

Town Clerk | Swaffham Town Council

From: Parkes, Ian <ian.parkes@norfolk.gov.uk>
Sent: 05 March 2019 09:39
To: James Dean
Cc: Jill Skinner; JUDY ANSCOMBE; Kate Gordon; Les Scott; Paul Darby; Stan Sole; Town Clerk | Swaffham Town Council
Subject: RE: Liaison Meeting - 11th February
Attachments: Swaffham Through traffic note.docx; 001_SwaffhamNIS_ThroughTrafficAssessment - v4.1 - signed.pdf; MajorRoadNetwork_Map.pdf

Dear James,

Sorry it taken a little while but please find attached the final version of the WSP report on through traffic in Swaffham. I have also attached my note containing my observations on that report as agreed at our last meeting.

I have also attached the DfT map of the Major Road Network.

Once you have had a chance to digest the WSP report I'd be happy to answer any questions you might have. Thanks.

Regards, Ian.

Ian Parkes CEng MICE
 Infrastructure Development
 Tel: 01603 223288



Norfolk County Council



From: James Dean <jamesdean@uwclub.net>
Sent: 17 February 2019 17:02
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Subject: Liaison Meeting - 11th February

Hi Ian

Further to our recent meeting, we would be pleased if you could let us have a copy of your consultant's traffic survey results in connection with the projected N / S Relief Road and your conclusions from that work.

Also when available, your access study report for Theatre Street car park.

Many thanks

JAMES (TAFG Secretary)



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Swaffham – Network Improvement Study

1.0 Through Traffic Assessment

1.1 Key findings

Considering 24 hour flows 16% of traffic entering Swaffham on the A1065 from the south goes towards Kings Lynn and 27% goes to destinations north of Swaffham.

Across all the access points into Swaffham over 24 hours 45% of traffic is passing through, the remainder having a destination within Swaffham.

The evidence would suggest any relief road should serve the south to west move as much as the south to north move. That is any bypass should be to the west of the town.

A bypass link from the A1065 from the south to the A47 in the west could carry some 4,000 vehicle a day but only assuming it was also used by all north-south and all south-east movements too. This may not happen as it may be more attractive to continue through the town for these movements.

Even assuming all the north-south A1065 movements transfer onto a new south to west link, 4,000 is still a very low figure to justify a bypass. In order to attract funding for a bypass it would need a good Benefit to Cost Ratio (BCR) from an economic appraisal. Based on these figures, It is likely that it would be very difficult to make a strong economic case for funding.

1.2 Conclusions

This evidence suggest that it would be very difficult to make a case for a bypass link from the A1065 in the south to the A47 in the west.

1.3 Recommendations

On the basis of this study, it is very unlikely that the County Council would recommend further expenditure on developing a bypass solution for Swaffham.

If the Town Council and/or Breckland would like to undertake further investigation work the following activities would be recommended:

- Traffic modelling to determine how much of the north-south movements travel the additional extra distance to use a south to west link rather than staying on the A1065 through the town
- Preliminary investigations into a route alignment and potential constraints on the corridor between the A1065 in the south to the A47 in the west.
- The preparation of a high level cost estimate for an A1065 in the south to the A47 in the west bypass link

If there is a desire to undertake further work NCC would be happy to ask WSP to prepare a cost estimate for the work outlined above to help inform decisions on the next steps.

Ian Parkes - February 2019

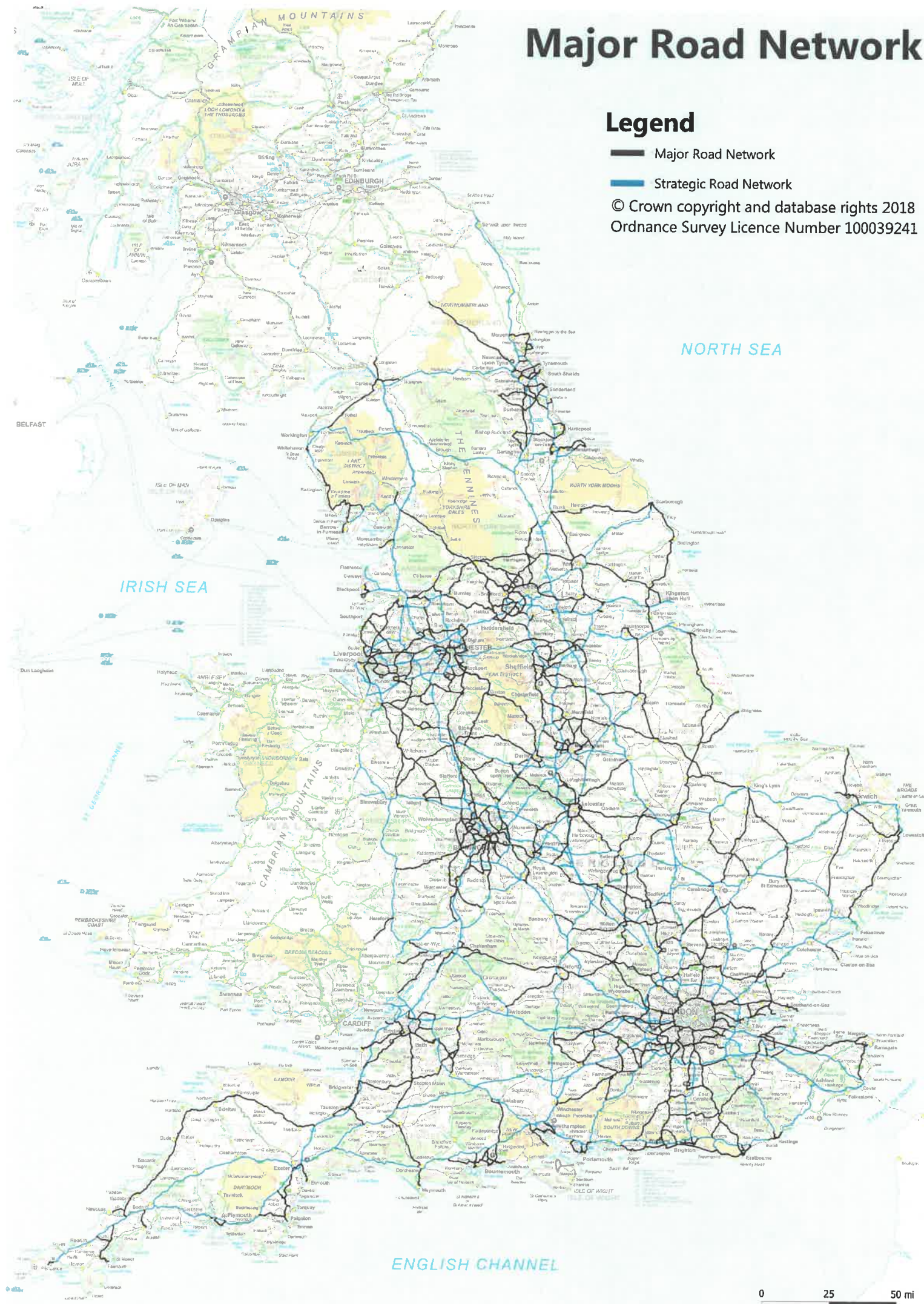
Major Road Network

Legend

Major Road Network

Strategic Road Network

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Norfolk County Council

SWAFFHAM NETWORK IMPROVEMENT STRATEGY

Through Traffic Assessment





Norfolk County Council

SWAFFHAM NETWORK IMPROVEMENT STRATEGY

Through Traffic Assessment

TECHNICAL NOTE (VERSION 4.1) PUBLIC

PROJECT NO. 70047677

OUR REF. NO. 001_SWAFFHAM_NIS

DATE: FEBRUARY 2019

WSP

62-64 Hills Road

Cambridge


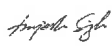
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GLOSSARY

Acronym	Meaning
AADF	Annual Average Daily Flow
ANPR	Automatic Number Plate Recognition
AQMA	Air Quality Management Area
ATC	Automatic Traffic Count
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
HGV	Heavy Goods Vehicle
NCC	Norfolk County Council
NIS	Network Improvement Strategy
NO ₂	Nitrogen Dioxide
RIS	Road Investment Strategy
SSSI	Site of Special Scientific Interest
VRM	Vehicle Registration Mark

