensure that any delay from one junction does not have a detrimental impact on the other.

### **Conclusion**

- 5.140 Following review of the Ravensbank ADR employment development through the RDM, it is considered that whilst a significant uplift in traffic is only seen through Junction 1 and 31; due to the analysis undertaken on Junctions 2 and 30, and the location of these junctions which form a part of the strategic road network throughout Redditch, that along with the site access, **Junctions 1, 2, 30 and 31** should be considered for further assessment and detailed modelling to assess any impact, and possible mitigation.

### **Individual Sites Assessment Results Summary**

- 5.141 Each development site within the RDM has been assessed on an individual basis, with the respective impact on RDM junctions analysed. For those junctions most impacted by the subject development, the development trip turning movements through junctions has also been assessed. Local knowledge and the strategic nature of all junctions has also been considered when assessing each sites impact, to ensure that all recommendations take into account local factors.
- 5.142 This process has provided a detailed understanding of the assignment and impact of development trips throughout the RDM network and junctions. Subsequently, the outcomes of each individual site assessment have been summarised, with appropriate recommendations provided in the event that the specific development is brought forward for planning application and a subsequent Transport Assessment (TA) is requested. The findings can be used to inform the TA, providing a guide for detailed junction assessments required for each site.
- 5.143 It should be noted that if the development size and/or site access proposals are altered as part of any future planning application, the below findings should be revisited to re-assess the impact of these changes.

### **Webheath**

- 5.144 **Junction 20A** is most severely affected by the Webheath development, but as this junction has been modelled to act as the access junction to the development **it is assumed appropriate junction amelioration measures will be incorporated into any planning application.**

- 5.145 The performance and operation of **Junction 18, 19 and 20** are likely to be detrimentally affected by the Webheath development and **it is recommended that more detailed assessment and appropriate migration measures are considered** in the event of the Webheath development being approved. The Highways Agency will be particularly concerned with the development's impact on Junction 19 as it forms part of the Redditch SRN.
- 5.146 **Junction 21** is an unsignalled priority junction. While the uplift in total traffic through Junction 21 is less than other RDM junctions, as a high proportion of development trips have been modelled to enter/exit the minor arm **it is recommended that Junction 21 is assessed using appropriate junction modelling software with particular consideration given to turning movements between Foxlydiate Lane and Birchfield Road.**
- Foxlydiate**
- 5.147 **Junctions 22 and 23** were modelled to incur both a high number of Foxlydiate development trips and experience a significant uplift in total traffic. As these RDM junctions are also the closest to the development, it is therefore **recommended that Junctions 22 and 23 are assessed in detail using appropriate junction modelling software.** The Highways Agency will be particularly concerned with the development's impact on Junction 22 as it forms part of the Redditch SRN.
- 5.148 **Junction 21** was modelled to experience a significant uplift in total traffic as a result of new Foxlydiate development trips. As it is also an unsignalled priority junction, **it is recommended that the performance and operation of Junction 21 is also assessed and junction amelioration schemes are considered if appropriate.**
- Brockhill Green Belt**
- 5.149 **Junction 24** incurs both the highest number of new Brockhill Green Belt development trips and percentage uplift in total traffic. All of the modelled development trip movements through Junction 24 are to/from a minor arm to/from the B4184. It is therefore **strongly recommended that this junction is assessed using appropriate junction modelling software in the event that the Brockhill Green Belt development site is progressed.**
- 5.150 **Junctions 23, 25 and 26** form part of the most direct east-west route between the site and Redditch Town Centre / the SRN. Junction 25 has been modelled to incur a high proportion of development trips and as Junction 25 is an unsignalled three arm roundabout, it is anticipated that new Brockhill Green Belt development trips will likely have a significant impact on the junction's performance and operation. Whilst Junctions 23 and 26 are seen to have a lower uplift in traffic, due to the strategic location of these junctions further assessment is considered necessary. Subsequently, Junction 23, 25 and 26

