Starnes plc

Land at Plover Road
Proposed residential development

Transport Assessment

Project Ref: 26677-001

August 2015

Peter Brett Associates LLP
Calgarth House
39-41 Bank Street
Ashford
Kent
TN23 1DQ
T: 0123 3651740
F: 0123 3651741
E: ashford@pba.co.uk

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	Name	Position	Signature	Date
Prepared by:	Faye Murray	Senior Engineer	F.F Murray	20/8/15
Reviewed by:	Gary Heard	Senior Associate	G Heard	20/8/15
Approved by:	Gary Heard	Senior Associate	G Heard	20/8/15
For and on behalf of Peter Brett Associates LLP				

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1 Introduction

1.1.1 Peter Brett Associates LLP (PBA) have been appointed by Starnes plc to provide transport support to a planning application for a proposed residential development on land adjacent to Plover Road in Minster, Isle of Sheppey.

1.1.2 The proposed residential use forms an outline planning application for 107 residential units which is based on 97 units (shown on the submitted masterplan) but with a 10% allowance to provide a robust assessment. This then allows a level of flexibility for the mix of residential development brought forward for a detailed scheme. A separate planning application has also been submitted at the same time for a foodstore and retail units which considers the residential use as part of this larger site.

1.1.3 The site is located in a residential area opposite Sheppey Community Hospital and is approximately 1.6Km from Minster High Street. An approximate site location (red circle) is illustrated below.

1.2 Proposed development

1.2.1 The existing site is scrub land and does not have any pre-existing use. The proposed development comprises up to 107 residential units with a mix of 2, 3 and 4 bed houses.

1.2.2 The residential development will be accessed from Plover Road using the existing Yarrow Drive/Plover Road simple priority junction. Pedestrian connectivity to the residential site will be available from a number of locations as summarised below (see red arrows superimposed by PBA on masterplan sketch (produced by BDB Design) below for locations):

- The access road includes a footway on both sides of the carriageway within the residential site which provides a route for pedestrians onto Plover Road.
- There will be pedestrian connectivity via the emergency access from Clover Close which links with Plover Road.
- There is proposed footway connectivity from the northern boundary (Parish Lane) of the proposed residential development.
- There is proposed footway connectivity from the southern boundary (Mistletoe Drive) of the proposed residential development.

1.2.3 Parking provision at the residential development is considered in detail later within this report.

1.3 This report

1.3.1 The scope and structure of this report has been discussed and agreed with Highway Officers at both Kent Highway Services (KHS) and the Highways Agency (now Highways England (HE)). Discussions on the scope and methodology of the Transport Assessment have been ongoing for this project since 2012. An initial meeting was held to agree the scope, and since then discussions have been held with highway officers in relation to the effect of development on the junction of Lower Road/Barton Hill Drive. The following report considers the transport effects of the proposed development and is structured as follows:

- Section 2 provides a review of the local, regional and national policy relevant to the site;
- Section 3 includes a summary of the existing transport network including cycling, pedestrian, public transport and highway;
- Section 4 describes the baseline traffic conditions on the local highway network;
- Section 5 provides the parking provision proposed against local guidance;
- Section 6 reviews the associated trip generation and distribution of the proposed developments;
- Section 7 reviews the traffic effects of the proposed development on the local highway network;
- Section 8 provides a sensitivity assessment of the traffic effects of the proposed development on the local highway network with the foodstore/retail units included;
- Section 9 summarises the Transport Assessment.

2 Planning Policy

2.1.1 This chapter considers local and national transport policy relevant to consideration of the proposed development of the site.

2.2 National Planning Policy Framework (NPPF)

2.2.1 The NPPF was adopted in March 2012 and is the current over-arching planning guidance for Local Authorities. This policy replaces all of the Planning Policy Guidance documents and Planning Policy Statement documents.

2.2.2 The NPPF document states:

'*Plans and decisions should ensure developments that generate significant movement are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised…..'*

'For larger scale residential developments in particular, planning policies should promote a mix of uses in order to provide opportunities to undertake day-to-day activities including work on site. Where practical, particularly within large-scale developments, key facilities such as primary schools and local shops should be located within walking distance of most properties.'

2.2.3 The proposed development forms part of a larger masterplan (part of a separate application) which provides retail facilities which will allow a proportion of local retail needs to be met locally by walking and cycling trips.

2.2.4 The site will be well connected to the existing footway network and the cycle network further afield, both of which are described in section 3. Public transport journeys can also be made from local bus stops and this is also considered in section 3.

2.2.5 Importantly, NPPF advises that development should only be refused on transport grounds if the residual cumulative impacts are likely to be "severe". The definition of "severe" in this context is unique to the individual site under consideration. However, it may be helpful to consider that within the context of the Environmental Impact Assessment "severe" impacts are often described as those that would have a national or regional significance. In this respect it is clear that NPPF is seeking to strike a positive balance between potential local traffic impacts and local economic or social benefits.

2.3 Local Transport Plan for Kent 3 (LTP3)

2.3.1 The Local Transport Plan for Kent (LTP3) was adopted and published in April 2011 and sets out Kent County Council's (KCC) strategy and implementation plans for local transport investment for the period 2011-16.

2.3.2 The following bullet points have been extracted from the LTP3 as relevant for consideration in relation to the site:

- "*New Development - …KCC works closely with the district authorities to encourage sustainable transport by locating development near existing transport hubs and providing facilities for walking, cycling and public transport. Mixed-use developments, where housing and employment sites are located in close proximity, also encourage shorter commuting journeys*…."

- "*Smarter Travel – …KCC is therefore exploring ways of encouraging journeys by more efficient modes of transport and reducing the distance travelled. With increasing technology, teleworking is becoming more popular with staff working from home or a nearby satellite office rather than their headquarters…. Through the promotion of car sharing and encouraging the use of public transport, walking and cycling, capacity can be released on the transport network which will allow more people to reach their destination on time."*

- *"Walking - Increasing the number of people choosing to walk, instead of drive, is one of the key outcomes needed if the UK is to achieve the carbon reduction target required by the Climate Change Act 2008. ….KCC will continue to make use of pedestrian reviews and access audits in order to provide well designed pedestrian networks connecting key services, employment and trip generators such as health centres, retail areas, town centres, and public transport interchanges."*

- "*Cycling - Currently, the provision of cycle infrastructure varies across the County. However, KCC is committed to the provision of a comprehensive cycle network for residents and visitors to Kent. Based on the evidence summarised in Chapter 9, there needs to be a mixture of dedicated cycle routes to enable people to become more confident cyclists along with measures to provide safer cycle routes on the highway. Importantly, cycle routes should be continuous and direct. Therefore, priority will be given to providing a comprehensive urban cycle network that enables people to cycle continuously to schools, work places, shops and leisure opportunities."*

- "*Buses - Alongside walking and cycling, buses are also delivering lower CO2 emissions per mile, and partnership working between local authorities and bus operators has seen continued improvement in bus passenger journeys, delivering modal shift from car to bus and reducing overall emissions. Under this Theme, bus measures will be implemented where there is the greatest potential to achieve modal shift, encouraging car users to take the bus for their journey.*"

2.3.3 The site will be well connected to the existing footway network and the cycle network further afield, both of which are described in section 3. