Transport Scotland

A96 Dualling: East of Huntly to Aberdeen

Traffic Data Analysis Report

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This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

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1 Introduction

1.1 Background

Since 2013 Transport Scotland has been progressing the preliminary engineering and strategic environmental assessment work along the A96 between east of Nairn and Aberdeen. The outcome of this preliminary strategic assessment work was presented at a series of public information exhibitions along the A96 corridor between Forres and Aberdeen in May 2015.

Based on the outcome of the preliminary work it was proposed to progress the next stage of design (i.e. Design Manual for Roads and Bridges (DMRB) Stage 2 assessment) in three geographic sections as shown in red in Figure 1.

Figure 1: A96 Dualling Extents

Following a successful tender, Amey OW Ltd and Ove Arup and Partners Ltd were appointed by Transport Scotland in July 2017 under a Joint Venture agreement for the purposes of delivering the A96 Dualling: East of Huntly to Aberdeen Multi-Disciplinary Support Services Contract.

Transport Scotland has requested that the west end of the Scheme will tie in to the existing A96 to the east of Huntly with a dual carriageway to single carriageway transition that allows a future dualling scheme to be developed westwards towards Huntly and beyond. The east end of the Scheme will tie in to the A96 junction with the Aberdeen Western Peripheral Route (AWPR) at Craibstone. An assessment of the existing dual carriageway, including junction provision, will be required between south of Inverurie and the proposed junction with the AWPR at Craibstone. The approximate scheme extents are shown in Figure 2.

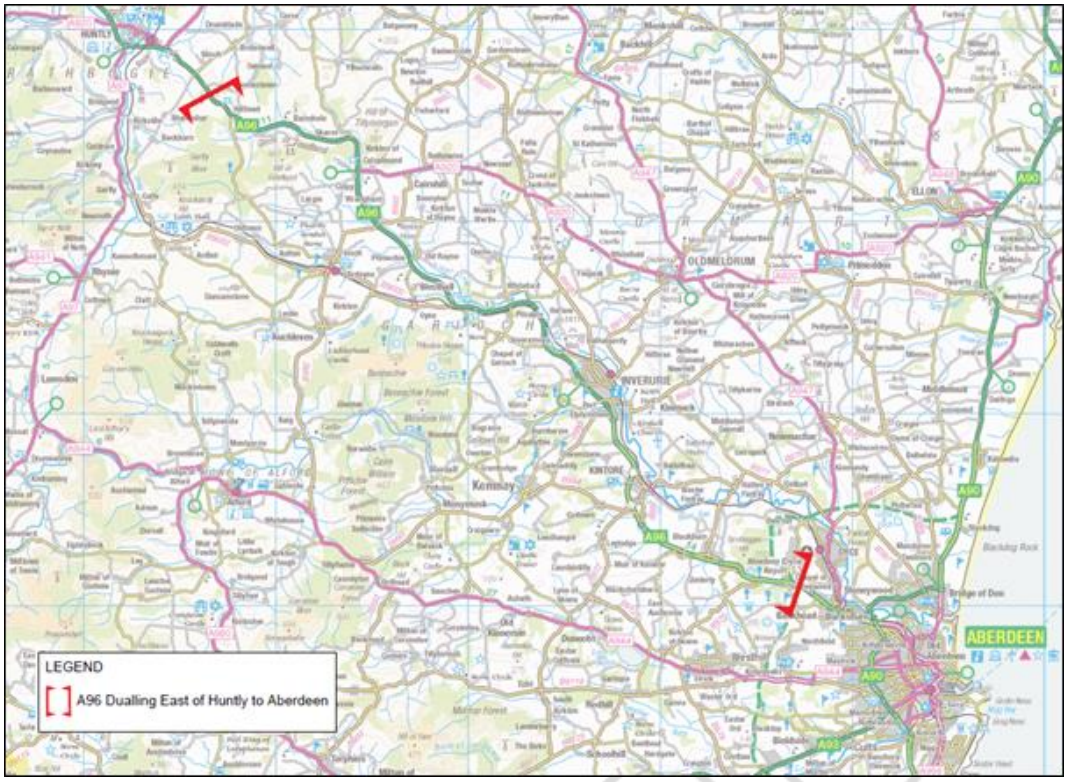

Figure 2: Scheme Extents - A96 Dualling East of Huntly to Aberdeen

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1.2 Purpose of This Report

The purpose of this report is to analyse the available traffic flow data to gain an understanding of the existing patterns of traffic behaviour on the A96 between Huntly and Aberdeen. Traffic using routes parallel to the A96, those with junctions for the A96 and those in the urban areas which are served by the A96, are also within the scope of this study.

The data was analysed for its quality, quantity and level of coverage of the network, with gaps identified. Future traffic surveys which would improve the level of understanding of traffic behaviour have been identified.

The report also analyses the structure of the A96 Corridor Route Assignment Model (CRAM) and indicates how the available data impacts the modelling exercise.

2 Summary of Available Traffic Data

Traffic data for the Huntly to Aberdeen section of the A96, as well as for major routes within the wider region, have been collated from multiple sources. These include data from permanent counter points operated by national and local government as well as temporary surveys procured for this scheme and for other traffic data and modelling projects.

The available data sets are presented in different formats with varying levels of detail, collection periods, reporting intervals and vehicle classification. They include:

- Link counts between two junctions;
- Junction turning counts for priority junctions and roundabouts;
- Automatic Number Plate Surveys (ANPR) tracking vehicles in an urban area;
- Roadside interview (RSI) data querying driver origins and destinations.

The available traffic data has been summarised in a network flow diagram for the A96 Huntly to Aberdeen scheme and is included as Appendix A.

2.1 Link Counts

Transport Scotland's permanent counter sites continuously perform link counts on the A96 as well as throughout the trunk road network. These are located at regular intervals between Huntly and Aberdeen.

Aberdeenshire Council have permanent counter sites throughout the non-trunk road network in its council area. Counts are performed on the A- and B-road network as well as on selected minor routes.

A further 29 link counts were collected by Sky High on areas in close vicinity to the A96 in November 2014. These were performed continuously over a period of one week and included a small number of A- and B- class roads; they were primarily focused on minor roads adjacent to or sharing junctions with the A96. A further set of eight link counts were performed by the same company on non-trunk A-roads (A97, A939, A944 and A947) to the same standard in May 2015.

A selection of additional temporary link counts were obtained to improve data coverage in the wider area away from the A96.

2.2 Junction Turning Counts

Junction turning counts were performed for Transport Scotland at junctions throughout trunk road network, including the A96, for use in construction of the Traffic Model for Scotland (TMfS) 12. Most A96 junctions with A- and B-class roads were surveyed between Huntly and Aberdeen, totalling 12 junctions. Data was collected for a single day at each site with surveys taking place over April and May 2013.

Tracsis performed classified junction turning counts at nine locations in Inverurie. Counts were performed on the same date in April 2017 and data was collected for peak periods of flow only with no data collection between 10:00 and 14:00.

2.3 Vehicle Routing Surveys

RSI surveys were performed to support the junction turning counts used to construct TMfS 12. Seven interview locations were used on the A96 on the same date in April 2013, two of which were located east of Huntly (at Skares, west of Colpy and at Thainstone, south of Inverurie). Vehicles in one direction were pulled aside and a census taker obtained details of the journey's origin, destination and purpose.

An ANPR survey was performed by Sky High in November 2014. Vehicle number plates were traced at eight count points in Inverurie to trace traffic routing into, through and out of the urban area, covering all the major accesses to the town including the A96.

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3 Traffic Count Data

3.1 Traffic Scotland Link Counts

Traffic Scotland's permanent link counter sites record traffic flow data continuously on the trunk road network. Traffic flows are recorded by direction and reported in hourly intervals. The level of vehicle classification varies, with sites using either unclassified counts (all vehicles), the Euro 6 classification system (differentiating motorbikes, cars, goods vehicles and PSVs) and the Euro 11 classification system (further differentiating cars and vans, LGVs from OGVs, and six different classes of rigid and articulated OGV).

The locations of the 12 count sites on the A96 between Huntly and the AWPR at Craibstone are shown in Figure 3 and listed in Figure 3**: Traffic Scotland permanent link count sites on A96**

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Table 1 with the links they survey.

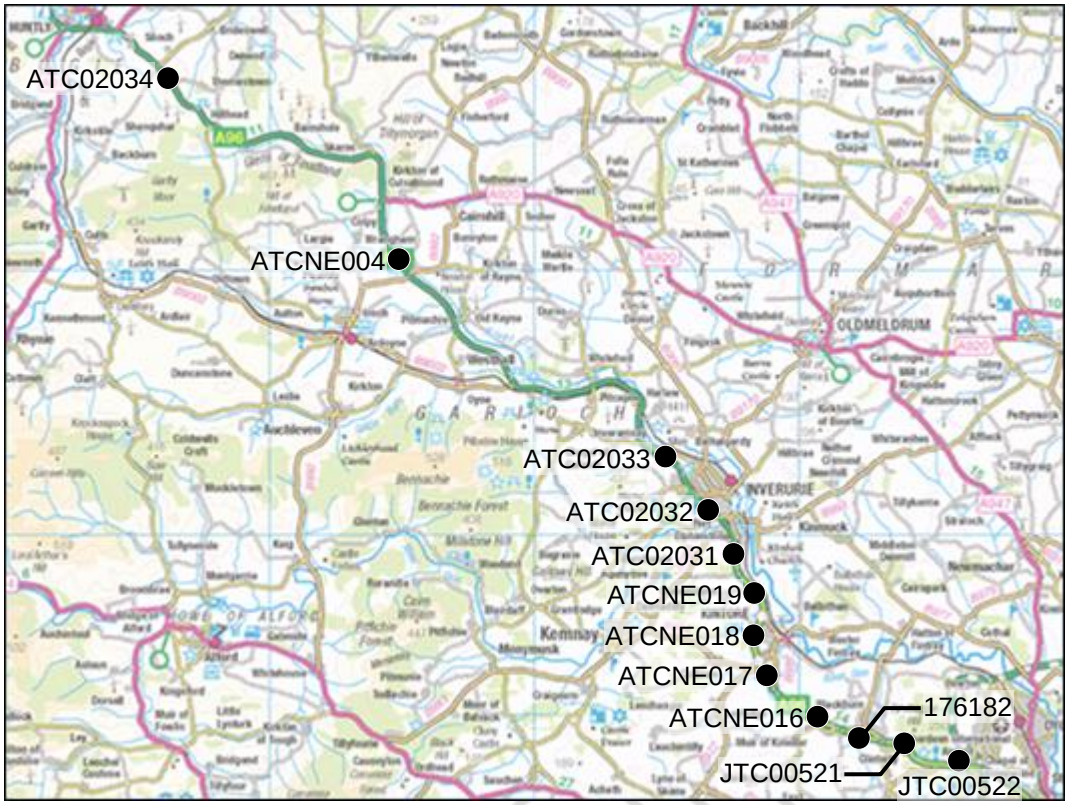

Figure 3: Traffic Scotland permanent link count sites on A96

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Table 1: Traffic Scotland permanent link count sites on A96

Counter	Link surveyed	Carriageway	Notes
ATC02034	Huntly East (A97) to Colpy (A920)	Single	
ATCNE004	Colpy (A920) to Kellockbank (B992)	Single	
ATC02033	Drimmies (C120C) to Blackhall (B9170)	Single	Inverurie bypass
ATC02032	Blackhall (B9170) to Port Elphinstone (B993)	Single	Inverurie bypass
ATC02031	Port Elphinstone (B993) to Thainstone (U114C)	Dual	
ATCNE019	Thainstone (U114C) to Tavelty (B987)	Dual	
ATCNE018	Tavelty (B987) to Gauchhill (B977)	Dual	Kintore bypass
ATCNE017	Gauchhill (B977) to Broomhill (B994)	Dual	Kintore bypass
ATCNE016	Broomhill (B994) to Kinellar (B973)	Dual	
176182	Kinellar (B973) to Clinterty (B973)	Dual	Blackburn bypass
JTC00521	Clinterty (B973) to Tyrebagger (B979)	Dual	Eastbound only
JTC00522	Tyrebagger (B979) to Craibstone (A90 AWPR)	Dual	

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Table **2** shows a sample of the data available from each counter. Data has been obtained for average traffic flows on weekdays (Mondays to Thursdays excluding bank holidays and the festive period) in 2012, 2014 and 2016. At each site the hour in which traffic peaks in each direction, the peak direction flow in vehicles per hour, and the overall Average Annual Weekday Traffic (AAWT) are shown.

The A96 between Huntly and Aberdeen runs on an approximately north-western/south-eastern axis; each count site identifies Westbound/Eastbound or Northbound/Southbound traffic based on the alignment of the link surveyed. For consistency, this report has converted all data to Westbound (towards Huntly) and Eastbound (towards Aberdeen).

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Table 2: Peak hour flows, timings and AAWTs at Traffic Scotland link count sites

Counter	2012			2014			2016		
	Peak hours		AAWT	Peak hours		AAWT	Peak hours		AAWT
	WB	EB		WB	EB		WB	EB	
ATC02034	519 17-18	428 07-08	8,519	447 06-07	534 17-18	9,353	436 06-07	539 17-18	9,579
ATCNE004	443 17-18	398 07-08	7,620	No data reported			No data reported		
ATC02033	641 17-18	706 07-08	10,266	800 17-18	1,022 07-08	13,642	1,354 17-18	1,371 07-08	22,220
ATC02032	1,219 17-18	1,324 07-08	19,663	1,091 16-17	1,291 07-08	19,793	No data reported		
ATC02031	1,989 17-18	1,831 07-08	29,483	1,910 16-17	1,791 07-08	30,661	1,855 16-17	1,796 07-08	31,051
ATCNE019	1,855 17-18	1,768 07-08	29,187	1,931 16-17	1,791 07-08	30,084	1,832 17-18	1,740 08-09	28,978
ATCNE018	1,719 17-18	1,736 07-08	25,586	Incorrect data segregation		27,585	Incorrect data segregation		27,055
ATCNE017	1,372 17-18	1,446 07-08	20,395	1,422 16-17	1,512 07-08	21,591	No data reported		
ATCNE016	1,673 17-18	1,877 07-08	26,097	1,717 16-17	1,910 07-08	27,527	No data reported		
176182	1,502 17-18	1,664 07-08	22,467	1,565 16-17	1,691 07-08	23,757	No data reported		
JTC00521	-	1,656 06-07	12,961	-	1,755 06-07	13,791	-	1,029 17-18	11,905
JTC00522	1,497 17-18	848 07-08	21,877	1,507 15-16	838 06-07	22,936	No data reported		

All 12 counter sites report link count data for 2012 but only 10 sites report for 2014 and by 2016 only six counter sites are reporting. Of those six, three report data which is not self-consistent in later years:

- At site ATC02034, the timing of the westbound and eastbound peaks flips between 2012 and 2014 with westbound traffic now peaking in the morning and eastbound in the evening. This is inconsistent with the 2012 data and almost all other counter sites which suggest morning traffic is greater eastbound;
- At site ATCNE018 in 2014 and 2016, westbound traffic accounts for over 75% of AAWT, with far less traffic progressing eastbound. This is inconsistent with surrounding counter sites and suggests that a proportion of eastbound vehicles are reported as travelling westbound. This may be due to changes in the road layout (e.g. contraflow) or incorrect data analysis at the site. The directional data has therefore been disregarded for those years.

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- At site JTC00521, the timing of the westbound and eastbound peaks flips between 2012 and 2014, again inconsistent with previous years' data and almost all other counter sites.

Only three counter sites therefore report traffic data which is self-consistent between 2012 and 2016, and none of those counters are located further east than Kintore. Traffic growth on the A96 east of Kintore in recent years is therefore difficult to quantify.

The available data shows that AAWTs and peak hour flows increase when progressing eastward from Huntly (2012 AAWT of 8,519) to Inverurie (maximum 2012 AAWT measured at 29,483). Traffic flow is slightly lower on the Kintore bypass (2012 AAWT 20,395 to 25,586) than on the Inverurie bypass. AAWTs stay at around the same value between Blackburn and Craibstone (around 22,000). The highest traffic levels are found on the section between Inverurie and Kintore.

The AAWT values at ATC02034 show traffic growth in the Huntly area of 12.4% between 2012 and 2016 or 3.0% per year. Traffic growth is more modest in the Inverurie and Kintore areas (ATC02031 reporting growth of 1.3% per year, ATCNE018 1.4%) and observed traffic volumes fall on the section immediately north of the Kintore bypass (ATCNE019 reporting growth of -0.2% per year).

Counter site ATC02033 (Inverurie Bypass north) is an outlier in that it shows very large growth of 116% between 2012 and 2016, equivalent to 21.3% per year. This is far higher than the surrounding counters; its location on the Inverurie bypass does not preclude the possibility that traffic growth, and rerouting away from congested junctions in Inverurie, would not generate these changes. The possibility that this counter data is erroneous, due to the counter being moved or vehicles being double counted, requires further investigation.

The morning peak hour is 07:00-08:00 at all but one counter site; JTC00521 on the Blackburn bypass reports an earlier peak of 06:00-07:00. Eastbound levels fall significantly between the hour 07:00-08:00 and 08:00-09:00, by approximately 20-30% at most counter sites. This is an important consideration as the modelled peak hour (discussed in Chapter 5) is 08:00-09:00.

The evening peak hour is 17:00-18:00 at all counter sites in 2012, but by 2014 six of the ten live counters report an earlier peak of 16:00-17:00 and one earlier still at 15:00-16:00. Almost all counters report similar traffic levels for the hours 16:00-17:00 and 17:00-18:00, so the modelled peak hour of 17:00-18:00 is likely to capture peak behaviour on the A96 accurately.

3.2 A96 Junctions

3.2.1 Junctions with A- and B-class roads

Junction turning counts are available for at most A96 junctions with A- and B-class roads road as shown in Figure 4 and listed in Figure 4**: Junction turning counts performed on A96**

Table 3. Traffic volumes for each movement through the junction were measured over a 12-hour period (07:00 to 19:00) of a single day and the classification of vehicle making that movement (car, LGV or OGV) was reported. The A96 junction turning counts were procured as a single set between 29 April and 2 May 2013.

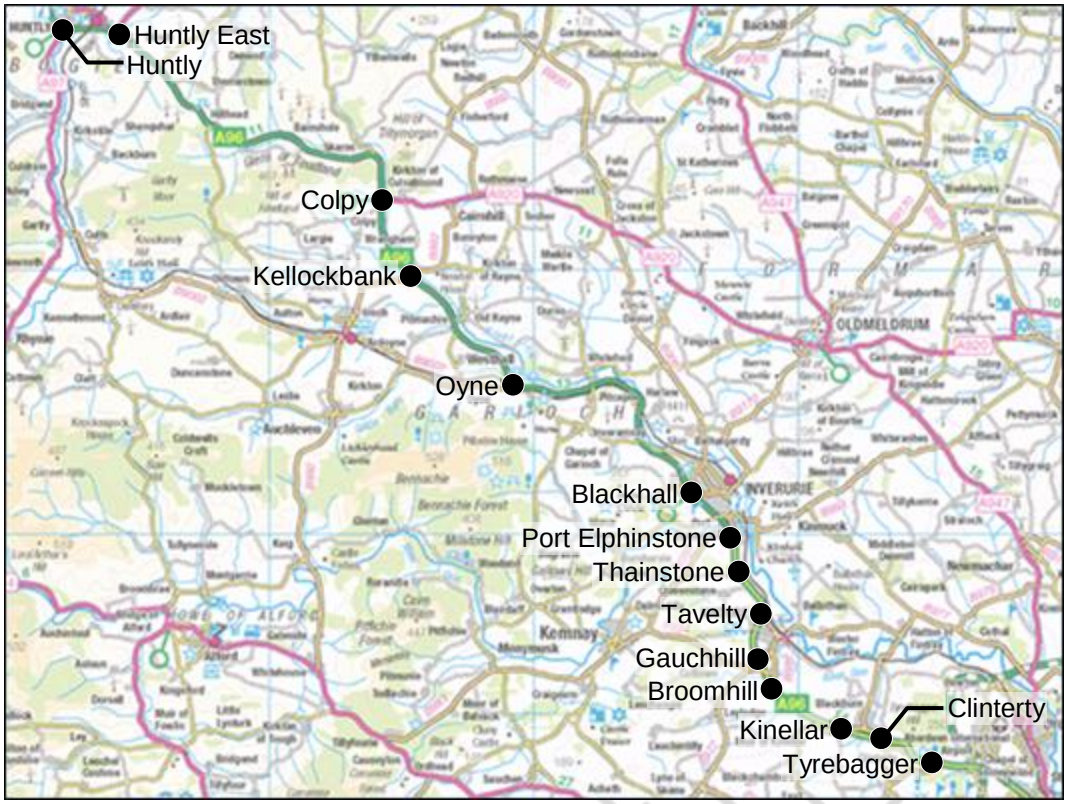

Figure 4: Junction turning counts performed on A96

Table 3: Junction turning counts performed on A96

Junction	Junction type	Non-A96 arms	
Huntly	Roundabout	A97 to Rhynie	A97 to Huntly
Huntly East	Priority	A97 to Banff	
Colpy	Priority	A920 to Oldmeldrum	
Kellockbank	Priority	B992 to Insch	B992 to Auchterless
Oyne	Priority (Fork)	B9002 to Oyne	
Blackhall	Roundabout	B9170 to Inverurie	C116C to Burnhervie
Port Elphinstone	Roundabout	B993 to Inverurie	B993 to Kemnay
Thainstone	Roundabout	U114C to Thainstone	U114C to paper mill
Tavelty	Grade separated	B987 to Kintore	U242C to Clovenstone
Gauchhill	Grade separated	B977 to Kintore	B977 to Lyne of Skene
Broomhill	Roundabout	B994 to Kintore	U242C to Broomhill
Kinellar	Roundabout	B973 to Blackburn	C99C to Glasgoforest
Clinterty	Roundabout	B973 to Blackburn	C92C to Clinterty
Tyrebagger	Priority junction	B979 to Clinterty	

The surveys predate the remodelling of Blackhall Roundabout when a fifth arm (Corsmanhill Drive) was added; the surveys refer to a four-armed junction. Port Elphinstone Roundabout is identified on road signs as Inverurie Roundabout, but is referred to as Port Elphinstone in this report to prevent ambiguity. The surveys also predate the construction of Craibstone Roundabout.

For each junction, the total number of movements over the 12-hour survey, and the hours in which the number of movements peaks, is shown in Table 4. The grade separated junctions at Tavelty and Gauchhill are omitted from this table as the turning counts conducted refer to the exit slips only; the total flow on the grade-separated A96 has not been observed.

Table 4: Total traffic demand and peak hour timings at A96 junctions

Junction	Total junction movements	A96 entry flow		Peak hours for total flow	
		From west	From east	AM	PM
Huntly	12,077	3,879	4,321	08:00-09:00	17:00-18:00
Huntly East	9,574	4,483	4,006	08:00-09:00	17:00-18:00
Colpy	7,386	3,299	3,194	07:00-08:00	17:00-18:00
Kellockbank	7,465	2,996	3,268	07:00-08:00	16:00-17:00
Oyne	9,495	3,171	4,880	07:00-08:00	17:00-18:00
Blackhall	21,899	4,383	8,008	07:00-08:00	17:00-18:00
Port Elphinstone	28,666	7,799	14,091	07:00-08:00	17:00-18:00
Thainstone	28,396	12,904	13,837	07:00-08:00	17:00-18:00
Broomhill	23,214	8,045	11,650	07:00-08:00	16:00-17:00
Kinellar	24,148	10,539	9,411	07:00-08:00	17:00-18:00
Clinterty	22,476	8,753	10,490	07:00-08:00	17:00-18:00
Tyrebagger	22,735	10,362	11,694	07:00-08:00	17:00-18:00

The busiest junction surveyed in terms of total traffic movements is Port Elphinstone Roundabout at the south end of the Inverurie bypass. The largest number of total entries from the A96 east are recorded here. suggests that significant volumes of traffic turn between Inverurie and the A96 east of here. Thainstone Roundabout has similarly high volumes of entering traffic although there are far fewer turning movements here.

The rise and fall of total A96 junction entries along the route are consistent with the link flows described in

Table **2**.

The observed peak hour for total junction flow is 07:00-08:00 in the morning and 17:00-18:00 in the evening, with two exceptions in each case. While this corroborates the data in

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Table **2**, the ANPR survey discussed in Chapter 4.2 suggests that certain movements, particularly in the Inverurie area, may have an AM peak that occurs partially before 07:00; the true peak periods may not therefore have been captured.

The total number of vehicles approaching each junction from a non-A96 arm in the identified peak hours is shown in Table 5.

Table 5: Entries and exits from side roads at A96 junctions

Junction		Link to/from	07:00-08:00 flow		17:00-18:00 flow	
Location	Road		Entries	Exits	Entries	Exits
Huntly	A97	Huntly	157	174	341	251
	A97	Rhynie	78	69	94	127
Huntly East	A97	Banff	94	7	94	9
Colpy	A920	Oldmeldrum	59	110	147	76
Kellockbank	B992	Cairnhill	20	12	21	19
	B992	Insch	99	67	89	115
Oyne	B9002	Oyne	214	53	92	289
Blackhall	B9170	Inverurie	733	410	712	951
	C116C	Highclere	219	154	243	315
Port Elphinstone	B993	Inverurie	658	388	551	1,016
	B993	Kemnay	68	39	85	84
Thainstone	U114C	Paper mill	6	54	47	8
	U114C	Thainstone	51	145	228	56
Tavelty	B987	Kintore	191	124	167	286
	U242C	Clovenstone	26	24	23	7
Gauchhill	B977	Kintore	151	61	130	226
	B977	Lyne of Skene	292	435	565	354
Broomhill	B994	Kintore	544	257	298	618
	U242C	Broomhill	6	4	10	5
Kinellar	B973	Blackburn	193	158	211	287
	C99C	Glasgoforest	285	368	422	319
Clinterty	B973	Blackburn	347	324	392	320
	C92C	Clinterty	180	16	77	67
Tyrebagger	B979	Clinterty	72	53	51	307

The junctions with the most entries from and exits to side roads are the Blackhall and Port Elphinstone roundabouts on the Inverurie bypass. Most of this traffic routes via the eastern A96 arm of these roundabouts which is consistent with AAWTs being higher east of Inverurie than west of it, as per

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Table **2**.

The junctions show a general trend in that the number of vehicles joining the A96 from the side roads is greater than the number leaving in the AM peak and vice versa in the PM peak. Given that most turning movements to the A96 proceed eastbound rather than westbound, this is consistent with the A96 serving as a commuter route for workplaces in Aberdeen.