**should also be assessed in more detail when proposals for the Brockhill Green Belt development site come forward.**

#### **Brockhill ADR**

5.151 The vast majority of new Brockhill ADR development trips pass through either **Junction 24 or 25** as these are the two closest junctions to the proposed development access road. The majority development trips pass directly between the A4184 arms of each junction but when considering the actual quantity of development trips it is likely that they will have a significant impact on the performance and operation of the junctions. Subsequently, **given the proximity of the development to the junctions and the uplift in total traffic observed, both Junction 24 and 25 should be subject to more detailed and accurate junction specific assessments.**

5.152 Similar turning movement trends are seen through **Junctions 23 and 26**, whereby the vast majority of development trips pass directly between the major A4184 arms. Given the significant uplift in traffic also observed through Junctions 23 and 26, it is also **recommended that the performance and operation of Junctions 23 and 26 are assessed in more detail.**

5.153 The Brockhill ADR development trips have also been modelled to impact on the Redditch SRN **Junctions 22 and 27**, the Highways Agency will be particularly interested to know the impact of development traffic on the performance and operation of these junctions. Therefore, **further junction modelling will be required for Junctions 22 and 27 in relation to Brockhill ADR development trips.**

#### **A435 ADR Sites**

5.154 In the event that the **A435 ADR (1)** site is separately developed it is **strongly recommended that Junctions 3, 4, 5 and 6 are modelled using appropriate junction modelling software with particular consideration given to turning movements involving Far Moor Lane.** The Highways Agency will be particularly concerned with the development's impact on **Junction 5** as it forms part of the Redditch SRN.

5.155 No RDM junctions were modelled to incur a significant uplift in total traffic as a result of the **A435 ADR (2)** site in isolation, however this is largely due to the existing high traffic volumes at the modelled junctions. It is therefore considered that due to the volume of existing traffic flows and the location of the junctions that any impact, no matter how small, should be assessed and that along with the site access, **Junctions 3 and 5 and 6** require further assessment and possibly detailed modelling to assess any impact, and possible mitigation.

5.156 No RDM junctions were modelled to incur a significant uplift in total traffic as a result of the **A435 ADR (3)** site in isolation, however this is largely due to the

existing high traffic volumes at the modelled junctions. It is therefore considered that due to the volume of existing traffic flows and the location of the junctions that any impact, no matter how small, should be assessed and that along with the site access, **Junctions 3, 5 and 8** require further assessment and possibly detailed modelling to assess any impact, and possible mitigation.

5.157 In the event that the **A435 ADR (4)** site is separately developed it is strongly recommended that along with the site access **Junctions 7, 8 and 9 are modelled using appropriate junction modelling software**. Whilst only Junction 9 is seen to show a significant uplift in traffic, due to the further analysis undertaken on Junction 7, and the proximity of Junction 8 to the site and its significance to the Highways Authority as it forms part of the Redditch SRN, it is considered that these two junctions should also be assessed further.

5.158 Following the assessment of the combined impact of **all four A435 ADR** sites, Junctions 4, 5, 7 and 9 are observed to have a significant impact by development traffic. Junctions 3, 6 and 8 are seen to have a lower impact, however due to either the proximity of the Junction to the proposed site access/s, or the strategic nature of the junction, further assessment is considered necessary. **It is therefore strongly recommended that Junction 3, 4, 5, 6, 7, 8 and 9 are modelled using appropriate junction modelling software**. The Highways Agency will also be concerned with the development's impact, specifically on **Junction 3, 5, 6 and 8** as these form part of the Redditch SRN.

#### **Land to the rear of Alexandra Hospital**

5.159 The anticipated traffic impact from the Alexandra development procures the **recommendation that Junctions 9, 10, 11 and 14 are assessed in further detail using appropriate modelling software**. Whilst a significant uplift in traffic is only seen through Junctions 9 and 10; due to the analysis undertaken on Junctions 11 and 14, and the location of these junctions which form a part of the strategic road network throughout Redditch, further assessment is required.

5.160 Additionally, as Junction 14 forms part of the Redditch SRN, the Highways Agency will be keen to understand the potential traffic impact at this location.

#### **Ravensbank ADR**

5.161 The location of the Ravensbank development results in the majority of new development trips to pass through **Junctions 1 and 31** as part of their trip. Both Junctions have been modelled to incur significant uplifts in total traffic as a result of the development, therefore **it is strongly recommended that junction specific models are development to accurately analyse the traffic impact of the development site on the performance and operation on these junctions**.

5.162                    **Junctions 2 and 30** have also been modelled to incur a proportion of the Ravensbank development trips. As these junctions, along with Junction 1, form part of the Redditch SRN, **the Highways Agency will be concerned over the development's impact on these junctions and further assessment is required.**

**Impact Summary Table**

5.163                    A table has been produced to summarise the earlier development traffic impact analysis and above recommendations.

5.164                    The table's cells have been colour coded based on the modelled severity of impact and weighting attached to the recommendations detailed above. Red cells indicate a severe and significant impact on the junction, while Orange cells indicate a significant impact or were a junction is considered to have a strategic/significant location in relation the site, and therefore will likely require further assessment. Yellow cells highlight junctions which will be of particular interest to the Highways Agency in relation to the subject development's traffic impact on the junction and should therefore also be considered for further detailed assessment.

5.165                    A summary of the individual Redditch development site traffic impact assessments is presented in Table 5.32 below.

Table 5.32: Single Site Junction Impact Summary Table

Junction	Webheath	Foxlydiate Green Belt	Brockhill Green Belt	Brockhill ADR	A435 ADR (1)	A435 ADR (2)	A435 ADR (3)	A435 ADR (4)	All A435 ADR	Rear of Alexandra	Ravensbank ADR
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20A											
20B											
20C											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31A											
32B											



## **6. Highway Impact - Combined Sites Assessment**

6.1 Having assessed the traffic impact of each Redditch development site in turn, the RDM has subsequently been used to assess the combined traffic impact of ALL Redditch development sites. This will highlight not only the junctions impacted on by a single site, but also the strategic junctions that are likely to require mitigation due to the cumulative impact of traffic from a number of sites.

6.2 Table 6.1 below shows the impact of all development sites on the junctions throughout the town. As previously, the percentage uplift figures have been colour coded using the following scheme:

- 0 to 5% uplift – no colour;
- 5 to 10% uplift – Yellow;
- 10 to 50% uplift – Orange;
- Over 50% uplift – Red.

**Table 6.1: RDM Junction Impact resulting from all RDM Development Sites**

Junctions	Existing Traffic		All Development Traffic		Uplift	
	AM	PM	AM	PM	AM	PM
1	9464	6020	658	583	6.95%	9.69%
2	6886* (10442)	4503* (6737)	250* (418)	223* (394)	3.63%	4.95%
3	5593	3540	322	307	5.76%	8.67%
4	583	281	73	72	12.55%	25.78%
5	3906	2134	348	323	8.91%	15.15%
6	5535	3155	298	252	5.37%	7.98%
7	1968	1472	116	104	5.89%	7.06%
8	2583	1848	75	69	2.91%	3.75%
9	765	314	63	60	8.19%	18.98%
10	134	41	57	56	42.28%	137.05%
11	1896	1157	74	68	3.92%	5.89%
12	2450	1580	57	54	2.31%	3.43%
13	2131	1333	45	44	2.11%	3.33%
14	3904	2545	115	115	2.95%	4.52%
15	4838	3212	109	106	2.25%	3.30%
16	6050	3997	172	163	2.84%	4.08%
17	955	484	48	42	5.04%	8.71%
18	3033	1884	284	257	9.37%	13.63%
19	2996* (9442)	1869* (5979)	270* (449)	263* (427)	9.02%	14.08%
20	133	74	506	529	379.84%	715.75%
21	709	407	88	86	12.46%	21.05%
22	2774* (8774)	1779* (5583)	312* (420)	295* (393)	11.25%	16.58%
23	798	444	194	177	24.35%	39.90%
24	1197	659	336	327	28.04%	49.63%
25	1598	1561	511	475	31.94%	30.44%
26	1441	1591	497	467	34.47%	29.34%
27	4221	2526	519	486	12.29%	19.23%
28	2346	2396	213	206	9.06%	8.59%
29	1107	714	6	7	0.53%	0.98%
30	3467 (8555)	2083 (4994)	199 (497)	175 (447)	5.74%	8.39%
31	4629	3269	604	533	13.05%	16.30%