1. INTRODUCTION

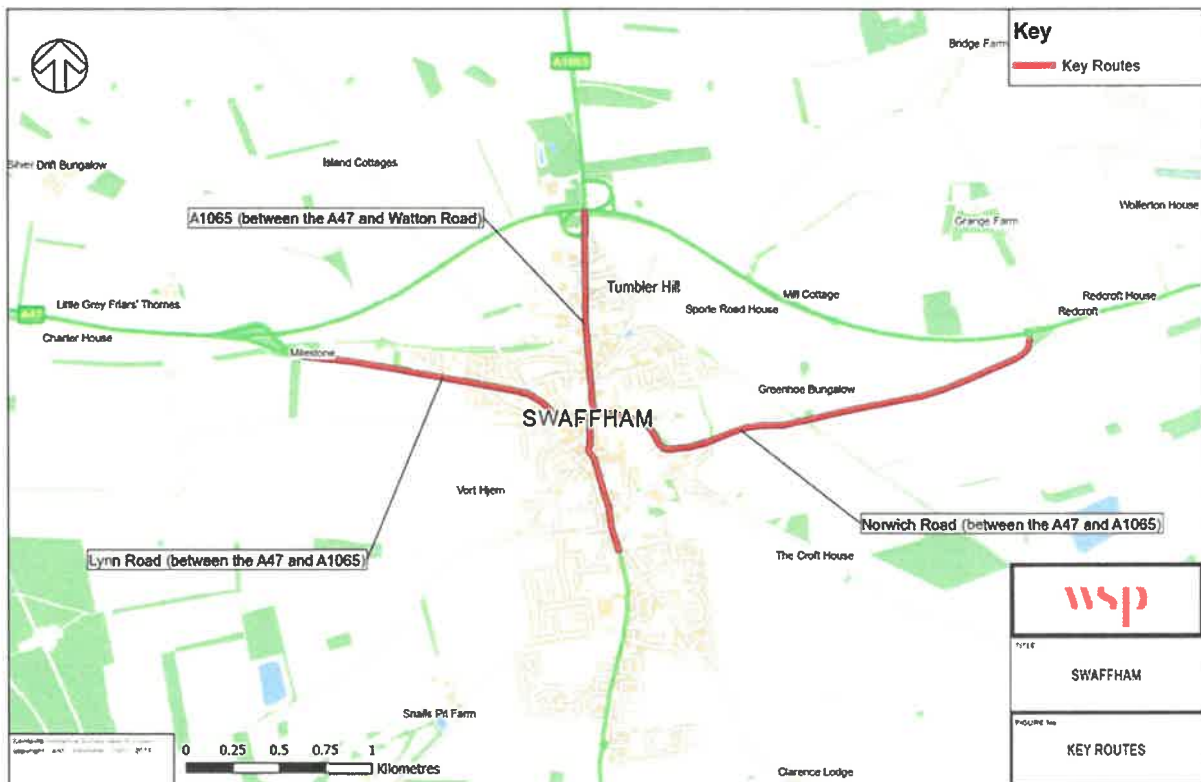
1.1. BACKGROUND

1.1.1. This technical note has been prepared by WSP for Norfolk County Council (NCC), as a part of the Swaffham Network Improvement Strategy (NIS). The purpose of the work is to carry out an assessment of the existing traffic conditions on the road network, in and around Swaffham, and use the knowledge gained from this, to determine whether there is a requirement for a bypass of the town.

1.1.2. The three main routes, which form the focus of this through traffic assessment, are outlined below and shown in **Figure 1**:

- A1065 (north-south) between the A47 and Watton Road
- Lynn Road (east-west) between the A47 and the A1065
- Norwich Road (east-west) between the A47 and the A1065

Figure 1 – Key routes considered



1.2. REPORT PURPOSE

1.2.1. This report outlines the current transport context, before analysing existing data and 2018 traffic survey data, in relation to the key routes. The data analysis aims to identify the peak periods of travel and the routes travelled, whilst providing a summary of the vehicle volumes, classifications and speeds. Subsequently, the report aims to determine the proportion of through-traffic (and thus the proportion of vehicles remaining within the town).

- 1.2.2. Utilising the information gained from the data, the report will consider the suitability of the existing key routes, and establish whether there is a need for any form of bypass. All work outlined in this report should be viewed in conjunction with other work carried out for the Swaffham NIS.

1.3. REPORT STRUCTURE

- 1.3.1. The remainder of the report is structured as follows:

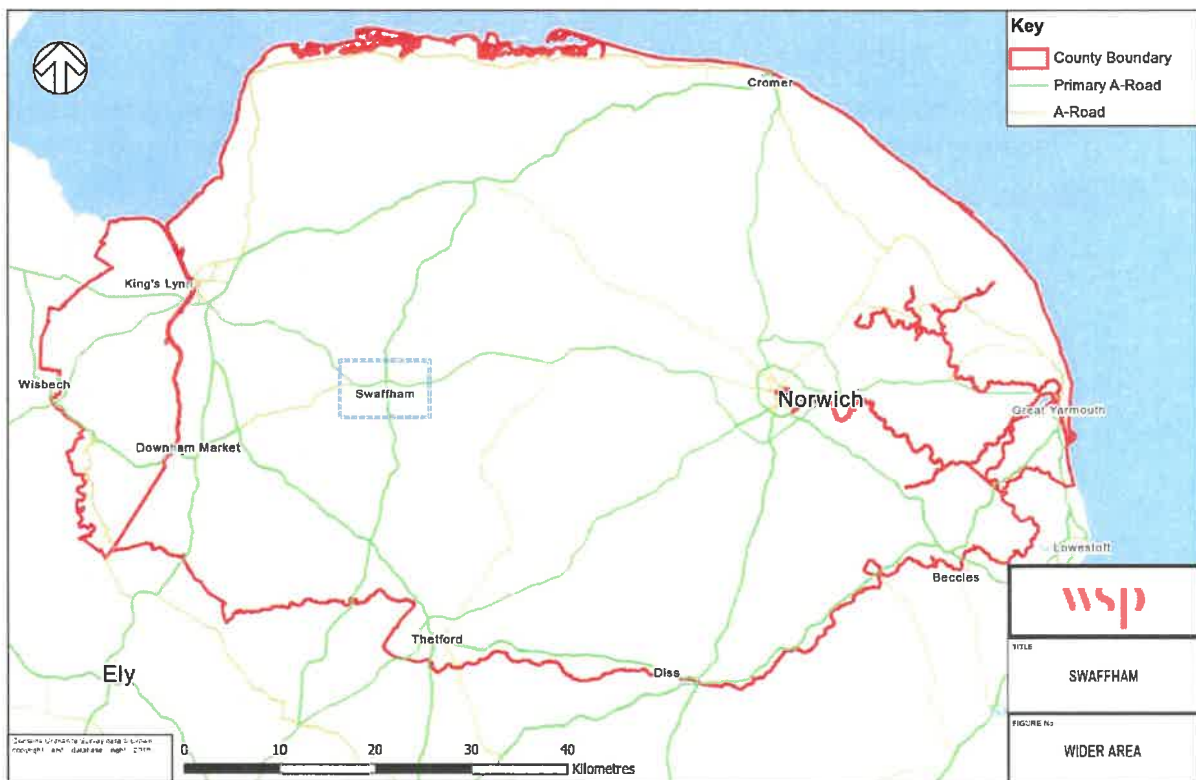
- **Chapter 2 – Transport Context**
 - describes the broad location of Swaffham, before detailing the existing road network and environmental designations in the vicinity of the town.
- **Chapter 3 – Traffic Data Analysis**
 - analyses the existing data available and traffic survey data undertaken for the study. It looks at the peak hour traffic flows, origin-destination information and vehicles speeds.
- **Chapter 4 – Conclusion**
 - summarises the analysis undertaken and indicates the predominant movements of any significant amounts of traffic that does not have an origin or destination in the town.

2. TRANSPORT CONTEXT

2.1. BACKGROUND

- 2.1.1. Swaffham is a market town within the county of Norfolk and district of Breckland. It is approximately 19km south-east of King's Lynn and 50km west of Norwich, with a population of 7,258 (Census, 2011). The location of Swaffham, within the wider Norfolk context, is shown in **Figure 2**.

Figure 2 – Swaffham within the wider area



2.2. ROAD NETWORK

- 2.2.1. Swaffham has two strategic highway connections to various settlements in Norfolk and further afield.

A47

- 2.2.2. The A47 runs east-west bordering the north of the town, and links Swaffham to Dereham and Norwich to the east and King's Lynn to the west. Lynn Road and Norwich Road previously formed the A47 through Swaffham town centre, until the 8km northern bypass was opened in 1981. The A47 is of dual carriageway standard from the A1122 Downham Road roundabout to the west of Swaffham, until approximately 600m after the A1065 junction, where it merges down to single carriageway standard. The A47 operates at national speed limits of 60mph for single carriageway and 70mph for dual carriageway.

- 2.2.3. Swaffham is connected to the A47 by three junctions, as follows:

- Grade separated A1065 junction to the north
- At-grade roundabout with Norwich Road and Norwich Road Services to the east
- Grade-separated Lynn Road junction to the west (restricted to eastbound exit and westbound entry only)

2.2.4. Due to congestion hot spots and planned development along the A47 through Norfolk, Highways England established an A47 corridor improvement programme within its 2015-2020 Road Investment Strategy (RIS). Work is planned to improve the A47 in numerous locations along its length, but not specifically at Swaffham.

A1065

2.2.5. The A1065 runs north-south through Swaffham, linking the town to Fakenham in the north and Mildenhall in the south. The A1065 is of single carriageway standard, entering Swaffham from the south along Brandon Road / London Street, before bearing right at a mini-roundabout with Market Place. The A1065 then intersects the previous A47 (Lynn Road and Norwich Road) at a signalised staggered crossroads, before heading north out of Swaffham along Station Street / Castle Acre Road to the grade-separated A47 junction. Throughout Swaffham, the speed limit along the A1065 is 30mph, until just south of the A47 where it increases to 40mph. North of the A47, the A1065 increases to the national speed limit for single carriageway (60mph).

OTHER ROADS

- 2.2.6. Other than the A47 and A1065, Swaffham links to neighbouring settlements to the south via a number of minor roads radiating from Swaffham town centre.
- 2.2.7. Swaffham is a historic town, centred around a large triangular market place, which provides ample parking off the main carriageway. The arterial streets into the centre of the town (Station Street, Norwich Road, London Street and Lynn Street) are wide, providing many options for travel through the town. However, the A1065 is the only major link for those wishing to travel north-south, directing vehicles through the centre of Swaffham.

2.3. ENVIRONMENTAL DESIGNATIONS

- 2.3.1. Breckland District Council deemed the A1065 corridor between Cley Road and Spinners Lane an Air Quality Management Area (AQMA) in 2017 due to nitrogen dioxide (NO₂) levels. To the south and south-west of Swaffham, there are numerous plots designated as Sites of Special Scientific Interest (SSSI) as part of the Breckland Forest SSSI and Breckland Farmland SSSI.
- 2.3.2. **Figure 3** highlights the extent of the AQMA in the centre of Swaffham and the SSSIs to the south and south-west of the town.

3. TRAFFIC DATA ANALYSIS

3.1. SURVEY TYPE & LOCATIONS

3.1.1. To determine the existing traffic conditions through Swaffham, a series of traffic surveys were undertaken between Thursday 12 July 2018 and Thursday 19 July 2018. The survey locations are identified in **Table 1** and shown in **Figure 4**.

Table 1 – Traffic survey locations

Road	Location			
A1065 Castle Acre Road [N]	Between	A47 [S]	and	Southacre Road [N]
Norwich Road	Between	Captains Close [W]	and	Green House Lane [E]
Watton Road	Between	Saxon Court [S]	and	Heathlands [N]
A1065 Brandon Road	Between	Sandringham Way [S]	and	Merryweather Road [N]
Lynn Road	Between	A47 [W]	and	Highfield Avenue [E]
A1065 Castle Acre Road [S]	Between	Admiral Wilson Way [S]	and	Green Way [N]

Figure 4 – Traffic survey locations

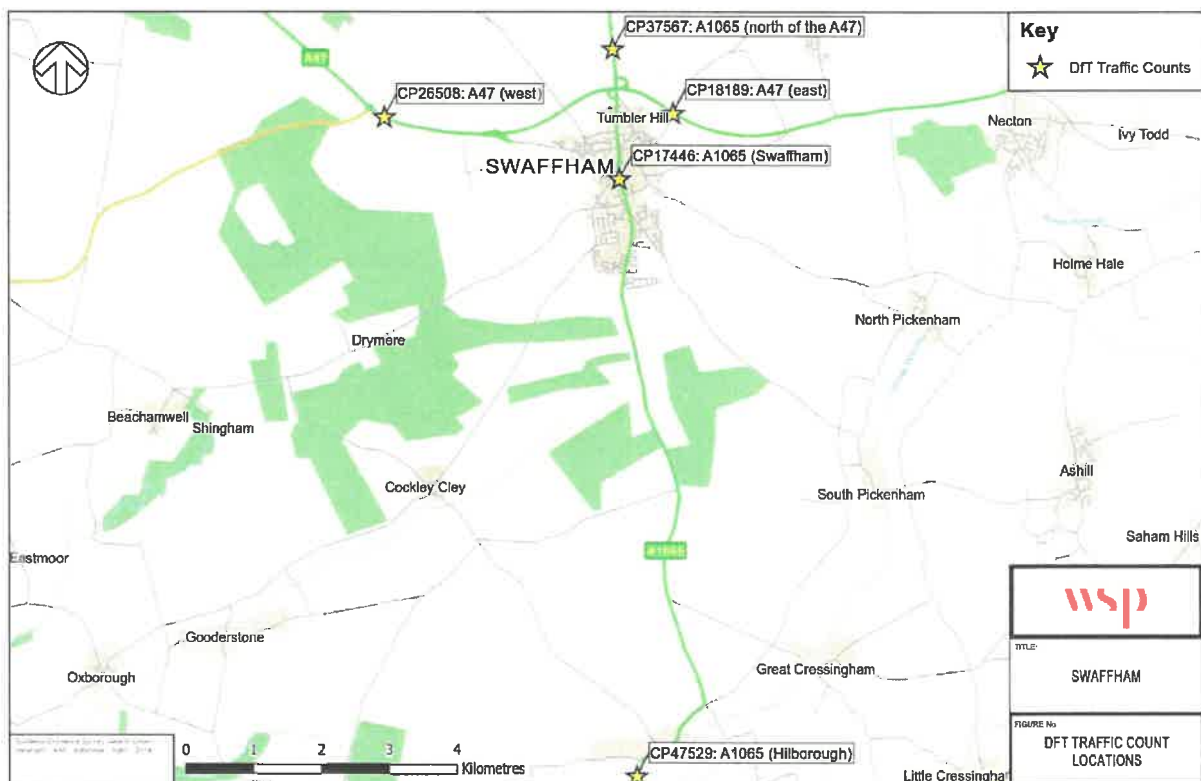


- 3.1.2. Automatic Traffic Count (ATC) data was collected continuously over the week period. This recorded bi-directional vehicle volume, speed and class at each of the survey locations in 15-minute time intervals. The ATC data was recorded to provide a daily profile of traffic flows, over a week period, which could then be analysed to identify the total volume of traffic, peak hours and classifications of vehicle types at each survey location.
- 3.1.3. To identify the level of through traffic routing through the town, Automatic Number Plate Recognition (ANPR) cameras were installed at the survey locations, establishing a cordon around the town to capture the majority of vehicular movements through the network. The ANPR survey was undertaken over a 12-hour period (07:00-19:00) and was conducted on Tuesday 17 July 2018.
- 3.1.4. The ANPR cameras, where possible, uniquely identified each vehicle based on its Vehicle Registration Mark (VRM), which allowed the 'inbound' movement (towards Swaffham town centre) of each vehicle to be matched with the 'outbound' movement (away from Swaffham town centre). Unmatched vehicles, those which were captured at either an 'inbound' or an 'outbound' ANPR location only, were assumed to be the component of traffic which had an origin or destination within Swaffham. A journey time threshold of 30-minutes was applied to the matched data to exclude trips that remain within the town for an extended period of time, and are unlikely to be considered through traffic.

3.2. TRAFFIC COUNTS

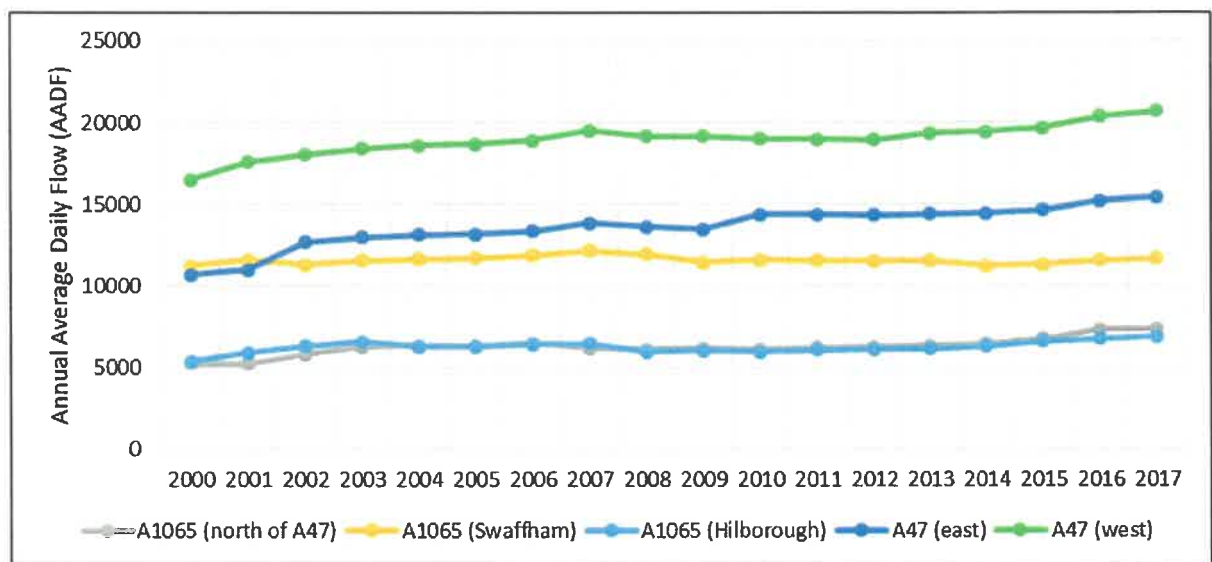
- 3.2.1. An assessment of the validity of the survey data has been undertaken by reviewing the Department for Transport's (DfT) Traffic Count database. This contains Annual Average Daily Flow (AADF) traffic data for the A1065 (north of the A47, within Swaffham and at Hilborough), and the A47 (at the extents of the dual carriageway section) from 2000-2017. **Figure 5** indicates the DfT traffic count locations.

Figure 5 – DfT traffic count locations



- 3.2.2. **Figure 6** demonstrates the AADF trend over time for the five sites. The data indicates that traffic levels on the A47 have increased by 7%, at both locations, over the most recent five years of data (between 2013 and 2017), with an average daily flow of over 15,000 vehicles.
- 3.2.3. A large growth in traffic is apparent on the A1065 to the north and south of Swaffham, within the 2013-2017 period (16% and 11% respectively). However, growth on the A1065 site within Swaffham is of 1%. It is evident that the AADF of the A1065 sites bordering Swaffham have a significantly lower traffic flow in comparison to the A1065 site within Swaffham (approximately 7,000 vehicles compared with approximately 12,000 vehicles).

Figure 6 – AADF for the A1065 and A47



Source: Department for Transport Traffic Counts (<https://www.dft.gov.uk/traffic-counts/>)

- 3.2.4. **Table 2** compares the latest DfT traffic count data (2017) with the survey data obtained in 2018. It compares two sites on the A1065, and indicates that the survey data collected for this study allows an assessment of the traffic conditions in and around Swaffham, upon which robust conclusions can be made.

Table 2 – Comparison of DfT data and survey data

Location	Annual Average Daily Flow (DfT, 2017)	Week Average Daily Flow (Survey, 2018)	Actual Difference	% Difference
DfT Site: A1065 (north of the A47) Survey Site: Castle Acre Road [N]	7,373	8,951	1,578	21%
DfT Site: A1065 (Swaffham) Survey Site: Castle Acre Road [S]	11,598	10,246	-1,352	-12%

3.3. PEAK HOUR IDENTIFICATION

- 3.3.1. The ATC data was analysed to identify the morning and evening peak hour across all the survey locations. The hourly two-way traffic flow for all vehicles was calculated for each of the surveyed days at each site. An average of the hourly totals, including Monday to Friday, was used to identify the average weekday peak hour. This was then averaged across all sites to determine the most representative peak hours across the Swaffham road network. The morning peak hour is observed between 08:00-09:00 and the evening peak hour between 16:00-17:00.
- 3.3.2. **Figure 7** provides the average hourly two-way traffic flow at each site for all the daytime hours (07:00-19:00), and **Table 3** provides the average two-way traffic flows for the identified morning and evening peak hour at each site.

Figure 7 – Average hourly two-way traffic flow profile

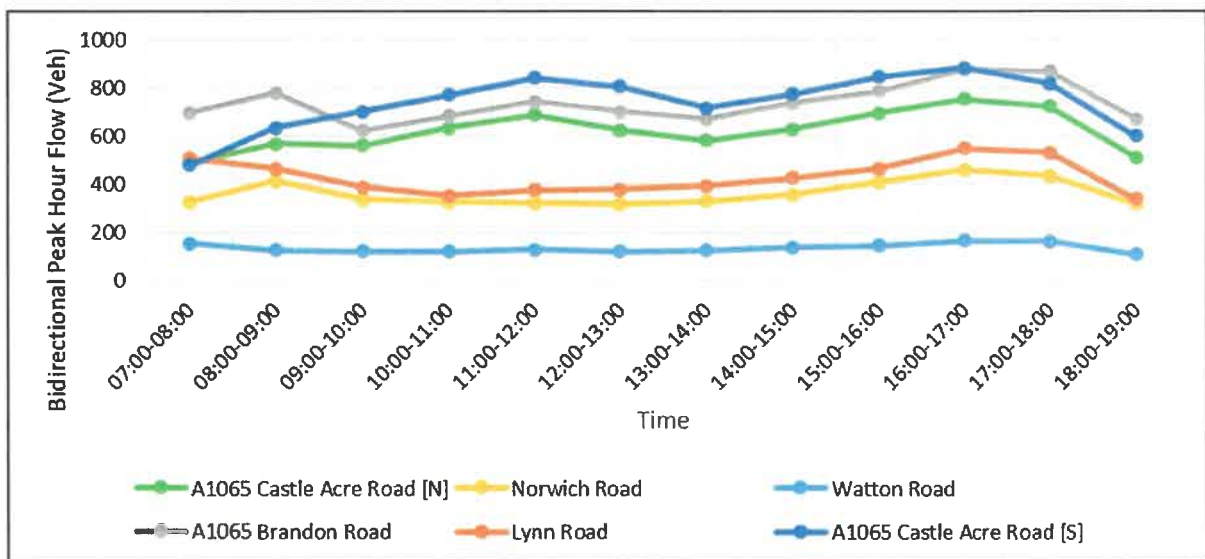


Table 3 – Peak hour two-way traffic flows

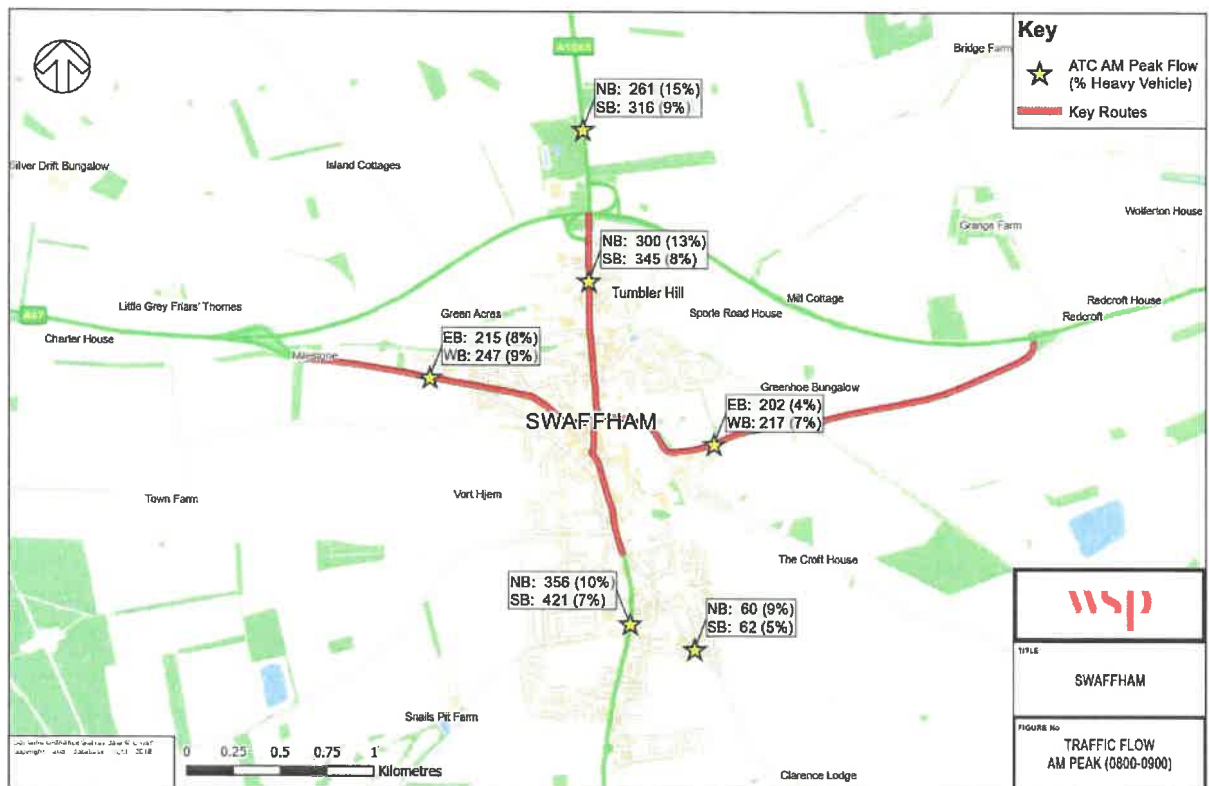
Site	Morning peak hour (08:00-09:00)	Evening peak hour (16:00-17:00)
A1065 Castle Acre Road [N]	567	755
Norwich Road	414	459
Watton Road	124	165
A1065 Brandon Road	777	877
Lynn Road	466	550
A1065 Castle Acre Road [S]	635	885
Average	497	615

- 3.3.3. The data demonstrates that the A1065 consistently exhibits higher average traffic flow through Swaffham in both peak hours, particularly on Brandon Road to the south of the town. This is consistent with it being the main north-south arterial route through the town.
- 3.3.4. Lynn Road and Norwich Road show similar flow levels which are consistent with the accesses to the A47 for westbound and eastbound traffic. Watton Road demonstrates the lowest two-way peak hour traffic flow, which is expected, due to it being a minor road in and out of Swaffham compared with the A47 and A1065.