Exceptions to this trend have been noted where more AM peak traffic is observed to leave the A96 than join it in the AM peak, suggesting that traffic is preferring an alternative route between its origin and Aberdeen:

- The number of exits from the A96 at Colpy exceeds entries in the AM peak; it is unlikely this volume of traffic is commuting to Oldmeldrum so this is consistent with the A920 being used as an alternative route to the A96;
- Thainstone Business Park attracts more traffic than it produces in the AM peak. This is consistent with employment opportunities being located there;
- More traffic exits the A96 for the B977 southbound at Gauchhill Junction than enters there in the AM peak. This does not represent a direct route to major settlements such as Westhill or Kingswells and therefore is also likely to form an alternative commuting route to Aberdeen via the B977 and A944;
- More traffic exits the A96 to the C99C Glasgoforest arm of Kinellar Roundabout than enters there in the AM peak. Although this does represent a logical route between the A96 and Westhill or Kingswells, it is a route recommended by web-based route planning websites to the A90 south of Stonehaven, and is much more likely being used for this purpose.

Given these assumptions, there is a significant volume of traffic which could commute on the A96 to Aberdeen but chooses not to for various reasons. It is likely that such behaviour will be modified once the AWPR is open as it will provide an alternative way to avoid congestion in Aberdeen. Therefore, these junctions should be re-surveyed once traffic behaviour on the AWPR has stabilised.

It will also be necessary to resurvey Blackhall Roundabout, which has been remodelled and a new arm added since the surveys were performed.

3.2.2 Junctions with C- and U-class roads

Junction turning counts were not performed at the A96 junctions with lower standard roads (C- and U- classifications). However, the volumes of turning traffic at many of these junctions can be estimated by link counts performed on the minor road approaches to those junctions.

The locations where minor road junction approach link counts have been performed are shown in Figure 5. The counters were installed temporarily for a single day and directional counts were reported at hourly intervals. The counts date from either April 2013, matching the date of the junction turning count surveys, or from November 2014. All are located between Huntly and Inverurie.

Figure 5: Locations of link counts on approach and exit from A96 minor junctions

The total flow to and from the A96 for each minor road junction approach link is shown in **Table 6** for the A96 traffic peak hours (07:00-08:00 and 17:00-18:00) as identified in the major road link and junction surveys. At the two Pitmachie junctions, more than one approach from the local road network was surveyed so each is shown in the table.

Table 6: Link counts on approach to and exit from A96 minor junctions

Junction		Link to/from	Year	07:00-08:00 flow		17:00-18:00 flow	
Location	Road			to A96	from A96	to A96	from A96
Leys of Dummuies	C81S	Gartly	2014	4	2	3	5
	C79S	Drumblade	2014	9	7	12	17
Hillhead	C82S	Brideswell	2014	7	0	2	7
	C66S	Insch	2013	9	13	21	19
Skares	C87S	Ythanwells	2014	15	4	3	17
Colpy South	C68S	Largie	2014	7	7	8	7
Pitmachie North	C59S	Bonnyton	2014	0	1	1	2
	C60S	Durno	2014	3	5	4	3
	U128S	Strathorn	2014	1	1	6	4
Pitmachie South	U61S	Oyne	2014	4	4	4	8
	U61S	Ardoyne	2014	5	6	6	7
Mill of Carden	C120C	Chapel of	2013	12	98	220	15

Junction		Link to/from	Year	07:00-08:00 flow		17:00-18:00 flow	
Location	Road			to A96	from A96	to A96	from A96
		Garioch					
Pitcaple	C117C	Chapel of Garioch	2013	12	3	10	23
	C83C	Whiteford	2013	69	44	56	69
Drimmies	C120C	Balquhain	2013	22	119	186	29
	C120C	Inverurie	2013	113	83	99	70

The busiest minor road junctions surveyed are the Mill of Carden and Drimmies junctions, both using the C120C via Chapel of Garioch. This is a very small settlement unlikely to generate a significant number of trips, so it is likely that these are through trips avoiding Inveramsay Bridge; before 2016 this low and narrow arched bridge was located on the A96 mainline necessitating shuttle working and causing delays. New surveys are required to determine if this routing has been eliminated by the improvements to the A96.

The other junctions with significant entry and exit flows are:

- The north arm of the Pitcaple junction, the C117C to Whiteford. Whiteford and neighbouring Logie Durno constitute a small settlement and there is quarrying activity nearby which will contribute to use of this junction;
- The south arm of Drimmies junction, the C120C to Inverurie. This is a northern entrance to Inverurie and therefore traffic from the north of the town using this junction would be expected.

None of the other links surveyed has a peak bidirectional flow greater than 40 vehicles per hour.

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3.2.4 Junctions not surveyed

The locations of and minor road junctions on the A96 not surveyed either as a junction turning count or using a proximal link count are shown in Figure 6.

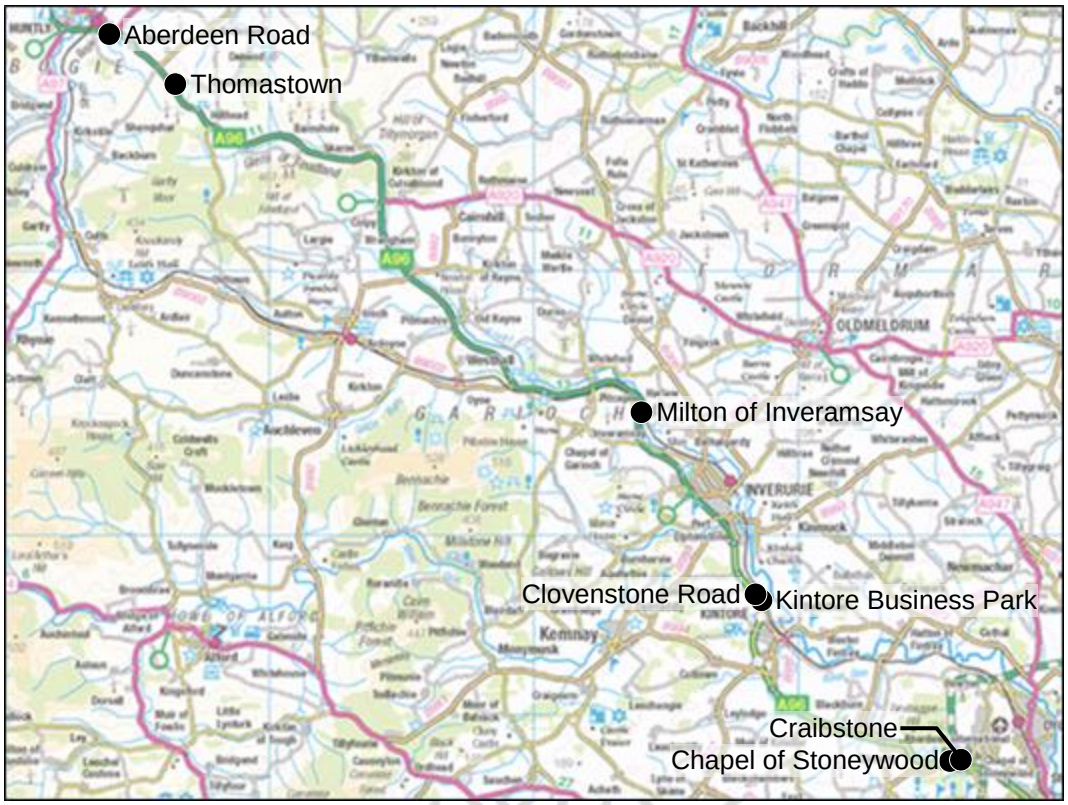

Figure 6: Locations of un-surveyed junctions on A96

The A97 Aberdeen Road junction near Huntly is used to access Huntly Station. It represents a logical route between central and eastern Huntly and the A96 eastbound. There is a difference between the adjacent junction flows of 35 vehicles eastbound in the AM peak hour and over 200 vehicles westbound in the PM peak hour, suggesting that some vehicles do turn off for Huntly here.

The staggered T-junction with the C53C and C89C at Chapel of Stoneywood, between Blackburn and Craibstone, serves local businesses and allowed for a short-cut to Kingswells, a large commuter settlement west of Aberdeen. Both minor road links were severed by the construction of the AWPR in 2017 although the final design allows a tie-in between the C89C and the AWPR junction at Craibstone which may attract additional traffic routing to avoid Craibstone Roundabout. This junction should therefore be surveyed once traffic behaviour stabilises on the AWPR.

Craibstone Roundabout, which is partially open and under construction as of December 2017, will provide the link between the A90 and A96 trunk roads as well as the new primary access to Aberdeen Airport. This junction should therefore be surveyed once traffic behaviour stabilises on the AWPR.

Other minor road junctions with no survey data available have also been included on the figure. These include the junctions at Thomastown (U82S) and Milton of Inveramsay (U81S), as well as the left-in-left-out junctions at Clovenstone Road and Kintore Business Park (both U113C).

3.3 A96 OGV Data

The junction and link counts described in Chapter 3.2 were segregated by vehicle classification into cars, LGVs and OGVs. The A96 is a High Load route and its traffic capacity is affected by the volume of OGVs; platooning has been observed to occur behind OGVs on the single carriageway sections of A96 as there are limited overtaking opportunities aside from the climbing lanes in the Glen of Foudland section of the route.

The Traffic Scotland counter data described in Chapter 3.1 has classification systems which differ by counter site. The Euro 6 system used at most sites does not differentiate LGVs from rigid HGVs, while some other sites do not segregate traffic classes at all. Given these inconsistencies, and the issues with the post-2012 data described in that chapter, OGV volumes on the A96 have been calculated from the 2013 junction turning count data.

The percentage of OGVs proceeding on the A96 at each junction are shown in Table 7 for the AM (07:00-08:00) and PM peak hour (17:00-18:00) common to most of those junctions. An average interpeak (10:00-16:00) hourly split is reported (this is a fully modelled period) and percentages for the full 12-hour junction turning count survey period are also shown.

Table 7: OGV percentages on A96

Junction	Westbound OGV %				Eastbound OGV %			
	AM	IP	PM	Total	AM	IP	PM	Total
Huntly	23.6%	15.5%	8.2%	13.0%	6.6%	13.6%	9.1%	12.1%
Huntly East	20.7%	11.8%	6.8%	10.1%	7.2%	12.3%	6.7%	10.4%
Colpy	17.7%	12.7%	3.0%	10.3%	7.4%	11.8%	10.2%	9.8%
Kellockbank	21.5%	13.3%	7.6%	11.8%	5.4%	11.4%	7.1%	9.9%
Oyne	18.0%	12.6%	3.7%	10.5%	7.7%	13.0%	11.2%	10.3%
Blackhall	23.5%	11.9%	3.3%	9.8%	2.5%	13.0%	12.4%	8.7%
Port Elphinstone	15.5%	10.3%	2.0%	7.9%	2.9%	11.3%	5.9%	7.5%
Thainstone	12.3%	8.9%	2.0%	6.6%	3.9%	9.3%	5.0%	6.8%
Broomhill	10.7%	9.6%	1.8%	6.6%	2.7%	9.5%	3.6%	6.4%
Kinellar	10.7%	9.6%	1.8%	6.6%	2.7%	9.5%	3.6%	6.4%
Clinterty	9.7%	9.8%	1.3%	6.8%	4.2%	11.4%	6.5%	7.7%
Tyrebagger	8.2%	9.3%	1.3%	6.7%	4.0%	10.5%	4.4%	7.2%

OGV percentages are much higher westbound than eastbound in the AM peak hour, and increase with progression westbound. The volume of westbound OGVs remains consistent (suggesting long distance movements) while non-OGV traffic volumes fall resulting in OGVs constituting a greater fraction of the remaining traffic.

Eastbound OGV percentages in the AM peak are much smaller as they avoid the congested period; OGVs constitute less than 4% of traffic between Inverurie and Craibstone. This behaviour is repeated in the PM peak hour when OGVs avoid the congested A96 westbound, constituting less than 3% of traffic from Craibstone to Inverurie.

Eastbound PM peak flows are more variable, forming up to 12.4% of traffic proceeding through Blackhall Roundabout but down to 5% or lower for junctions nearer Aberdeen.

OGV percentages in the interpeak are generally larger than at peak times and are more consistent, constituting 10-15% of traffic in both directions between Huntly and Inverurie and 9-11% of traffic between Inverurie and Craibstone. The same pattern is reflected in overall OGV percentages which are higher further west, with the largest shares at Huntly (13% westbound and 12% eastbound), an intermediate share at Inverurie (8-10% westbound and 7-9% eastbound) and lower shares east of Kintore (approximately 7% in both directions).

3.4 Non-A96 Link Counts

3.4.1 Permanent Link Counts

Aberdeenshire Council perform regular traffic counts throughout the non-trunk road network in its area. Data is collected continuously and reported at hourly intervals (excluding the period 00:00-06:00 which is reported as a single interval). Data is archived back to January 2012 but not all counter sites report in each month. Traffic is not differentiated by class or direction.

The sites for which survey data is available are shown in Figure 7 and the data availability for each site is listed in Figure 7**: Aberdeenshire permanent link count locations**

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Table 8.