\*at junction counts only, bracketed figures represent all junction traffic

6.3

Based on the above model run results, it can be concluded that:

6.4

All junctions within the RDM experience some form of impact due to the proposed development throughout the town. **Junctions 2, 8, 12, 13, 14, 15, 16 and 29 have been modelled to incur an impact less than 5%.** However, this does not necessarily mean that the performance and operation of each junction will not be detrimentally affected, as the existing level of congestion

also needs to be considered. Even if the uplift in total traffic is not deemed to have a significant impact in its own right, if the existing operation of the junction is compromised by existing excess traffic then even the effect of a further, however slight, increase in traffic will exacerbate the existing congestion. Therefore, although the above junctions incur a low proportion of new development trips relative to the existing level of traffic, **the impact of new development trips will still need to be considered, particularly if it is known that congestion already exists at the junction.**

6.5 Table 6.1 clearly identifies two junctions whereby the percentage uplift in total traffic is very high. **Junctions 10 and 20** have been observed to incur an uplift in total traffic of over 100% in one or more of the modelled time periods. Both Junction 10 and 20 were observed to incur the majority of new development trips from the individual Alexandra and Webheath development assessments respectively. These new development trips were deemed to have a significant impact on the Junctions' performance and operation, despite the relatively low level of existing traffic accentuating the percentage uplift in total traffic. Further, taking into account the individual development site assessments, **it can be considered that Junctions 10 and 20 only need to be assessed further in the event that either the Alexandra or Webheath development is progressed** as part of a particular Redditch development scenario.

6.6 One of the most important outcomes of performing a collaborative assessment of the RDM development sites is the ability to identify junctions which now incur a significant uplift in total traffic as a result of a number of development sites, but did not when each development was considered in isolation. **Junctions 3, 11, 17, 28 and 30 did not incur a significant uplift in total traffic as a result of one individual development site, but do incur a significant uplift when a combination of development sites are applied to the RDM.** Taking into account the actual number of development trips, as displayed within Table 6.1, Junctions 3, 28 and 30 are seen to incur a high number of new development trips, while the uplift through Junctions 11 and 17 is due to a comparatively lower level of existing traffic. Subsequently, **it is recommended that the development traffic impact on Junctions 3, 28 and 30 is considered in detail in the event of one or more RDM development sites being progressed. It is only recommended that further junction assessments of Junction 11 and 17 are completed in the event that a combination of development sites in the vicinity of those junctions are progressed.**

6.7 The individual assessments of the Foxlydiate, Brockhill Green Belt and the Brockhill ADR highlighted a significant impact on the **junctions along the B4184; Junctions 22, 23, 24, 25, 26 and 27.** This traffic impact is exacerbated when these development sites are applied collaboratively to the RDM network, highlighting the strategic importance of the B4184 to the Redditch

road network in linking the A441 and A448 for north west areas of Redditch. **It is recommended that all junctions along the B4184 are assessed in detail in the event of a combination of the Foxlydiate, Brockhill Green Belt or Brockhill ADR development sites are progressed.**

6.8 Similar to the above, the individual assessments of the A435 ADR sites highlighted a significant impact on the **junctions located in east Redditch; Junctions 3, 4, 5, 6, 7 and 8**. This traffic impact is exacerbated when these development sites are applied collaboratively to the RDM network, highlighting the strategic importance of these junctions in providing access between the development sites and the wider Redditch road network. Subsequently, **it is recommended that Junctions 3, 4, 5, 6, 7 and 8 are assessed in detail in the event that a combination of the A435 ADR development sites are progressed.**

6.9 Junctions located on the strategic road network will almost certainly incur development traffic. However, due to the relatively high amount of existing traffic using those junctions, a relatively high proportion of new development traffic is required to be deemed 'significant' through the methodology employed within this study. However, as discussed above, if the existing operation of the junction is compromised by existing excess traffic then even the effect of a further, however slight, increase in traffic will exacerbate the existing congestion. This issue will be of particular concern to the Highways Agency, as SRN junctions will be less likely to incur a significant uplift in total traffic from an individual development, but the combined impact of a number of development sites maybe more significant. Taking this into account, **the Highways Agency will be particularly concerned with the impact of development trips on Junctions 1, 2, 3, 5, 8, 6, 19, 22, 27 and 30, therefore further detailed junction assessment may be required.**

6.10 Additionally, RDM junctions on the strategic road network are more likely to incur an uplift in total traffic from multiple development sites, whereas other more 'isolated' junctions incur significant uplifts predominately because of an individual development site located in close vicinity to that specific RDM junction. Therefore, it is important to consider the results within Table 6.1 along side those presented within Chapter 5 when attributing modelled uplifts in total traffic to particular RDM development sites.

### **Combined Sites Assessment Results Summary**

6.11 The above paragraphs have set out the trends and impacts seen throughout the town following the cumulative impact of all developments. In order to draw a number of conclusions from this assessment, and to provide a number of useful results to take forward the following areas have been considered:

- Those junctions which are now seen to have experienced a significant impact which were not previously considered;
- An overview of the cumulative impact on a junction against the impact from a single site; and
- The impact of all sites on strategic junctions.

6.12 Taking each of these points in turn:

**Those junctions which are now seen to have experienced a significant impact which were not previously considered;**

6.13 The cumulative assessment results have shown a significant uplift on a number of junctions, which were not previously considered in the single site assessment. It can therefore be concluded that these uplifts can be attributed to the cumulative impact of all developments and not a single site. These junctions are as follows:

**Table 6.2: RDM Junction only showing a significant uplift only when all sites are considered**

Junctions	Type	Arms	Arm Names
3	Roundabout	4	A4189/A435
11	Priority	4	A435/Redditch Road/B4092
17	Roundabout	4	Greenlands Drive/Woodrow North/Woodrow Drive/Rough Hill Drive
28	Priority	3	A441/B4101
30	Slip Junction	7	A4023/B4497/Moons Moat Drive

6.14 It is evident that these are predominantly strategic junctions which are seen to be impacted on by traffic from all sites. Their very nature, as a 'strategic' junction, providing links from the town to the wider area will draw traffic from all sites. The impact of development traffic on these junctions cannot be attributed to a single site, but any development site should provide a necessary contribution to any future improvements due to the cumulative impact of development on these junctions. Further junction specific analysis will be required to provide a suitable mitigation scheme for these junctions.

**An overview of the cumulative impact on a junction against the impact from a single site;**

6.15 Table 6.3 below shows the severity of impacts on each junction against the impact of a single site. The table provides an indication of where a junction impact is attributed to a single site or where any impact can be seen to worsen or is due to a combination of sites.

6.16 The table's cells have been colour coded based on the modelled severity of impact and weighting attached to the recommendations detailed above. Red cells indicate a severe and significant impact on the junction, while Orange cells indicate a significant impact or where a junction is considered to have a strategic/significant location in relation the site, and therefore will likely

require further assessment. Yellow cells highlight junctions which will be of particular interest to the Highways Agency in relation to the subject development's traffic impact on the junction and should therefore also be considered for further detailed assessment.