3.4. PEAK HOUR TRAFFIC FLOWS

- 3.4.1. Following the identification of the peak hours, the directional traffic flows were analysed and the percentage component of heavy vehicles calculated. **Figure 8** and **Figure 9** show the peak hour traffic flow by direction and the percentage of heavy vehicles (in brackets), for the morning and evening peak hours respectively.

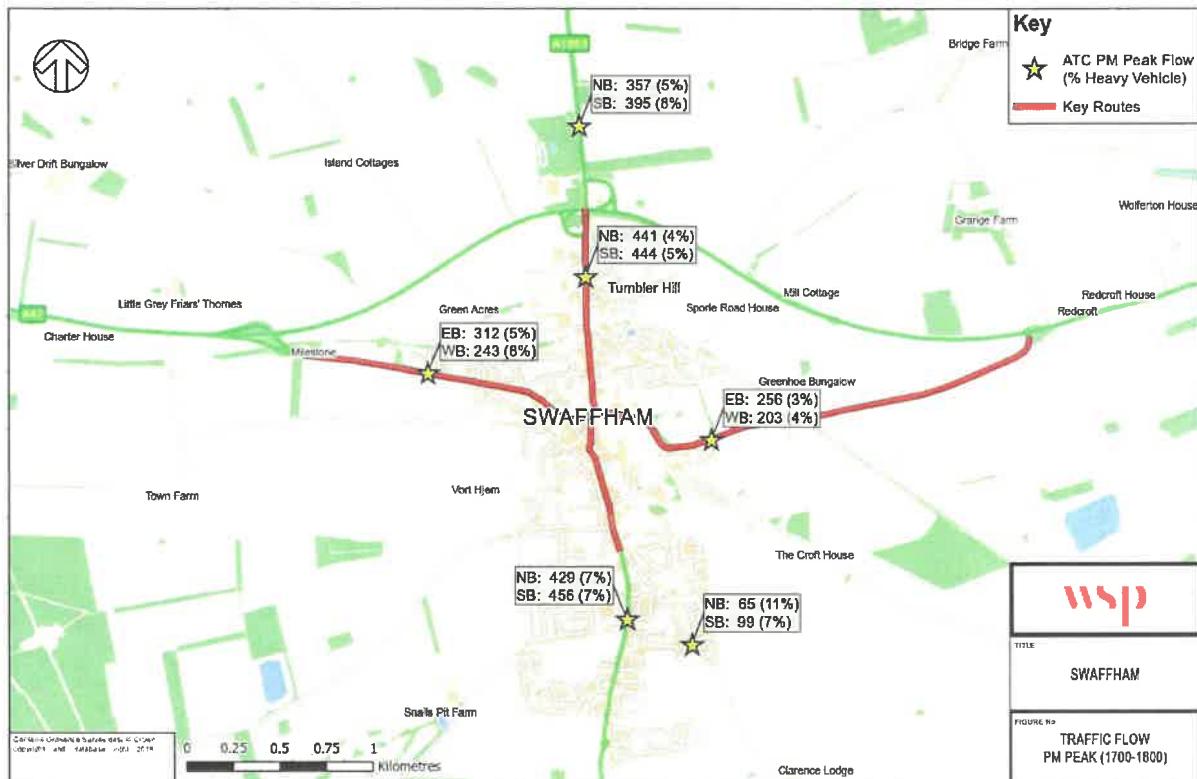
Figure 8 – Peak hour traffic flow and percentage heavy vehicles (morning peak hour)



- 3.4.2. During the morning peak hour, the vehicular flow along the A1065 is consistently of the magnitude of 260-360 northbound vehicles and 310-430 southbound vehicles. The largest hourly vehicle flow is recorded on the A1065 Brandon Road, with 421 southbound vehicles and over 350 vehicles continuing northbound towards the town centre. There is a higher proportion of Heavy Goods Vehicles (HGVs) heading northbound in the morning peak hour (10%-15% compared with 7%-9% southbound).

- 3.4.3. On Lynn Road, during the morning peak hour, 247 vehicles were observed travelling westbound to join the A47, whereas 215 vehicles were observed travelling eastbound towards Swaffham. To the east, on Norwich Road there is a similar magnitude of flow, however there are more westbound vehicles heading towards Swaffham (217) compared with the number of eastbound vehicles accessing the A47 (202). On both Lynn Road and Norwich Road, less than 10% in either direction are noted to be HGVs.

Figure 9 – Peak hour traffic flow and percentage heavy vehicles (evening peak hour)



- 3.4.4. During the evening peak hour, the vehicular flow along the A1065 is marginally higher than that of the morning peak hour with flows of 350-450 northbound vehicles and 390-460 southbound vehicles. The largest vehicle flow is again recorded on the A1065 Brandon Road, with 456 southbound vehicles and nearly 430 vehicles continuing northbound towards Swaffham. In the evening peak hour there is a similar proportion of HGVs heading northbound and southbound along the A1065 (4%-8%).
- 3.4.5. On Lynn Road, during the evening peak hour, more vehicles were observed travelling towards Swaffham than towards the A47 (312 eastbound vehicles compared with 243 westbound vehicles). Between 5%-8%, dependent upon direction, are noted to be HGVs. To the east, on Norwich Road, there is a similar magnitude of flow, however there are more eastbound vehicles heading away from Swaffham (256) compared with the number of westbound vehicles (203). Less than 5% of vehicles in either direction on Norwich Road are recorded to be HGVs.

3.5. VEHICLE SPEEDS

- 3.5.1. The directional vehicle speed has been calculated for the morning peak hour (08:00-09:00), interpeak period (10:00-16:00) and evening peak hour (17:00-18:00) at each of the six survey locations. This is an average of the 15-minute mean speed for each time segment across the survey days (excluding Saturday and Sunday). **Table 4** provides the average vehicle speed at each survey site with the speed limit enforced at that location.

Table 4 – Average directional vehicle speed (mph)

Site	Speed Limit	Morning peak hour (08:00-09:00)		Interpeak period (10:00-16:00)		Evening peak hour (17:00-18:00)	
		Northbound / Eastbound	Southbound / Westbound	Northbound / Eastbound	Southbound / Westbound	Northbound / Eastbound	Southbound / Westbound
A1065 Castle Acre Road [N]	40	48	43	46	42	48	41
Norwich Road	40	41	40	41	40	42	41
Watton Road	30	31	33	31	32	32	34
A1065 Brandon Road	30	24	21	28	30	30	32
Lynn Road	40	39	44	38	44	40	46
A1065 Castle Acre Road [S]	40	32	33	30	31	32	32

- 3.5.2. The data demonstrates that vehicles on the A1065 through Swaffham town centre (A1065 Castle Acre Road [S]), on average, travel below the enforced speed limit of the road by approximately 20% throughout each of the time periods analysed. Conversely, south of the town centre, on the A1065 Brandon Road, vehicles largely travel at the enforced speed limit, except for the morning peak hour, where average vehicle speeds are slightly reduced. North of the A47, the A1065 Castle Acre Road [N] operates with speeds above the 40mph speed limit (however, it is noted that the A1065 does become 60mph within close proximity of the survey site to the north). This suggests that vehicles experience slow, and congested conditions on the A1065 travelling through Swaffham town centre.
- 3.5.3. All other sites demonstrate average vehicles speeds that are marginally above, or at, the speed limit enforced at that location, suggesting that there are not any significant congestion issues.

3.6. VEHICLE ORIGIN-DESTINATIONS

- 3.6.1. To identify the level of through traffic routing through the town, ANPR cameras were installed at the survey locations, allowing the 'inbound' movement (towards Swaffham town centre) of each vehicle to be matched with the 'outbound' movement (away from Swaffham town centre). The ANPR survey was undertaken over a 12-hour period (07:00-19:00) and was conducted on Tuesday 17 July 2018.
- 3.6.2. High sample rates were achieved across all sites with an overall average of 93%. The number plate 'inbound' match rates were lower, with an average of 55%. A smaller match rate is expected due to the potential for vehicles to enter / exit the study area on non-surveyed routes.
- 3.6.3. For the through traffic analysis, the external sites have been used (excluding the A1065 Castle Acre Road [S] site) to create a cordon around Swaffham, enabling the majority of movements through the town to be identified. A journey time threshold of 30-minutes was also applied to the matched data to exclude trips that remain within the town for an extended period of time. U-turn movements (those vehicles matched at the same location for the 'inbound' and 'outbound' captures) represent a journey into and out of the cordon, without being captured at any other 'outbound' ANPR location.
- 3.6.4. Data in the subsequent sections is presented in matrices, whereby each row represents the 'inbound' movement (origin) and each column represents the 'outbound' movement (destination). The intensity of the colour is proportional to the volume of traffic.

MORNING PEAK HOUR

- 3.6.5. **Table 5** and **Table 6** provide the number of matched trips and percentage of through traffic origin-destination matrices for the morning peak hour, for all vehicles and HGVs respectively. **Figure 10** presents the percentage of 'inbound' through traffic diagrammatically. The data illustrates that 43% of the total observed 'inbound' trips (1,187) are through traffic.
- 3.6.6. The data indicates that prominent through traffic movements, in the morning peak hour, represent trips between the north and south of Swaffham. A total of 66% of 'inbound' vehicles from the A1065 Brandon Road are through traffic, of which, the majority (23%) route through Swaffham to leave the cordon via the A1065 Castle Acre Road [N] site. An additional 35% of through traffic from the A1065 Brandon Road have a destination of the A47 via either Lynn Road (22%) or Norwich Road (13%). Vehicles travelling from Watton Road share a similar south-to-west desire line, with 28% of through traffic utilising the A1065 to access the A47 westbound.
- 3.6.7. The number of vehicles carrying out the opposite movement (from the north of Swaffham to the south), also represents a large proportion of through traffic. Of 'inbound' vehicles at the A1065 Castle Acre Road [N], a total of 35% are through traffic, of which, 28% have a destination of the A1065 Brandon Road. Similarly, a large proportion of through traffic from the A47 (18% from Norwich Road and 15% from Lynn Road) have a destination south of Swaffham.
- 3.6.8. The number of HGVs, that represent through traffic, that travel through the study area in the morning peak hour is relatively low (4% of all vehicles). The main HGV movements are from the A1065 Brandon Road to Lynn Road (4%) and travelling north-south through the town on the A1065 (2% north; 2% south).

Table 5 – ANPR matches origin-destination matrix (morning peak hour): all vehicles

Site	A1065 Castle Acre Road [N]	Norwich Road	Watton Road	A1065 Brandon Road	Lynn Road	Matched	All Vehicles	% Through Traffic
A1065 Castle Acre Road [N]	13 4%	3 1%	2 1%	92 28%	2 1%	112	323	35%
Norwich Road	1 0%	8 4%	3 1%	39 18%	8 4%	59	211	28%
Watton Road	6 9%	3 4%	2 3%	0 0%	19 28%	30	67	45%
A1065 Brandon Road	85 23%	48 13%	4 1%	26 7%	82 22%	245	370	66%
Lynn Road	5 2%	5 2%	10 5%	32 15%	13 6%	65	216	30%

Table 6 – ANPR matches origin-destination matrix (morning peak hour): HGVs

Site	A1065 Castle Acre Road [N]	Norwich Road	Watton Road	A1065 Brandon Road	Lynn Road	Matched	All Vehicles	% Through Traffic
A1065 Castle Acre Road [N]	1 0%	0 0%	0 0%	6 2%	1 0%	8	323	2%
Norwich Road	0 0%	0 0%	0 0%	2 1%	2 1%	4	211	2%
Watton Road	0 0%	1 1%	0 0%	0 0%	0 0%	1	67	1%
A1065 Brandon Road	8 2%	3 1%	0 0%	0 0%	16 4%	27	370	7%
Lynn Road	0 0%	0 0%	1 0%	1 0%	1 0%	3	216	1%

Figure 10 – Absolute (and percentage) ‘inbound’ through traffic (morning peak hour)



INTERPEAK PERIOD

- 3.6.9. **Table 7** and **Table 8** provide the number of matched trips and percentage of through traffic origin-destination matrices for the interpeak period, for all vehicles and HGVs respectively. **Figure 11** presents the percentage of ‘inbound’ through traffic diagrammatically. The data illustrates that 45% of the total observed ‘inbound’ trips (6,087) are through traffic.
- 3.6.10. As with the morning peak hour, the interpeak period demonstrates similar key through traffic movements between the north and south of Swaffham. A total of 59% of ‘inbound’ vehicles from the A1065 Brandon Road are through traffic, of which, the majority (30%) route through Swaffham to leave the cordon via the A1065 Castle Acre Road [N] site. An additional 23% of through traffic from the A1065 Brandon Road have a destination of the A47 via either Lynn Road (13%) or Norwich Road (10%). Vehicles travelling from Watton Road share a similar south-to-west desire line, with 25% of through traffic utilising the A1065 to access the A47 westbound.
- 3.6.11. The number of vehicles carrying out the opposite movement (from the north of Swaffham to the south), also represents a large proportion of through traffic. Of ‘inbound’ vehicles at the A1065 Castle Acre Road [N], a total of 39% are through traffic, of which, 30% have a destination of the A1065 Brandon Road. Similarly, a large proportion of through traffic from the A47 (18% from both Norwich Road and Lynn Road) have a destination south of Swaffham.
- 3.6.12. The number of HGVs, that represent through traffic, in the interpeak period is relatively low (3% of all vehicles). The main HGV through traffic movements follow the same pattern as described in the paragraphs above.

Table 7 – ANPR matches origin-destination matrix (interpeak period): all vehicles

Site	A1065 Castle Acre Road [N]		Norwich Road		Watton Road		A1065 Brandon Road		Lynn Road		Matched	All Vehicles	% Through Traffic
A1065 Castle Acre Road [N]	79	5%	12	1%	31	2%	501	30%	21	1%	644	1,654	39%
Norwich Road	24	3%	57	6%	16	2%	176	18%	47	5%	320	952	34%
Watton Road	26	7%	15	4%	18	5%	28	7%	96	25%	183	381	48%
A1065 Brandon Road	555	30%	189	10%	18	1%	103	6%	236	13%	1,101	1,851	59%
Lynn Road	57	5%	48	4%	93	7%	223	18%	64	5%	485	1,249	39%

Table 8 – ANPR matches origin-destination matrix (interpeak period): HGVs

Site	A1056 Castle Acre Road [N]		Norwich Road		Watton Road	A1065 Brandon Road		Lynn Road		Matched	All Vehicles	% Through Traffic	
A1056 Castle Acre Road [N]	1	0%	1	0%	0	0%	38	2%	4	0%	44	1,654	3%
Norwich Road	1	0%	0	0%	1	0%	10	1%	3	0%	15	952	2%
Watton Road	1	0%	0	0%	0	0%	0	0%	6	2%	7	381	2%
A1065 Brandon Road	35	2%	17	1%	1	0%	0	0%	30	2%	83	1,851	4%
Lynn Road	5	0%	3	0%	3	0%	14	1%	3	0%	28	1,249	2%

Figure 11 – Absolute (and percentage) ‘inbound’ through traffic (interpeak period)



EVENING PEAK HOUR

- 3.6.13. **Table 9** and **Table 10** provide the number of matched trips and percentage of through traffic origin-destination matrices for the evening peak hour, for all vehicles and HGVs respectively. **Figure 12** presents the percentage of ‘inbound’ through traffic diagrammatically. The data illustrates that 44% of the total observed ‘inbound’ trips (1,349) are through traffic.
- 3.6.14. The evening peak hour demonstrates similar key through traffic movements, as the morning peak hour and interpeak period, with the key routes being between the north and south of Swaffham. A total of 64% of ‘inbound’ vehicles from the A1065 Brandon Road are through traffic, of which, the majority (27%) route through Swaffham to leave the cordon via the A1065 Castle Acre Road [N] site. An additional 33% of through traffic from the A1065 Brandon Road have a destination of the A47 via either Lynn Road (18%) or Norwich Road (15%). Vehicles travelling from Watton Road share a similar south-to-west desire line, with 19% of through traffic utilising the A1065 to access the A47 westbound.
- 3.6.15. The number of vehicles carrying out the opposite movement (from the north of Swaffham to the south), also represents a large proportion of through traffic. Of ‘inbound’ vehicles at the A1065 Castle Acre Road [N], a total of 34% are through traffic, of which, 28% have a destination of the A1065 Brandon Road. Similarly, a large proportion of through traffic from the A47 (31% from Norwich Road and 20% from Lynn Road) have a destination south of Swaffham.
- 3.6.16. The number of HGVs, that represent through traffic, in the evening peak hour is low (1% of all vehicles). The main HGV through traffic movements are between the A1065 Brandon Road and A1065 Castle Acre Road and between the A1065 Brandon Road and Lynn Road.

Table 9 – ANPR matches origin-destination matrix (evening peak hour): all vehicles

Site	A1065 Castle Acre Road [N]		Norwich Road		Watton Road		A1065 Brandon Road		Lynn Road	Matched	All Vehicles	% Through Traffic	
A1065 Castle Acre Road [N]	6	2%	4	1%	12	3%	105	28%	2	1%	129	376	34%
Norwich Road	3	2%	9	5%	2	1%	59	31%	3	2%	76	191	40%
Watton Road	5	7%	3	4%	0	0%	1	1%	14	19%	23	73	32%
A1065 Brandon Road	100	27%	57	15%	1	0%	19	5%	66	18%	243	377	64%
Lynn Road	9	3%	4	1%	36	11%	66	20%	10	3%	125	332	38%

Table 10 – ANPR matches origin-destination matrix (evening peak hour): HGVs

Site	A1065 Castle Acre Road [N]	Norwich Road	Watton Road	A1065 Brandon Road	Lynn Road	Matched	All Vehicles	% Through Traffic
A1065 Castle Acre Road [N]	0	0	0	4	0	4	376	1%
Norwich Road	0	0	0	0	0	0	191	0%
Watton Road	0	0	0	0	0	0	73	0%
A1065 Brandon Road	2	0	0	0	3	5	377	1%
Lynn Road	1	0	0	0	1	2	332	1%

Figure 12 – Absolute (and percentage) ‘inbound’ through traffic (evening peak hour)



ALTERNATIVE ROUTING

- 3.6.17. It is envisaged that a proportion of vehicles currently use local roads, such as New Sporle Road, to avoid congestion and delays on the A1065 through the centre of Swaffham. To quantify the number of vehicles using this north-south rat-run, the ANPR trip chain data has been analysed to distinguish between those that travel between the A1065 Castle Acre Road [N] site and the other external sites passing through the internal A1065 Castle Acre Road [S] site ('direct'), and those that do not pass through the internal site ('indirect').
- 3.6.18. **Table 11** indicates the volume of 'direct' and 'indirect' trips (all vehicles and HGVs) for the morning peak hour (08:00-09:00), interpeak period (10:00-16:00), evening peak hour (17:00-18:00) and across the 12-hour period that the ANPR cameras were active. **Figure 13** diagrammatically presents the volume of 'direct' and 'indirect' trips for the daytime hours.

Table 11 – A0165 ANPR trip chain routing (all vehicles and HGVs)

Trip Chain		Morning peak hour (08:00-09:00)		Interpeak period (10:00-16:00)		Evening peak hour (17:00-18:00)		Daytime hours total (07:00 – 19:00)	
		All	HGV	All	HGV	All	HGV	ALL	HGV
Northbound	Direct (trip chain includes internal A1065 Castle Acre Road [S] site)	91	9	619	22	110	3	1171	42
	Indirect (trip chain excludes internal A1065 Castle Acre Road [S] site)	6	1	43	12	5	1	86	19
Southbound	Direct (trip chain includes internal A1065 Castle Acre Road [S] site)	97	6	553	39	122	4	1183	67
	Indirect (trip chain excludes internal A1065 Castle Acre Road [S] site)	3	0	12	0	1	0	26	0

Figure 13 – A1065 ANPR trip chain routing (all vehicles and HGVs): daytime hours total



- 3.6.19. The data indicates that only a small number of vehicles take an 'indirect' route to avoid Swaffham town centre. A total of 15% of vehicles travelling between the A1065 Castle Acre Road [N] and the other external sites utilise alternative routes to bypass Swaffham town centre.
- 3.6.20. Throughout the daytime hours (07:00-19:00), 112 vehicles (of which, 19 are HGVs) are deemed to use local routes, like New Sporle Road, to avoid Swaffham town centre. A higher proportion of vehicles and HGVs use alternative routes through Swaffham when travelling northbound. In the morning peak hour, a total of nine vehicles made the trip between the external cordon of sites, without being captured at the internal A1065 Castle Acre Road [S] site. Of these, one was a northbound HGV trip. Similarly, in the evening peak hour, six vehicles are assumed to use an alternative route between the external cordon of sites excluding the A1065 Castle Acre Road [S] site, one of which was a northbound HGV.

ANNUAL AVERAGE DAILY FLOW

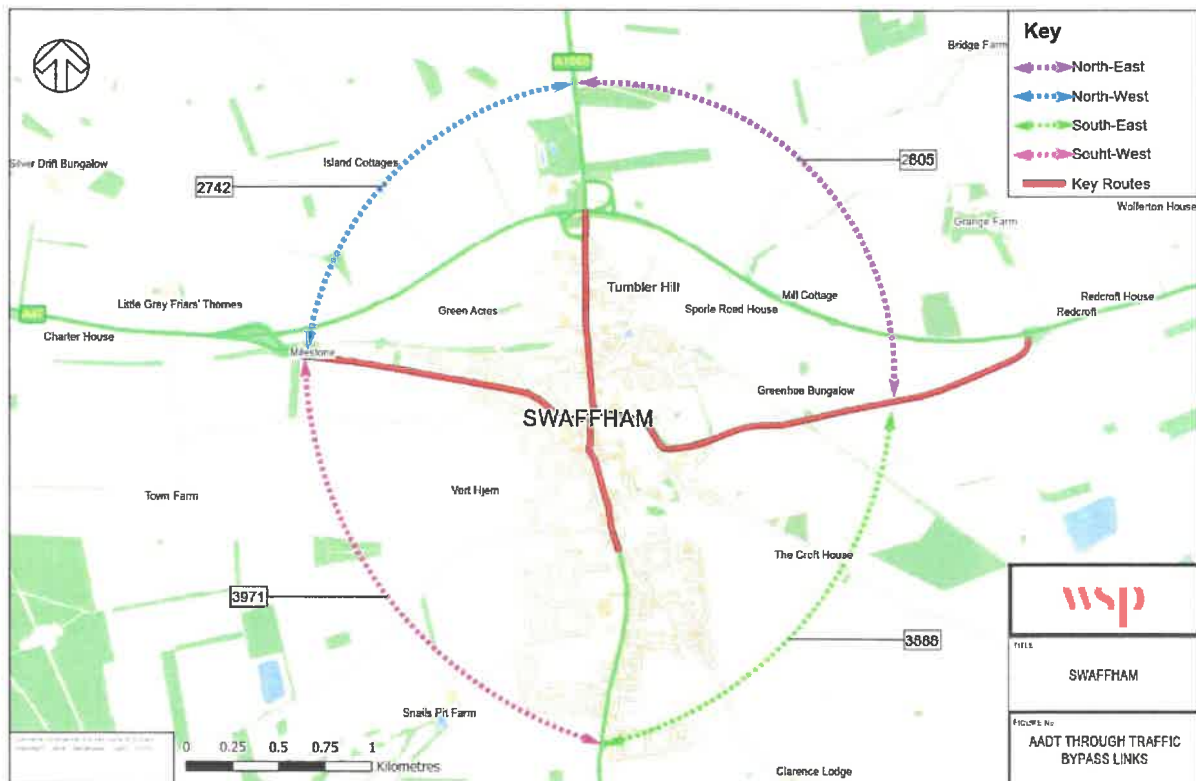
- 3.6.21. The 12-hour ANPR 'inbound' data was factored up to provide an AADF, to illustrate the daily volume of through traffic travelling through the study area. **Table 12** provides the AADF number and percentage of through traffic origin-destination matrix. The data illustrates that 45% of the AADF trips (16,005) are through traffic.
- 3.6.22. A total of 60% of 'inbound' vehicles from the A1065 Brandon Road are calculated to be through traffic, of which, the majority (27%) route through Swaffham to leave the cordon via the A1065 Castle Acre Road [N] site. An additional 27% of through traffic from the A1065 Brandon Road have a destination of the A47 via either Lynn Road (16%) or Norwich Road (11%). Vehicles travelling from Watton Road share a similar south-to-west desire line, with 30% of through traffic utilising the A1065 to access the A47 westbound.
- 3.6.23. The number of vehicles carrying out the opposite movement (from the north of Swaffham to the south), also represents a large proportion of through traffic. Of 'inbound' vehicles calculated at the A1065 Castle Acre Road [N], a total of 38% are through traffic, of which, 30% have a destination of the A1065 Brandon Road. Similarly, a large proportion of through traffic from the A47 (20% from Norwich Road and 19% from Lynn Road) have a destination south of Swaffham.