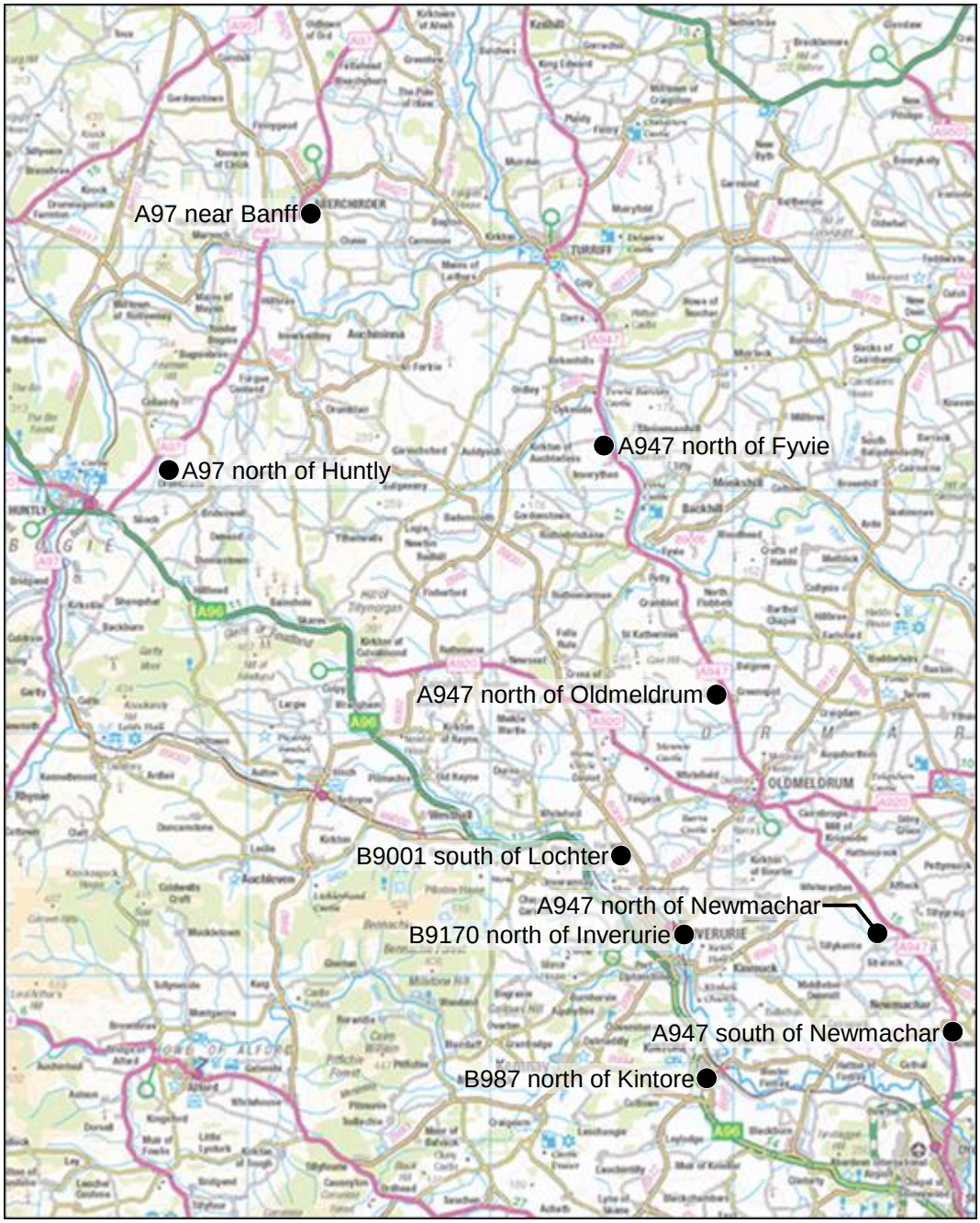

Figure 7: Aberdeenshire permanent link count locations

Table 8: Permanent Aberdeenshire link count locations and data available

Road	Location	Years available
A97	North of Huntly	2012-2017
	Near Banff	2012-2017
A947	North of Fyvie	2012-2017
	North of Newmachar	2012-2015
	North of Oldmeldrum	2012-2017
	South of Newmachar	2012-2017
B987	North of Kintore	2012-2017
B9001	South of Lochter	2013-2017
B9170	North of Inverurie	2012-2017

The peak link flow volumes, the hours in which those peaks occur, and the AAWTs reported for each counter site are shown in Table 9 for 2012 traffic levels and Table 10 for 2017 traffic levels. AAWTs have been based on traffic data for neutral months; where data is lacking for those years, or no neutral month data is available for that year, the substituted year has been indicated.

Table 9: Traffic volumes at permanent Aberdeenshire link count locations, 2012

Road	Location	AM peak		PM peak		AAWT
		Hour	Flow	Hour	Flow	
A97	North of Huntly	08:00-09:00	166	17:00-18:00	197	2,237
	Near Banff	08:00-09:00	130	17:00-18:00	152	1,674
A947	North of Fyvie	07:00-08:00	384	17:00-18:00	540	5,382
	North of Newmachar	08:00-08:00	793	17:00-18:00	795	8,348
	North of Oldmeldrum	07:00-08:00	466	17:00-18:00	614	5,996
	South of Newmachar	07:00-08:00	1,092	17:00-18:00	963	11,461
B987	North of Kintore	08:00-09:00	331	17:00-18:00	364	4,415
B9001	South of Lochter (2013)	07:00-08:00 08:00-09:00	706	17:00-18:00	979	6,837
B9170	North of Inverurie (2013)	08:00-09:00	921	17:00-18:00	1,218	11,064

The maximum hourly flow at either of the A97 counter sites is 197 bidirectional vehicles per hour. This represents less than two cars per minute per direction.

Traffic levels on the A947 increase with proximity to Aberdeen; north of Fyvie the AAWT is 5,382 but traffic is added as the road proceeds south to Oldmeldrum and then Newmachar; south of Newmachar the AAWT is 11,461 and both peaks have bidirectional hourly flows of over 950 vehicles per hour. This observation is also consistent with this section of the A947 being used as part of an alternative route between Huntly and Aberdeen as described in Table 5.

The B987 link north of Kintore has bidirectional flows of up to 364 vehicles per hour, suggesting that little traffic routes to and from Kintore via Tavelty Junction, which would not be a logical route for most Kintore traffic to use when commuting to Aberdeen. The local peak hours are 08:00-09:00 and 17:00-18:00.

The B9001 at Lochter, north of Inverurie, has identical traffic levels for both hours between 07:00 and 09:00, with a significant increase in peak hour flow in the PM peak (concentrated in one hour rather than spread across two). The maximum hourly flow is 979 vehicles per hour.

The B9170 counter point also has a much higher PM peak flow (1,218 bidirectional vehicles per hour) than AM peak (881), although in contrast to the B9001 the three busiest hours of the day all occur in and around the PM peak. The AAWT is significantly busier than that of the parallel B9001 at 11,064.

Table 10: Traffic volumes at permanent Aberdeenshire link count locations, 2017

Road	Location	AM peak		PM peak		AAWT
		Hour	Flow	Hour	Flow	
A97	North of Huntly	08:00-09:00	176	17:00-18:00	217	2,515
	Near Banff	08:00-09:00	152	17:00-18:00	154	1,749
A947	North of Fyvie	07:00-08:00	421	17:00-18:00	555	5,693
	Nth of Newmachar (2014)	07:00-08:00	828	17:00-18:00	836	8,954
	North of Oldmeldrum	07:00-08:00	523	17:00-18:00	762	6,466
	South of Newmachar	07:00-08:00	1,135	17:00-18:00	1,089	11,926
B987	North of Kintore	08:00-09:00	327	16:00-17:00	351	4,392
B9001	South of Lochter	08:00-09:00	545	17:00-18:00	688	6,205
B9170	North of Inverurie	08:00-09:00	1,521	17:00-18:00	2,056	21,619

Traffic growth on the A97 is higher at the counter nearer Huntly (2.3% per year) than further north nearer Banff (0.9% per year).

Annual traffic growth on the A947 is between 0.8% and 3.0% across the four counter sites. The site between Oldmeldrum and Newmachar shows the largest traffic growth; it is this site that would first detect vehicles using the A920/A947 as an alternative to the A96. That growth is not however reflected in the next counter south, and the calculation is based on 2012 to 2014 growth only so this is a less robust comparison. The surrounding counters have a maximum growth rate of 1.5% per year.

Traffic volumes on the B987 north of Kintore are steady throughout the survey period.

Volumes on the B9001 south of Lochter are significantly lower in 2017 than 2012 with an annual drop of 1.9%. This traffic may be exchanging with the parallel B9170, which has shown very high levels of growth; a new link road to the north of Inverurie links the B9001 and B9170 and traffic between points north-west of Inverurie and the A96 to the south-east may be using it to avoid travelling through central Inverurie.

The B9170 counter point is located in an urban extension of Inverurie where significant construction is underway; the site has been partially occupied between 2012 and 2017. Hence there are very large increases in AAWT of 95% over the five years or 14.3% per year.

3.4.2 Temporary Link Counts

Further link counts were produced for Aberdeenshire Council and/or Transport Scotland, with traffic volumes and vehicle speeds measured at links not among the regular survey points. Surveys were performed over periods of between one day and one week with traffic counts and vehicle speeds reported at hourly intervals. Traffic direction was measured but no vehicle classification was performed in most cases. The survey sites are shown in Figure 8.

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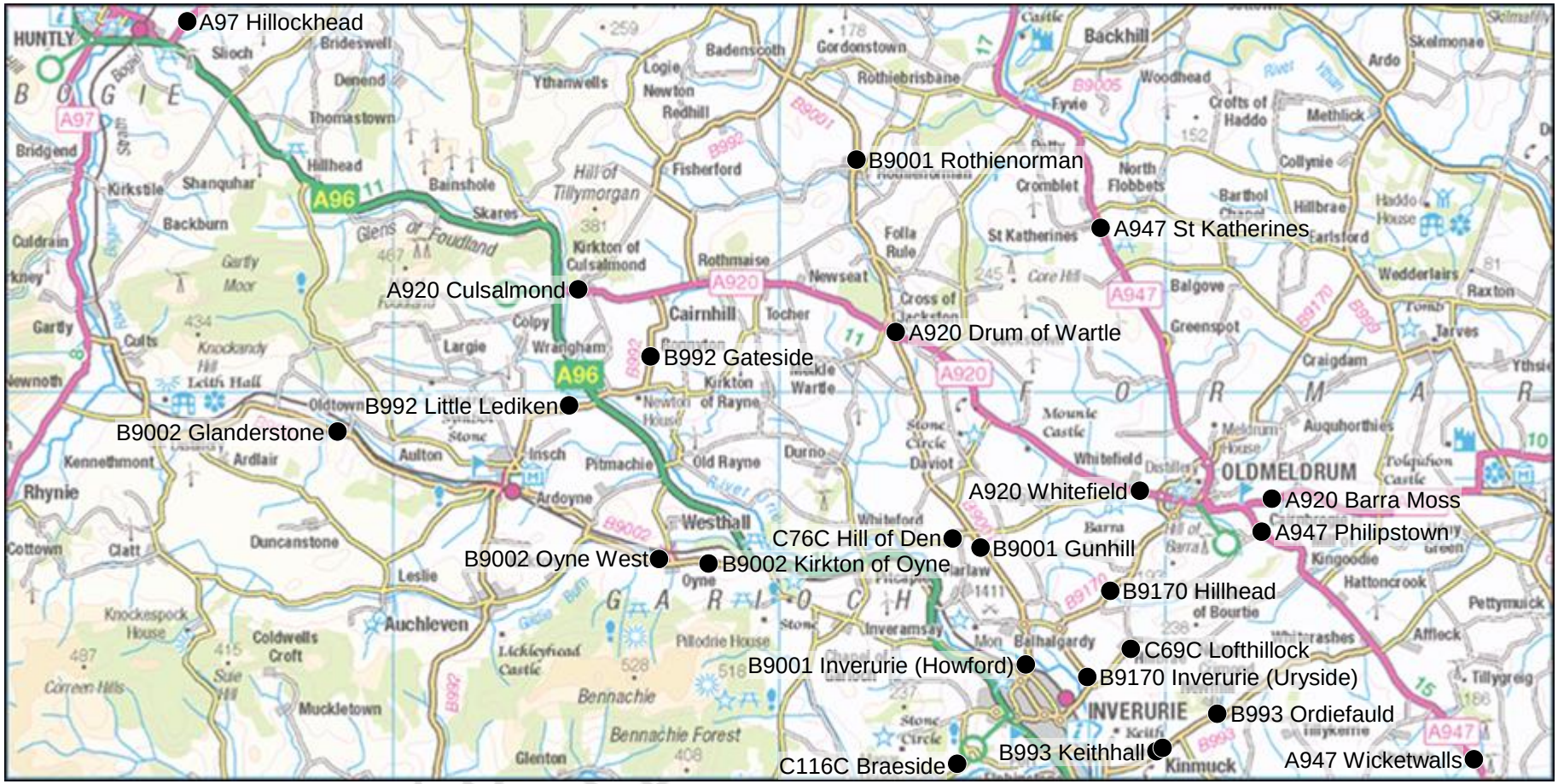

Figure 8: Aberdeenshire Temporary Link Count Locations between Huntly and Inverurie

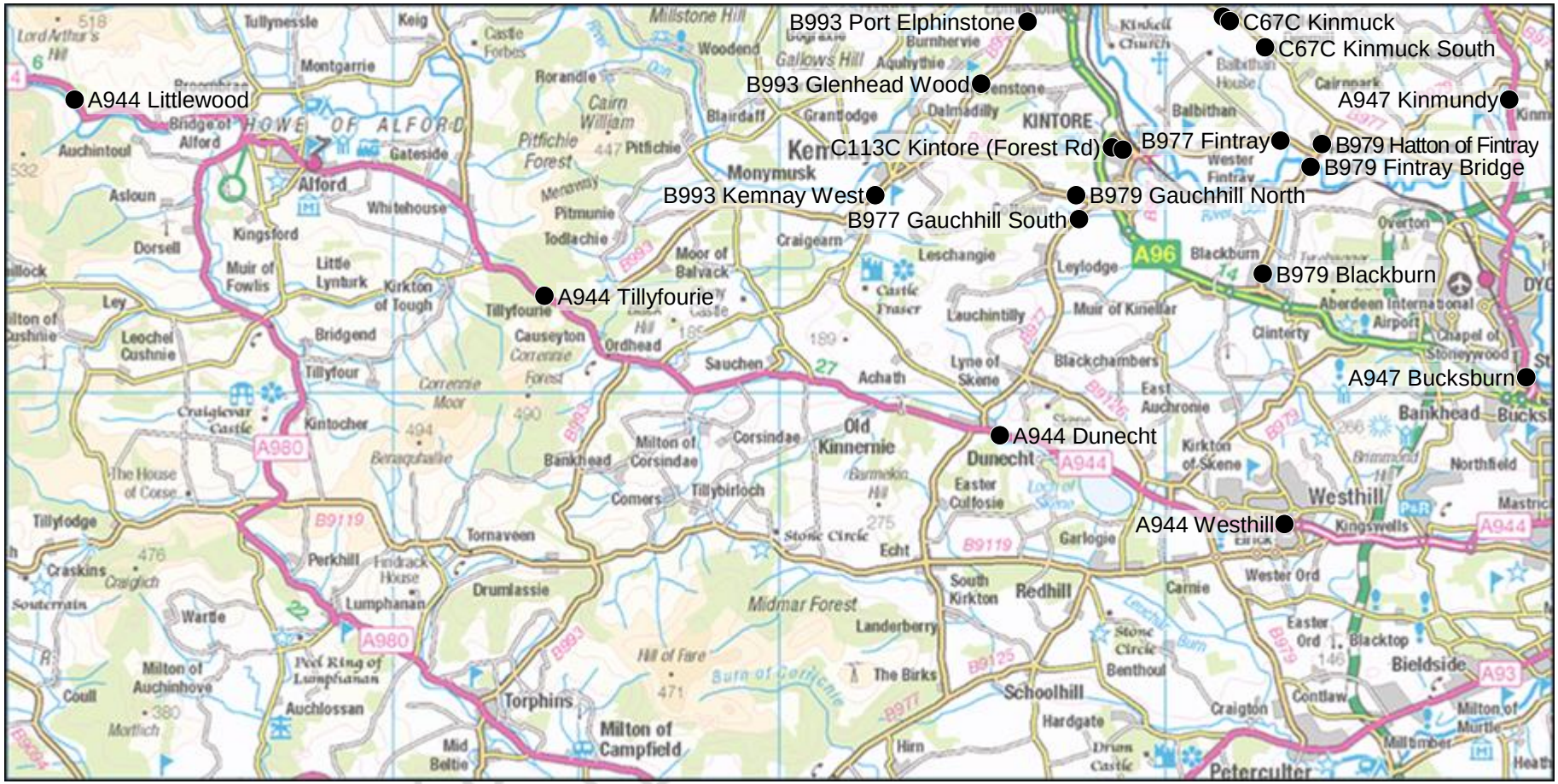

Figure 9 Aberdeenshire Temporary Link Count Locations between Port Elphinstone and Bucksburn

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The survey dates for each site are listed in Table 11.

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Table **12** and 13 show, for each counter point, the times and volumes of peak flow in each direction as well as the observed average weekday traffic volumes.

Table 11: Specific link counts and speed surveys for Aberdeenshire Council

Road	Location	Date	Road	Location	Date
A97	Hillockhead	2012	B993	Ordiefauld	Nov 2014
A920	Culsalmond	Nov 2014		Keithhall East	Dec 2014
	Drum of Wartle	Feb 2014		Keithhall West	Dec 2014
	Whitefield	Nov 2014		Port Elphinstone	Nov 2014
	Barra Moss	Nov 2014		Glenhead Wood	Oct 2016
A944	Littlewood	May 2015		Kemnay West	Nov 2013
	Tillyfourie	Jun 2015	B994	Gauchhill North	Nov 2014
	Dunecht	Apr 2015	B9001	Rothienorman	Feb 2015
	Westhill	2012		Gunhill	Nov 2014
A947	St Katherines	2012		Inverurie (Howford)	Dec 2016
	Philipstown	Nov 2014	B9002	Glanderstone	Jun 2015
	Wicketwalls	May 2015		Oyne West	Jul 2015
	Kinmundy	2012		Kirkton of Oyne	Nov 2014
	Bucksburn	May 2013	B9170	Hillhead	Nov 2014
B977	Fintray	Nov 2014		Inverurie (Uryside)	Nov 2013
	Gauchhill South	Nov 2014	C67C	Kinmuck North	Feb 2015
B979	Hatton of Fintray	Jan 2013		Kinmuck Central	Sep 2013
		Feb 2015		Kinmuck South	Nov 2014
	Hatton Bridge	Nov 2014	C69C	Lofthillock	Nov 2013
	Blackburn	Nov 2013	C76C	Hill of Den	Nov 2014
		Feb 2016	C113C	Kintore (Forest Rd W)	Sep 2013
B992	Gateside	Nov 2014		Kintore (Forest Rd E)	Sep 2013
	Little Lediken	Nov 2014	C116C	Braeside	Nov 2014

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Table 12: Northbound/Southbound Traffic volumes at specific Aberdeenshire link count locations

Road	Location	Peak NB flow		Peak SB flow		AAWT
		Flow	Hour	Flow	Hour	
A97	Hillockhead	111	17:00-18:00	93	08:00-09:00	2,170
A947	St Katherines	372	17:00-18:00	375	06:00-07:00	5,691
	Philipstown	479	17:00-18:00	528	07:00-08:00	7,119
	Wicketwalls	580	17:00-18:00	665	07:00-08:00	8,564
	Kinmundy	736	17:00-18:00	986	07:00-08:00	11,236
	Bucksburn	604	06:00-07:00	672	16:00-17:00	15,142
B979	Hatton of Fintray (13)	284	17:00-18:00	153	08:00-09:00	2,186
	Hatton of Fintray (15)	491	18:00-19:00	343	09:00-10:00	3,099
	Hatton Bridge	487	17:00-18:00	395	07:00-08:00	2,752
	Blackburn (13)	500	17:00-18:00	469	07:00-08:00	5,636
	Blackburn (16)	582	17:00-18:00	456	07:00-08:00	5,511
B992	Gateside	17	08:00-09:00	19	17:00-18:00	302
	Little Lediken	129	07:00-08:00	143	17:00-18:00	2,369
B9001	Rothienorman	256	18:00-19:00	201	07:00-08:00	2,991
	Gunhill	694	17:00-18:00	564	08:00-09:00	9,089
	Inverurie (Howford)	530	17:00-18:00	169	08:00-09:00	7,496
B9170	Hillhead	407	17:00-18:00	325	08:00-09:00	7,367
	Inverurie (Uryside)	483	17:00-18:00	429	08:00-09:00	9,085
C67C	Kinmuck North	122	17:00-18:00	189	07:00-08:00	1,908
	Kinmuck Central	139	17:00-18:00	167	07:00-08:00	1,385
	Kinmuck South	146	17:00-18:00	207	07:00-08:00	1,358

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Table 13: Eastbound/Westbound Traffic volumes at specific Aberdeenshire link count locations

Road	Location and Year	Peak WB flow		Peak EB flow		AAWT
		Flow	Hour	Flow	Hour	
A920	Culsalmond	151	17:00-18:00	122	07:00-08:00	2,063
	Drum of Wartle	538	17:00-18:00	437	07:00-08:00	6,277
	Whitefield	284	17:00-18:00	329	08:00-09:00	5,520
	Barra Moss	196	08:00-09:00	213	17:00-18:00	3,841
A944	Littlewood	73	08:00-09:00	94	17:00-18:00	1,564
	Tillyfourie	439	17:00-18:00	392	07:00-08:00	5,301
	Dunecht	560	17:00-18:00	576	07:00-08:00	6,308
	Westhill	1,171	17:00-18:00	1,127	07:00-08:00	22,405
B977	Fintray	126	17:00-18:00	164	07:00-08:00	1,418
	Gauchhill South	303	07:00-08:00	342	17:00-18:00	5,775
B993	Ordiefauld	107	07:00-08:00	139	17:00-18:00	1,463
	Keithhall East	157	09:00-10:00	131	10:00-11:00	2,506
	Keithhall West	148	09:00-10:00	125	18:00-19:00	2,549
	Port Elphinstone	282	17:00-18:00	258	08:00-09:00	5,138
	Glenhead Wood	264	16:00-17:00	247	07:00-08:00	5,145
	Kemnay West	251	17:00-18:00	185	07:00-08:00	4,510
B994	Gauchhill North	403	17:00-18:00	378	07:00-08:00	4,809
B9002	Glanderstone	47	08:00-09:00	62	17:00-18:00	898
	Oyne West	240	18:00-19:00	198	07:00-08:00	3,420
	Kirkton of Oyne	260	17:00-18:00	215	07:00-08:00	3,426
C69C	Lofthillock	77	17:00-18:00	24	17:00-18:00	684
C76C	Hill of Den	74	17:00-18:00	59	08:00-09:00	957
C113C	Kintore (Forest Rd W)	82	17:00-18:00	72	07:00-08:00	1,102
	Kintore (Forest Rd E)	216	17:00-18:00	189	07:00-08:00	3,188
C116C	Braeside	30	07:00-08:00	41	17:00-18:00	771

The A947 shows a general trend of increasing AAWTs and peak hour flows the further south the road progresses; north of Oldmeldrum and the A920 AAWTs are at most 7,110 but they are 8,500 north of Newmachar and 11,250 south of there. The dominant traffic flow is southbound in the AM peak and northbound in the PM peak; the exception being at Bucksburn, where northbound traffic dominates in the AM peak, peaking before 07:00 which may be due to the proximity to Dyce and Aberdeen Airport.

The three B979 counter sites show that traffic volumes increase with southward progression towards the A96 with AAWTs in Blackburn twice those of Hatton of Fintray. The B979 has two count sites that were surveyed twice in different years, showing growth on the route: at Hatton of Fintray there is a significant increase in

AAWT between 2013 and 2015 equating to 19% year-on-year growth and the southbound AM peak more than doubles in size, while in Blackburn AAWTs are stagnant although the size of the northbound PM peak increase significantly from 2013 to 2016.

The B992 link to Insch (south of the A96) is much more heavily used than that to Auchterless (north of the A96); traffic uses the southern link between Insch and Aberdeen in the morning and returns in the evening, while there is little peak behaviour on the northern section and an AAWT of barely 300 vehicles.

Traffic volumes on the B9001 increase with proximity to Inverurie, although an AAWT of almost 3,000 persists as far north as Rothienorman. The B9001 is busiest among the surveyed count points at Gunhill, north of Inverurie; the flow in the Inverurie urban area further south is lower (with the AAWT falling from 9,000 to 7,500). This appears counterintuitive but the counter further south in Inverurie was surveyed in late 2016 following the opening of a new link road between the B9001 and B9170; Chapter 3.5 discusses the impact of this new junction and the turning movements there are consistent with these observations. However, this southern counter has much greater flows northbound than southbound (by over 100%) which requires further investigation.

The B9170 counters show similar behaviour to those on the B9001, with increasing flow as traffic approaches Inverurie. However, these counts were taken before the aforementioned link road was constructed, and as discussed in Chapter 3.5 additional traffic is now using the B9170 in preference to the B9001; there has also been additional residential development in this area in recent years. The sharp increase in traffic described at the permanent counter in Table 10 shows the impact of these new developments.

The three C67C traffic counters near the village of Kinmuck show that AAWTs are greater north of the town than south; however, the dominant flow is southbound in the AM peak and northbound in the PM peak. This is apparently inconsistent, but it should be noted that the northern count is the most recent so traffic growth through this route, either due to local development or as a rat-run, may be significant.

The A920 is busiest at Drum of Wartle, where the road layout results in B9001 traffic sharing the route for a short section; the A920 traffic increase relative to nearby counters is consistent with the B9001 AAWT at Rothienorman north of this point. Traffic volumes increase to 5,500 AAWT as the road approaches Oldmeldrum, although there is no data on routing via the town. At all counter sites the dominant flow is towards the A947 in the AM peak (and presumably onward to the Aberdeen area) and away in the PM peak.

The A944 is a quiet rural route west of Tillyfourie, with the low traffic flows commuting towards Huntly (westbound in the AM peak) rather than Aberdeen. Flows increase with proximity to Aberdeen with 5,300 AAWT at Tillyfourie and 6,300 at Dunecht. This relatively modest increase at Dunecht (the A944/B979 junction) suggests that traffic which is using the B979 to avoid the A96 in the PM peak is joining the A944 further east, perhaps using the B9126. By the time the A944 reaches Westhill traffic levels are almost as great as those on the A96.

The B977 counter south-west of Gauchhill shoes that traffic is greater westbound in the AM peak and eastbound in the PM peak. Therefore, traffic is exiting the A96 towards the B977 in the morning and returning in the evening; in contradiction with most links near the A96 but consistent with the B977 and A944 being used as an alternative to the A96 as described in Chapter 3.2.1.

There are two sets of B993 counters. Those west of Port Elphinstone Roundabout show an approximately steady AAWT of 4,500-5,150 with Kemnay accounting for relatively few vehicles; traffic flows towards the A96 in the AM peak and away in the PM peak, consistent with observations on that road.

The B993 counters east of Inverurie show that traffic peaks are much less prominent at Keithhall and towards the A947; peaks occur at unusual times (such as 10:00-11:00 eastbound east of Keithhall) suggesting that commuting behaviour does not significantly contribute to traffic behaviour here. AAWTs are around 1,500-2,500, larger closer to Inverurie.

The B994 is the busier west-facing arm of Gauchhill roundabout, suggesting it is being used for commuters between Kemnay and Aberdeen. This is consistent with the large AM peak towards the A96 and the PM peak towards Kemnay. This occurs at the same time as B977 traffic from Gauchhill peaks in the opposite direction avoiding the A96.

The B9002 is busier east of Insch (AAWT 3,400) than west of the town (900). East of Insch, again generally flows towards the A96 and Aberdeen in the AM peak and away in the PM peak, while to the west the dominant (albeit much lower flow) is westbound towards the Huntly area. Insch is therefore likely to be the destination for most B9002 traffic at Oyne. The counter at Oyne shows a late PM peak hour with traffic remaining at peak levels until 19:00. This may be reflective of the distance between Aberdeen and Oyne.

The C69C, C76C and C116C minor roads north-east, north-west and south-west of Inverurie respectively are not well used with AAWTs under 1,000. Traffic generally flows towards Inverurie in the AM peak and away in the PM peak.

The two counters on the C113C Forest Road show that over 50% of traffic is lost between the eastern survey point near the B987 junction and the western one near the overbridge, suggesting that most traffic here is local.

3.5 Inverurie Junction Turning Counts

Turning counts were performed at eight junctions in the Inverurie urban area on 20 April 2017 as shown in Figure 10 (site 5 was surveyed on 25 April 2017). Counts were reported at 15 minute intervals in seven vehicle classes.

The survey durations differed between the survey sites as shown in Figure 10**: Junction turning counts locations at Inverurie in April 2017**

Table 14. The timing of peak traffic flows at each junction, and the total number of junction entries during those peaks, is shown in Table 15.

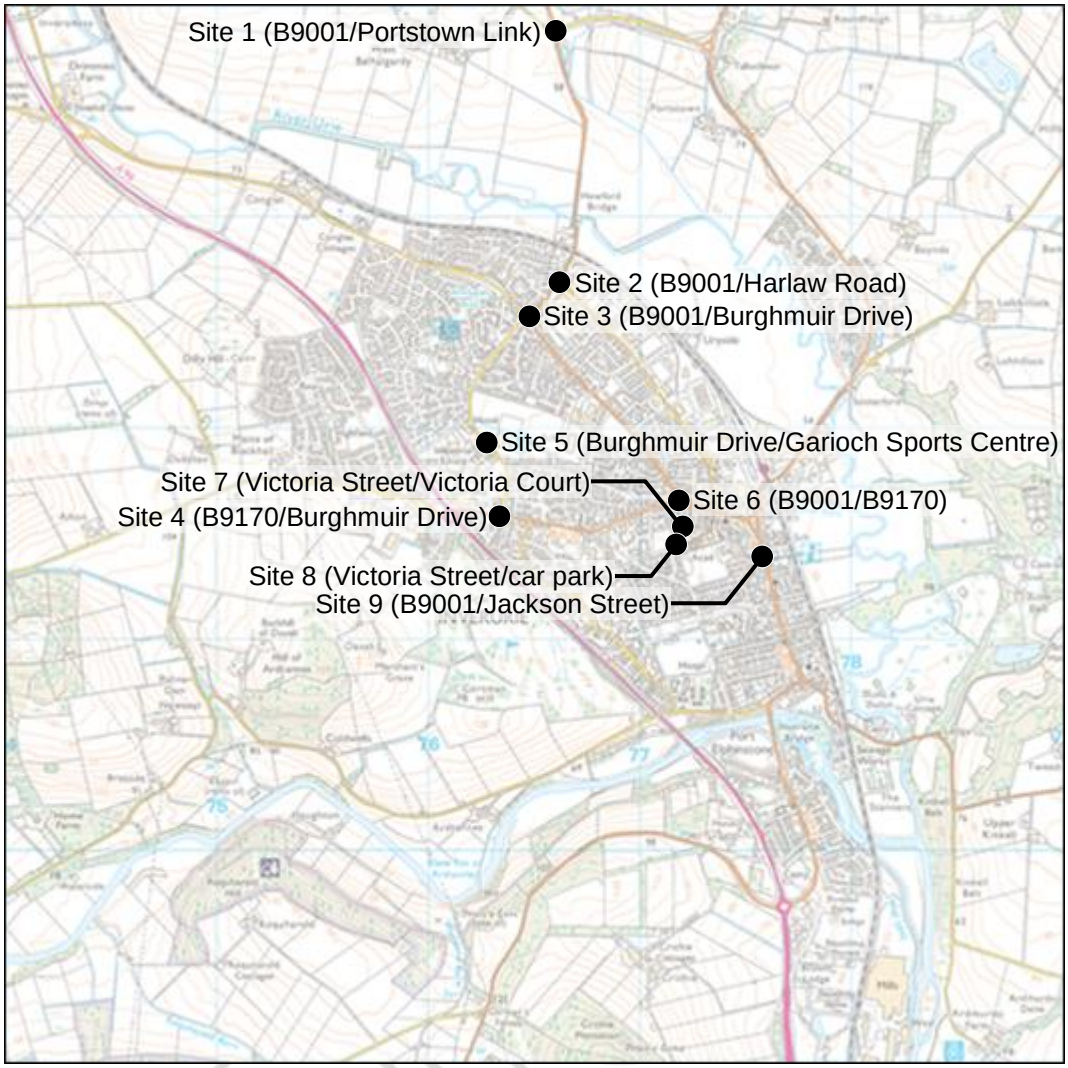

Figure 10: Junction turning counts locations at Inverurie in April 2017

Table 14: Junction turning counts conducted in Inverurie in April 2017

Site	Type	Roads at junction	Survey timings	
			AM peak	PM peak
1	Roundabout	B9001, Portstown Link, Balhalgardy road	07:00 to 10:00	16:00 to 19:00
2	Priority	B9001, Harlaw Road		
3	Roundabout	B9001, Burghmuir Drive		
4	Roundabout	B9170, Burghmuir Drive, Morrisons access		
5	Priority	Burghmuir Drive, Garioch Sports Centre	No survey	16:00 to 20:00
6	Roundabout	B9001, B9170, West High Street	07:00 to 10:00	14:00 to 19:00
7	Priority	Victoria Street, Victoria Court		
8	Priority	Victoria Street, Inverurie Academy car park		
9	Priority	B9001, Jackson Street		

Table 15: Magnitude and timing of peak junction entries in Inverurie

Site	AM peak		PM peak	
	Entries	Hour	Entries	Hour
1	824	08:00-09:00	1,113	17:00-18:00
2	1,107	08:30-09:30	1,480	17:00-18:00
3	1,317	08:00-09:00	1,678 1,678	16:45-17:45 17:00-18:00
4	1,977	08:30-09:30	2,840	16:45-17:45
5	No data		1,254	17:00-18:00
6	1,159	08:15-09:15	1,458	17:00-18:00
7	304	08:15-09:15	401	16:45-17:45
8	147	08:15-09:15	196	16:45-17:45
9	1,317	08:30-09:30	1,599	17:00-18:00

The busiest of the surveyed junctions in Inverurie is the B9170/Burghmuir Drive roundabout (site 4). The maximum AM peak entry volume occurs from 08:30-09:30 which contrasts with the peak at the adjacent A96 Blackhall Roundabout on the A96 (07:00-08:00 as shown in Table 4). Given the congestion observed here blocking back from the A96, it is likely that the throughput of this junction is reduced when there is congestion at Blackhall Roundabout.

All junctions have peak hours that fall within the range 08:00 to 09:30 in the AM, in contrast to the A96 traffic which peaks in the hour 07:00-08:00 (or potentially earlier as discussed in Chapter 3.2.1). The PM peak hours on the trunk road and in Inverurie show more similarity.

The PM peak hour junction entry totals are 21%-44% higher than the AM peak hour totals at each junction. The three-hour PM period (16:00-19:00) is 26%-44% busier than the corresponding AM period (07:00-10:00) at the high-flow junctions and up to 75% busier at the low-flow Victoria Street junctions. The possibility that traffic is diverting away from the A96 eastbound in the AM peak period has been discussed in Chapters 3.1 and 3.2; this does not however account for behaviour in Victoria Street.

The busiest junction movement at Site 1 (the B9170-B9001 link road roundabout) is north-to-south on the B9001 towards Inverurie in the AM peak and vice versa in the PM peak, suggesting traffic commuting to (or through) Inverurie. The other significant movements at the junction are between the southern and eastern arm, representing local movements in Inverurie, which are consistent throughout the day; this agrees with the observed increase in B9170 traffic south of here shown in Table 10.

As with site 1, at Site 2 (Harlaw Road) most traffic proceeds north-south in the morning and south-north in the evening. Approximately 25% of southbound AM traffic turns off to use Harlaw Road, which is a parallel alternative to the B9001 North Street.

At the B9001/Burghmuir Drive roundabout (site 3), the north-to-south movement is the busiest in the AM peak but there are significant south-to-north movements as well which is likely to be performed by local Inverurie traffic. The western arm

(linking to the A96 Drimmies junction described in Table 6) contributes 20% of junction entries and 9% of junction exits, suggesting that link is not well used to access the A96 in the AM peak; this does not corroborate with the significant traffic growth on the northern section of the A96 Inverurie bypass discussed in Chapter 3.1.

The number of AM peak junction entries to Site 4 (Burghmuir Drive/Morrisons access) is approximately equal from the Burghmuir Drive and B9170 Blackhall Road accesses, with most traffic proceeding to the A96 at Blackhall Roundabout. The eastbound entry arm from Blackhall is busier still with traffic making these movements in reverse, suggesting that this roundabout is being used for movements both in and out of Inverurie in the AM peak. The flow volumes are higher still in the PM peak with the distribution of junction entries and exits in a similar pattern.

Site 5 was surveyed only in the PM peak, attempting to capture afternoon and evening journeys to and from the sports centre. More journeys to the centre are captured in the hour 17:00-18:00 and from the centre in the hour 19:00-20:00, consistent with the leisure use of this centre and therefore junction.

The total number of junction entries at the B9001/B9170 roundabout (Site 6) is approximately equal for the three classified arms of the junction; almost all traffic exchanges between two of these three routes with lower volumes to and from Victoria Street. The PM peak sees most vehicles exchange between the B9170 Blackhall Road and B9001 Burghmuir Road, with the West High Street comparatively quieter (although still significantly busier than Victoria Street).

Both sites 7 and 8 on Victoria Street have much lower flows than the other junctions surveyed. All three arms of the Victoria Court junction (site 7) are approximately as busy as one another, while use of the car and bus park (site 8) is low compared to through traffic on Victoria Street.

Little of the traffic proceeding on the B9001 High Street turns into Jackson Street (site 9) which is a dead-end road with few properties.

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4 Routing Data

4.1 Roadside Interview surveys

RSI points were set up on the full length of the A96 in April 2013. A proportion of vehicles were pulled aside at the interview points and drivers were queried for their trip origins, destinations and purposes.

Seven RSIs were performed, two of which were east of Huntly: eastbound at Skares near Colpy, and westbound between Thainstone and Port Elphinstone Roundabouts. Both surveys were performed on 18 April 2013. They were planned to run until 19:00 but were curtailed due to adverse weather at 18:10 and 16:28 respectively.

Two further surveys were conducted in 2015 on routes parallel to the A96 that may be used by traffic as an alternative to the A96 corridor as suggested by the junction turning count data discussed in Chapter 3.2:

- The A944 westbound between the B9126 at Skene and the B979 at Dunecht was surveyed on 22 April 2015 between 07:00 and 19:00;
- The A947 northbound between the B979 at Newmachar and the B993 at Whiterashes was surveyed on 23 April 2015 between 07:00 and 19:00.

The locations of these four surveys are shown in Figure 11. Drivers' origins and destinations were recorded as postcodes which were assigned to localities as defined in the 2011 census, as shown in Appendix C.