**Table 6.3: Single Site and Combined Development Junction Impact Summary Table**

Junction	Webheath	Foxlydiate Green Belt	Brockhill Green Belt	Brockhill ADR	A435 ADR (1)	A435 ADR (2)	A435 ADR (3)	A435 ADR (4)	All A435 ADR	Rear of Alexandra	Ravensbank ADR	ALL SITES
1												
2												
3												
4												
5												
6												
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30												
31A												
32B												

### **The impact of all sites on strategic junctions;**

6.17 There are a number of strategic junctions throughout the town, which provide links to the wider highway network and surrounding towns and cities. This cumulative impact assessment has shown that a number of these junctions will show a significant uplift in traffic due to the impact of a number of developments sites throughout the town and through the impact of a single site – as set out in paragraph 6.13 above. However, this list does not cover all strategic junctions throughout the town.

6.18 An assessment of the key junctions throughout the town has been undertaken, in order to consider those junctions seen as the ‘primary’ links into and out of the town. It is important that any impact on these junctions is considered in order to ensure that the major routes into/out of the town are not adversely affected by the cumulative impact of employment. The impact on junctions of these nature is often difficult to attribute to a single development as any improvements are often costly and are not necessarily within close proximity of a single site, moreover the impact of a single development can often justify its impact is small and therefore a request to provide mitigation to the junction is not justified. Based on the results of the cumulative RDM impact assessment, and taking into account observational studies of Redditch it is considered that the following key junctions should be assessed in more detail to ensure that they can adequately deal with all traffic from the proposed future developments throughout the town:

**Table 6.4: Key junctions throughout the town impacted on by all sites**

Junctions	Type	Arms	Arm Names
2	Slip Junction	3	A4023/A435
3	Roundabout	4	A4189/A435
11	Priority	4	A435/Redditch Road/B4092
12	Priority	3	A435/A448
19	Slip Junction	4	A448/B4504
22	Slip Junction	6	B4096/B4184/A448/Birchfield Road
27	Roundabout	5	A441/Bordesley Lane/Middlehouse Lane
28	Priority	3	A441/B4101
30	Slip Junction	7	A4023/B4497/Moons Moat Drive

6.19 It should be noted, that a number of these junctions are also accountable to the Highway’s Authority, who should be consulted should any mitigation be proposed.

6.20 Due to the size, geographic spread and variable content of the Redditch development sites, whilst the impact of a single development is shown to generally only have a significant impact on the junction/s within its vicinity, the culmination of a number of development sites and their associated traffic will have a wider impact on junctions throughout the town and the SRN. It is

therefore recommended that assessments (and likely mitigation schemes) are completed on a number of junctions throughout the town to take into account the cumulative impact of numerous development sites. Subsequently, assessment and likely mitigation schemes should be apportioned to all sites to collectively provide the necessary improvements to junctions throughout the town.

### **Next Stage**

- 6.21 The above work has highlight the junctions likely requiring improvements based on the impact of a single site and the cumulative impact of a number of sites throughout the town, as well as the arms of the junctions having the greatest impact from development traffic, thus forming a strategic highway impact strategy for the town. The work has not provided the exact mitigation required, as this will require further detailed junction specific modelling through the use of relevant modelling packages. Moreover, the study aimed to show a high level assessment of junctions requiring mitigation, and proposing a strategy built upon this.
- 6.22 It is advised that as each site comes forward for planning application it is re-modelling through the RDM as further site specific details will be provided i.e. site access proposals, site specific trip rates, revised development quantum that will effect the overall results for the site.
- 6.23 Following this assessment the next stage of the work would be to assess the highlighted junctions in more detail, using appropriate junction modelling software (i.e. LINSIG, Arcady and Picady) to show if any suitable mitigation schemes are required at specific junctions. This work can be undertaken on a site by site basis, and requested as compulsory as part of any subsequent planning application, or the work can be undertaken by WCC / Halcrow to provide a series of mitigation proposals for junction improvements based on the impact of a single site or multiple sites. A contribution towards these improvements can then be sort through any subsequent planning application.