Table 12 – ANPR matches origin-destination matrix (AADF): all vehicles

Site	A1065 Castle Acre Road [N]	Norwich Road	Watton Road	A1065 Brandon Road	Lynn Road	Matched	All Vehicles	% Through Traffic
A1065 Castle Acre Road [N]	169 4%	34 1%	81 2%	1,276 30%	44 1%	1,604	4,278	38%
Norwich Road	43 2%	127 5%	37 1%	524 20%	103 4%	833	2,557	33%
Watton Road	73 7%	37 4%	32 3%	53 5%	294 30%	488	984	50%
A1065 Brandon Road	1,298 27%	551 11%	39 1%	256 5%	756 16%	2,900	4,869	60%
Lynn Road	124 4%	94 3%	288 9%	641 19%	153 5%	1,299	3,317	39%

- 3.6.24. Using each of the origin-destination pairs, the potential number of vehicles that would utilise a new north-east, south-east, south-west or north-west link around Swaffham were calculated – which is presented in **Figure 14**. A link to the south-west of Swaffham would attract the highest number of through traffic trips (3,971), and could potentially re-route a large volume of traffic away from Swaffham town centre, allowing greater connectivity to the A47 westbound, and onward travel along the A1065.

Figure 14 – Potential number of vehicles that would utilise a new link



- 3.6.25. The Design Manual for Roads and Bridges (DMRB) indicates the recommended carriageway standard to be provided dependent upon opening year AADF values (**Table 13**). Using the values presented in **Figure 14**, if a new link were to be developed, a single carriageway would be the recommended standard using existing flow data. However, with background and planned growth, there is potential to justify the requirement for a wide single carriageway standard link.

Table 13 – Recommended flow range for new links

Carriageway Standard	Opening Year AADF	
	Minimum	Maximum
Single 7.3m	Up to 13,000	
Wide single 10m	6,000	21,000
Dual two-lane all-purpose	11,000	39,000
Dual three-lane all-purpose	23,000	54,000
Dual two-lane motorway	Up to 41,000	
Dual three-lane motorway	25,000	67,000
Dual 4-lane motorway	52,000	90,000

Source: Design Manual for Roads and Bridges, Volume 5, Section 1, Part 3, TA 46/97, Table 2.1

SUMMARY

- 3.6.26. The origin-destination data presented in this section has demonstrated that, throughout each of the time periods analysed, between 43% and 45% of the total 'inbound' vehicles are through traffic. Of which, between 1% and 4% of these are HGV trips. The key movements for through traffic within Swaffham are between the A1065 Castle Acre Road [N] and A1065 Brandon Road sites, which is a logical conclusion as the A1065 is the only north-south arterial through the study area. Other key movements are between the A1065 Brandon Road and Lynn Road / Norwich Road (providing access to the A47), which is understandable as the A47 provides a strategic east-west link to King's Lynn, Dereham and Norwich.
- 3.6.27. Of vehicles undertaking a trip between the external survey locations, a proportion of vehicles are deemed to use local roads, such as New Sporle Road, to avoid congestion and delays on the A1065 through the centre of Swaffham (15%). A higher proportion of vehicles and HGVs use alternative routes through Swaffham when travelling northbound to avoid potential town centre congestion.
- 3.6.28. The AADF origin-destination matrix data illustrates that 45% of the total 'inbound' trips (16,005) are through traffic, with key movements following the pattern described above. Using the AADF data, the potential users of new links around Swaffham illustrated that a south-west link would attract the highest number of through traffic trips (3,971). A single carriageway standard road would be sufficient for this volume of traffic, however, background and planned growth, increase the justification for a wide single carriageway standard link.

4. CONCLUSION

4.1. SUMMARY

- 4.1.1. This technical note has provided an assessment of the existing traffic conditions on the road network in and around Swaffham, with a focus on the A1065 (between the A47 and Watton Road), Lynn Road (between the A47 and A1065) and Norwich Road (between the A47 and A1065).
- 4.1.2. A series of Automatic Traffic Counts (ATCs) and Automatic Number Plate Recognition (ANPR) surveys were undertaken at six strategic locations on the main radial routes around, and within, Swaffham. From the data collected, the morning and evening peak hours were identified to be 08:00-09:00 and 16:00-17:00.

TRAFFIC FLOWS

- 4.1.3. Over the five-year period from 2013-2017, the A1065 outside of Swaffham has experienced an increase in Annual Average Daily Flow (AADF) of 10% up to the magnitude of 7,000 vehicles, whereas within the town centre, growth is restrained to 1%, but with vehicle numbers of approximately 12,000. Analysis of the peak hour vehicle flows on the A1065 indicates that evening peak hour flows are marginally higher than that of the morning peak hour, with flows northbound between 260-360 in the morning peak hour and between 350-455 in the evening peak hour. Southbound flows are also marginally higher, with values between 310-430 in the morning peak hour and 390-460 in the evening peak hour.
- 4.1.4. The maximum percentage of Heavy Good Vehicles (HGVs) on the network is 15% which is observed on the A1065 Castle Acre Road [N] heading northbound, away from Swaffham, in the morning peak hour, which is likely to have originated from the A47. In the morning peak hour, of the traffic that is directing towards the centre of Swaffham, between 7%-10% are HGVs, whereas in the evening peak hour the percentage of HGVs passing through Swaffham is lower at 4%-7%.

VEHICLE SPEED

- 4.1.5. The vehicle speed data demonstrates that vehicles passing through the A1065 Castle Acre Road [S] site travel 20% below the enforced speed limit. On the A1065 Brandon Road, vehicle speeds are slightly reduced during the morning peak hour but are largely at the speed limit. The other roads operate with speeds at, or slightly above the speed limit, suggesting any congestion issues are confined to Swaffham town centre.

ORIGIN-DESTINATIONS

- 4.1.6. Origin-destination data was derived from ANPR data. High sample rates were achieved across all sites (93%) with the number plate 'inbound' match rate lower (55%), due to the potential for vehicles to enter / exit via a non-surveyed route. An outer cordon (excluding the Castle Acre Road [S] site) was used to enable the majority of movements through Swaffham to be identified. A journey time threshold of 30-minutes was applied to remove trips that remain within the town limits for an extended period.

- 4.1.7. The origin-destination data presented, demonstrated that, throughout each of the time periods analysed, between 43% and 45% of the total 'inbound' vehicles are through traffic. Of which, between 1% and 4% of these are HGV trips. The key movements for through traffic within Swaffham are between the A1065 Castle Acre Road [N] and A1065 Brandon Road sites, which is a logical conclusion as the A1065 is the only north-south arterial through the study area. Other key movements are between the A1065 Brandon Road and Lynn Road / Norwich Road (providing access to the A47), which is understandable as the A47 provides a strategic east-west link to Kings Lynn, Dereham and Norwich.
- 4.1.8. Of vehicles undertaking a trip between the external survey locations, a proportion of vehicles are deemed to use local roads, such as New Sporle Road, to avoid congestion and delays on the A1065 through the centre of Swaffham (15%). A higher proportion of vehicles and HGVs use alternative routes through Swaffham when travelling northbound to avoid potential town centre congestion.
- 4.1.9. The AADF origin-destination matrix data illustrates that 45% of the total 'inbound' trips (16,005) are through traffic, with key movements following the pattern described above. Using the AADF data, the potential users of new links around Swaffham illustrated that a south-west link would attract the highest number of through traffic trips (3,971). A single carriageway standard road would be sufficient for this volume of traffic, however, background and planned growth, increase the justification for a wide single carriageway standard link.

4.2. CONCLUDING REMARKS

- 4.2.1. The A1065 is experiencing long-term growth in traffic volumes, and with new housing developments to the south of the town, the A1065 is likely to continue experiencing increased traffic levels. Between 43% and 45% of vehicles entering the network are considered to be undertaking through traffic movements, of which, between 1% and 4% are HGVs. The majority of these through traffic movements are undertaken as part of a longer-distance north-south journey on the A1065, or vehicles exchanging between the A47 and A1065.
- 4.2.2. Through traffic movements are currently routing through Swaffham town centre, where vehicle speeds are significantly reduced. Within the town centre, a 30mph limit is enforced, but lower averages are actually achieved, thus implying that Swaffham is a pinch-point along the A1065 corridor. Due to slow moving traffic and subsequent congestion, this has also led to the designation of an Air Quality Management Area (AQMA) within the town centre.
- 4.2.3. The through traffic analysis indicates that approximately 4,000 vehicles are through traffic in the east-south and south-west directions respectively. Measures of re-routing this volume of traffic away from Swaffham town centre, would help to alleviate congestion within Swaffham town centre.



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