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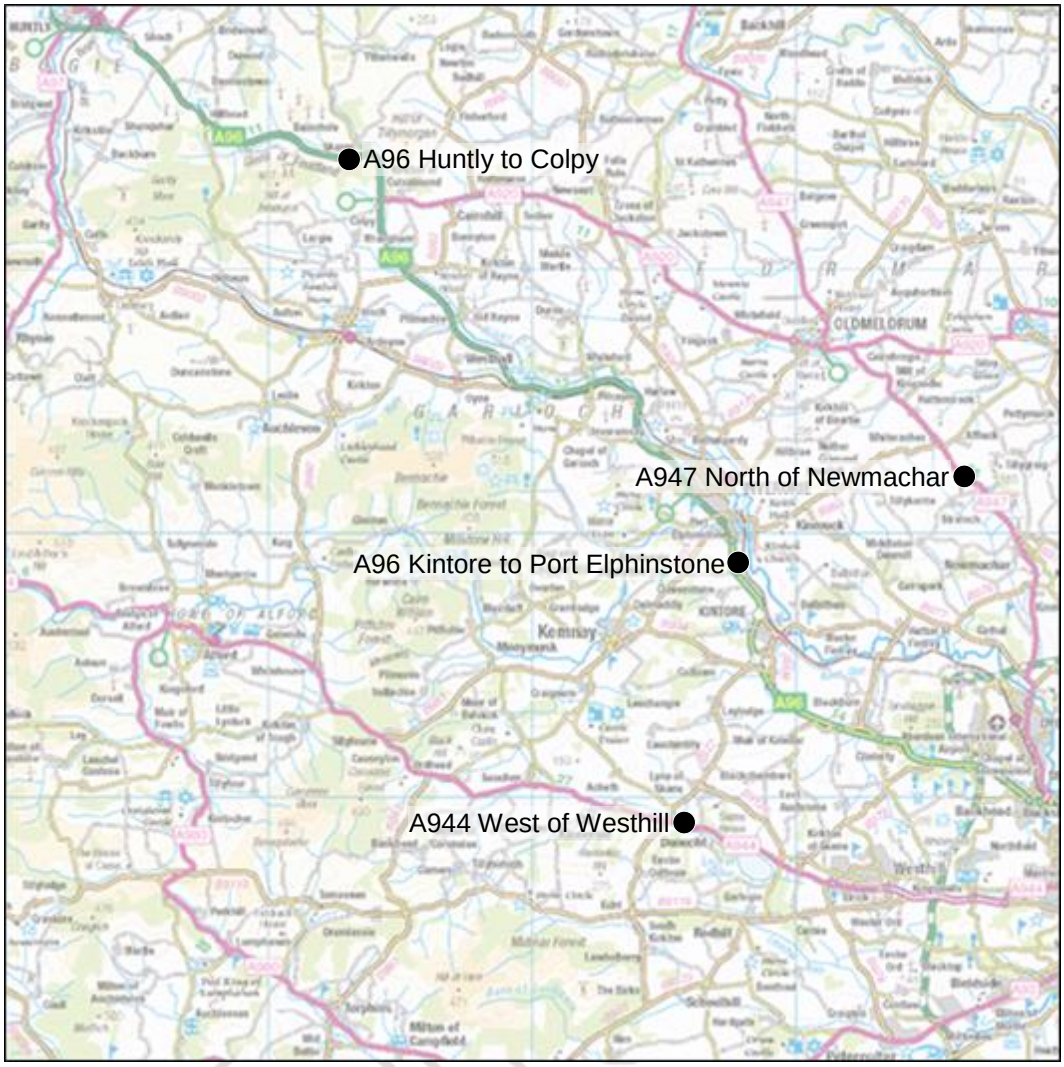

Figure 11: RSI survey locations

4.1.1 A96 Huntly to Colpy

The A96 Huntly to Colpy RSI surveyed 554 vehicles, 12.9% of the eastbound AAWT on this link. Of those 554 vehicles, 364 provided a valid origin postcode and 521 a destination postcode. Statistics on the most common origins and destinations for vehicles on this link are shown in Table 16.

Table 16: A96 eastbound common origins and destinations

Most common origins		Most common destinations		Most common O-D pairs	
Huntly	80	Aberdeen	159	Huntly to Aberdeen	19
Elgin	53	Dyce	58	Huntly to Inverurie	9
Inverness	28	Inverurie	37	Elgin to Aberdeen	
Keith	16	Kintore	15	Inverness to Aberdeen	
Buckie	12	Oldmeldrum	14	Elgin to Inverurie	6
Dufftown	8	Kemnay	10	Inverness to Dyce	

Huntly is the most popular origin for traffic on the link surveyed and accounts for 22% of traffic (excluding those which did not provide an origin). Almost all other vehicles began their journey west of Huntly and therefore beyond the scheme extents.

Aberdeen and Dyce are the two most popular destinations accounting for 42% of surveyed traffic. Intermediate destinations on the A96 within the scheme extents (Kintore and Inverurie) account for 10% of traffic destinations.

Around 30 vehicles (6%) travelled to destinations reached along the A920 including Oldmeldrum, Ellon and Newmachar. However, the turning count surveys described in Chapter 3.2.1 show that 17% of A96 eastbound traffic turns off for the A920 at the Colpy junction. This suggests that traffic to other destinations is also using the A920, possibly as an alternative to the A96.

4.1.2 A96 Kintore to Port Elphinstone

The A96 Kintore to Port Elphinstone RSI surveyed 1,002 vehicles, 6.7% of the westbound AAWT on this link. 946 vehicles provided an origin postcode and 946 vehicles a destination postcode (not all vehicles provided both). Statistics on the most common origins and destinations for vehicles on this link are shown in Table 17.

Table 17: A96 westbound common origins and destinations

Most common origins		Most common destinations		Most common O-D pairs	
Aberdeen	320	Inverurie	474	Aberdeen to Inverurie	134
Kintore	111	Huntly	45	Kintore to Inverurie	68
Dyce	50	Inverness	40	Blackburn to Inverurie	29
Westhill	46	Elgin	30	Dyce to Inverurie	
Blackburn	35	Aberdeen	26	Westhill to Inverurie	23
Inverurie	19	Insch	25	Aberdeen to Huntly	21

57% of traffic approaching Port Elphinstone originates from locations directly accessible from the A96 (Aberdeen, Dyce, Blackburn, Kintore and Inverurie; this latter category includes round trips and areas of Inverurie south of the survey point such as Thainstone Business Park). Much of the remaining traffic comes from the Aberdeen commuter belt including Westhill, Banchory, Stonehaven, Ellon, Newmachar and Portlethen.

Half of traffic ends its journey in the Inverurie area while Huntly accounts for another 5% and A96 destinations beyond Huntly (Inverness, Elgin and Keith) another 9%. Areas attracting traffic which are relatively local to the A96 include Insch (3%), Oldmeldrum (3%) and Kemnay (1%).

4.1.3 A944 West of Westhill

The A944 West of Westhill RSI surveyed 307 vehicles, 9.6% of the westbound AAWT on this link. All vehicles provided origin and destination postcode data. Statistics on the most common origins and destinations for vehicles on this link are shown in Table 18.

Table 18: A944 westbound common origins and destinations

Most common origins		Most common destinations		Most common O-D pairs	
Aberdeen	145	Alford	66	Aberdeen to Alford	41
Westhill	84	Inverurie	23	Westhill to Alford	13
Dyce	8	Kemnay	22	Westhill to Inverurie	8
Peterculter	7	Inverness	4	Aberdeen to Kemnay	
Portlethen	4	Huntly	3	Westhill to Kemnay	7
Six other destinations	2	Kintore	2	Aberdeen to Inverurie	6

75% of traffic on the A944 westbound began its journey in Aberdeen or Westhill, the major settlements on the route. Very little traffic originating beyond Aberdeen uses the route with less than 10 users from the A90 south (Stonehaven, Dundee and Montrose).

The most common destination is Alford, the largest settlement to the west on the A944, accounting for 21% of traffic. 23 vehicles (7.5%) route towards Inverurie and therefore need to transfer to the A96; this suggests, as per comments regarding Kinellar Roundabout and Gauchhill Junction in Chapter 3.2.1, that this is used as an alternative route between Aberdeen and Inverurie/Kintore. When other long-distance trips are included, 13% of A944 westbound traffic is using it to reach destinations on the A96, although some of these trips begin in Westhill and therefore are not rerouted from the A96 in the first instance.

4.1.4 A947 North of Newmachar

The A947 North of Newmachar RSI surveyed 425 vehicles (excluding HGVs for which no data was collected), 10.1% of the northbound AAWT on this link. All non-HGVs provided origin and destination postcodes. Statistics on the most common origins and destinations for vehicles on this link are shown in Table 19.

Table 19: A947 northbound common origins and destinations

Most common origins		Most common destinations		Most common O-D pairs	
Aberdeen	190	Oldmeldrum	89	Aberdeen to Oldmeldrum	48
Dyce	109	Turriff	49	Aberdeen to Turriff	30
Newmachar	49	Inverurie	32	Dyce to Oldmeldrum	17
Kingseat	13	Banff	22	Newmachar to Inverurie	15
Potterton	6	Macduff	14	Aberdeen to Banff	14
Kingswells	5	Aberchirder	8	Newmachar to Oldmeldrum	12

Aberdeen and Dyce collectively account for 70% of vehicles using the A947 northbound with almost all other traffic also originating locally in Newmachar, Kingseat and smaller settlements north of Aberdeen.

Oldmeldrum, Turriff, Banff and Macduff are served by the A947 and constitute four of the five most common destinations for traffic passing the survey point, accounting for 41% of all A947 northbound traffic. 8% of traffic proceeds to the Inverurie area; this traffic may be rerouting to avoid the A96, although it may also be routing to areas in and to the north of the town via Oldmeldrum and the B9170.

Newmachar to Inverurie is a relatively popular trip accounting for almost half of trips to Inverurie.

In the event that traffic between Huntly and Aberdeen is routing via the A920 and A947 rather than the A96, as discussed in Chapters 3.2.1 and 4.1.1, reciprocal movements from this survey site to Huntly and locations further west on the A96 would be expected. However only 1% of traffic proceeds to such locations (Huntly, Keith, Elgin, Nairn and Inverness combined), suggesting this routing decision may only occur eastbound.

4.2 ANPR surveys

An ANPR survey was conducted in the Inverurie urban area between 06:00 and 19:00 on Tuesday 18 November 2014, with data reported at 15 minute intervals. The surveys detected vehicles which progressed through Inverurie, noting the time and direction of travel at eight bidirectional survey points as listed in Table 20 and shown in Figure 12. Seven represent entrances and exits to the urban area, while one (Site 5) is located within the town.

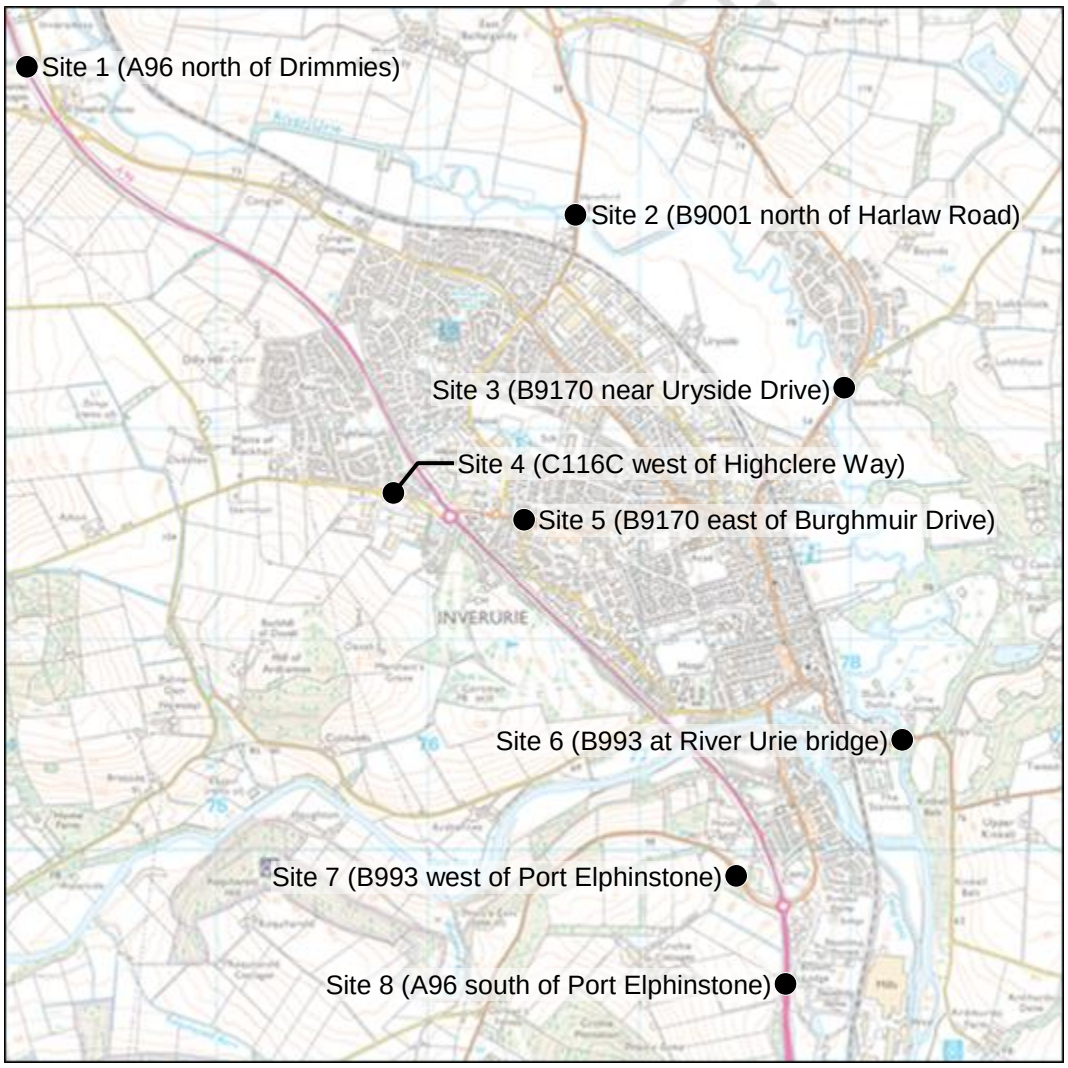

Figure 12: ANPR survey locations in Inverurie

Table 20: Inverurie ANPR survey sites

Site	Location	Direction A	Direction B
1	A96 north of Drimmies	1 – Northbound	2 - Southbound
2	B9001 north of Harlaw Road	3 – Northbound	4 - Southbound
3	B9170 near Uryside Drive	5 – Northbound	6 - Southbound
4	C116C west of Highclere Way	7 – Westbound	8 - Eastbound
5	B9170 east of Burghmuir Drive	9 – Eastbound	11 - Westbound
6	B993 at River Urie bridge	12 – Eastbound	13 - Westbound
7	B993 west of Port Elphinstone	14 – Westbound	15 - Eastbound
8	A96 south of Port Elphinstone	16 – Northbound	17 - Southbound

The ANPR data was analysed by plotting logical routes between detector points on a map representing the road layout of Inverurie. This allowed routes which did not pass through intermediate detection points (particularly at Site 5) to be identified. An example of the routing analysis program is shown in Figure 13 and is included as Appendix B.

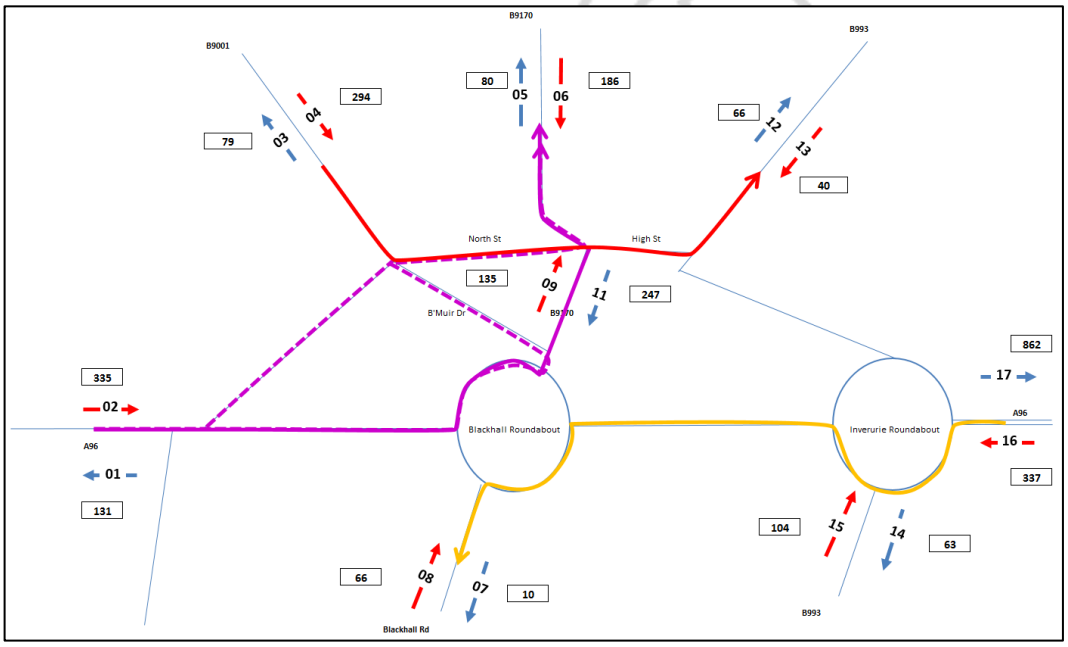

Figure 13: Inverurie ANPR analysis outputs

The total demand entering and exiting the system at each counter point is shown in

Table **21**, along with the peak hour of entries. These figures do not encompass all vehicles detected by the ANPR system as some number plates were not correctly read; the percentage of vehicles captured at each site is shown.

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Table 21: Inverurie ANPR peripheral flows

Site	Total entries	Total exits	Peak hour for entries		Peak hour for exits		Capture rate
			Volume	Hour	Volume	Hour	
1	3,021	3,346	372	06:15-07:15	523	16:00-17:00	92.2%
2	1,999	2,033	331	06:30-07:30	421	17:15-18:15	96.1%
3	1,522	1,652	186	07:00-08:00	259	17:15-18:15	98.7%
4	534	629	70	07:30-08:30	91	16:15-17:15	89.5%
6	607	482	86	16:15-17:15	69	07:15-08:15	93.0%
7	1,290	1,486	128	07:30-08:30	210	16:45-17:45	96.2%
8	7,566	6,989	1,184	16:45-17:45	940	06:15-07:15	88.0%

Traffic which is first detected at site 5 is omitted as it does not represent an entry/exit from the ANPR survey area. A total of 2,885 vehicles were first detected there, suggesting they began their journey in Inverurie, with 87% progressing south toward Blackhall Roundabout and 13% progressing east toward the High Street.

A general trend is observed in that traffic flows from the north and west (sites 1, 2, 3 and 6) to the southeast (site 8) in the AM peak and returns in the PM peak. The peak hours vary by origin but in general survey points with higher flows have early AM peak hours ending before 08:00; this contrasts with the Inverurie junction turning counts discussed in Chapter 3.5 that suggests later peaks of 08:00-09:00 in most cases.

PM peaks are more uniform with most arms showing a peak hour that falls within the range 16:45 to 18:15. Site 6, which primarily services a business and industrial park, does not exhibit strong peaks unlike the other sites.

In general, the number of vehicles passing each counter point in the PM peak is greater than that in the AM peak. This is corroborated by other sources discussed in this report and suggests that vehicles are avoiding the Inverurie area in the AM peak and may be rerouting away from local congestion.

For vehicles approaching Inverurie from the north (site 1), 76% continue southbound on the A96 towards Kintore. 17% of trips end in Inverurie with 11% last detected in the urban area suggesting a significant length of stay in the town and 6% next detected leaving again to the north within one hour.

Vehicles approaching from site 2 (the B9001) have Site 8 (the A96 southbound) as their most favoured destination (51%); five-sixths of those proceed via the Blackhall Road detector, although this represents a longer route than the direct B9001 Burghmuir Drive route. This may be occurring due to congestion at the Blackhall Road/Burghmuir Drive roundabout. 32% of journeys end in Inverurie with approximately half of those reaching the detector at Burghmuir Drive and half exiting Inverurie by the same detector site within an hour. Around 5% of journeys exit via Site 7 with the most likely destination being Kemnay.

From Site 3 (B9170), there are a similar proportion of through trips to the A96 southbound (52%) than with the parallel Site 2. 22% of journeys are to Inverurie, most of which are short-term and exit the town northbound via Site 3 again. A significant number of vehicles (13%) exit to Site 7.

The breakdown of destinations for journeys from Site 4 varies considerably from the previous sites with 53% of journeys into Inverurie; 36% are last detected in the town and 17% are short stays with an exit back to Site 4 again. 26% of journeys route to the A96 south of Inverurie with only 5% exiting to the north.

For all traffic first detected at site 5 and therefore most likely beginning their journey in Inverurie, 52% proceed to the A96 southbound and 15% to the A96 northbound. 10% of traffic exits to the Highclere business park area (site 4) and 6% exits to the B9001 northbound.

Site 6 represents a rural area east and southeast of Inverurie although the A96 southbound (32%) continues to represent the most popular destination. 18% of traffic continues towards Kemnay while 22% have their destination in Inverurie. North-easterly exits from Inverurie (sites 2 and 3) represent 18% of trips.

45% of vehicles entering Inverurie at site 7 (from the Kemnay direction) are heading to Inverurie. Only 18% are continuing south on the A96 while 23% exit Inverurie to the north-east on either the B9001 or B9170. Traffic to the B9001 favours routing via Blackhall Roundabout versus routing via the town by a ratio of 2:1, while over 9 in every 10 vehicles to the B9170 routes via the town which is a much more logical route for this destination. 7% of vehicles use the A96 northbound out of the town.

For traffic to Inverurie from the A96 southbound (site 8), 33% continue on the trunk road beyond the town; in absolute terms this is comparable to the total for A96 southbound journeys. A further 30% end their journey in Inverurie or return to the A96 southbound after a short stay of less than an hour. 16% of traffic exits to the north-east for the B9001 and 13% to the B9170. As with Site 7, two-thirds of traffic to the B9001 prefers the route via Blackhall Roundabout and Burghmuir Road while nine-tenths of traffic to the B9170 route via Port Elphinstone and the town.

There is a significant traffic increase from the west of Inverurie to the east, as seen in the differences between count sites 1 and 8. This is corroborated by the increases in AAWT detected at the Traffic Scotland counter sites shown in

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Table **2**. Of all traffic proceeding towards Kintore on the A96:

- 32% came from the A96 north of Inverurie;
- 29% came from one of the link roads north and east of Inverurie;
- 33% came from Inverurie itself (22% first detected in the town and 11% making a return journey from the south);
- 5% joined from locations to the west of the A96

This analysis shows there is consistency on how vehicles choose to route and the number of vehicles making journeys between origin-destination pairs is consistent in both directions. Given the high capture rates of over 88% at each count point, it is likely to be a realistic representation of vehicle behaviour in and around Inverurie.

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5 A96 CRAM Traffic Model

5.1 Model Description and Scope

The A96 CRAM is a SATURN highway model with a 2012 base year. It was developed to inform the A96 Dualling Programme. The main uses of the model are traffic forecasting, journey time production and analysis, option testing, noise and air quality assessments and economic assessments. The model maintains consistency with the Aberdeen Sub Area Transport Model and the S-Paramics models of Inverurie and Kintore.

The modelled time periods are AM Peak (08:00-09:00) Interpeak (average hour between 10:00-16:00) and PM peak (17:00-18:00). The AM and PM models are supplied with PASSQ data (simulating the level of queueing occurring in the previous hour) to ensure that queueing occurring before the peak period is included within the model.

The A96 corridor is coded as simulation between its junctions with the A9 at Inverness and the A90 at Aberdeen. Parallel routes and links from those locations are included.

The main towns and villages included as part of the simulation network in the A96 eastern section include Huntly, Insch, Oldmeldrum, Inverurie, Kemnay, Kintore, Dyce and Bucksburn.

5.2 Comparison of Model and Traffic Data

The level of detail in the junction and link surveys discussed in this report slightly exceeds the level of data coded into the CRAM, although most of the C- and U-class routes and their junctions with the A96 have been modelled. One route that is missing is that where vehicles have been observed to leave the A96 eastbound in the AM peak to find an alternative route which includes the C99C arm of Kinellar Roundabout.

The level of modelled detail in Inverurie is comparable to the level of detail available from the ANPR and junction turning count surveys in the town. The minor road junctions in Inverurie shown in **Figure 10: Junction turning counts locations at Inverurie in April 2017**

Table 14 coincide with modelled zones, which forms a rationale for their inclusion.

The C120C route avoiding Inveramsay Bridge is modelled in both the base and forecast years, although the capacity restraint at Inveramsay is correctly removed in the forecast years.

Blackhall Roundabout was enlarged with a fifth arm added for a new housing development between the base year and the present. This additional junction arm is not included in the forecast models.

6 Conclusions

Many of the routing decisions described in this report may be caused by traffic using alternative routes to the A96 to avoid localised congestion in and around Aberdeen city during peak periods. Once the AWPR is complete it could provide a more attractive route choice for some of these trips which may affect routing behaviour within our study area, in particular at the eastern end of the scheme.

Following completion of the AWPR and the stabilisation of traffic behaviour, the permanent link counts should be re-examined to determine if vehicle routing changes. It is essential that accurate link count information is available for the A96 so the data errors discussed in Chapter 3.1 should be rectified by repairing the traffic counters throughout the route.

The junctions at which rerouting traffic is seen to exit the A96 (Colpy Junction, Gauchhill Junction and Kinellar Roundabout) should also be re-surveyed to detect if the rerouting persists.

Craibstone Roundabout should also be surveyed at this point to determine how much A96 traffic turns off for the A90. Consideration should be given to the collection of traffic data at all the non-surveyed junctions shown in Figure 6.

The modelled AM peak period does not coincide with periods of peak traffic flow on the A96 with the modelled peak (08:00-09:00) later than peak A96 traffic levels (07:00-08:00 or possibly earlier). A96 traffic levels are 20% to 30% lower in the modelled peak hour than in the previous hour and therefore the worst traffic effects, and therefore the differing benefits between scheme options, may not be correctly captured by modelling the existing AM peak hour. The possibility of developing a CRAM 07:00-08:00 peak model should be explored although it is accepted that this represents a very large modelling exercise and may not be suitable for the remainder of the A96 corridor.

Most of the available surveys (excluding the Inverurie ANPR survey and 24-hour automated traffic counts) commence at 07:00, whereas it has been observed that queues form before this time at congested junctions. It is recommended that all future surveys commence at 06:00 to capture these effects.

Blackhall Roundabout in Inverurie is a source of significant congestion in the AM peak, and has recently been remodelled to access a new housing development (Corsmanhill Drive). The traffic data for this roundabout is therefore out of date and re-surveying is recommended.

A database of available traffic count data (permanent and temporary) should be maintained.

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Appendix A

Network Flow Diagram (Excel format)

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Appendix B

Inverurie ANPR Analysis (Excel format)

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Appendix C

RSI Origins and Destinations (Excel format)

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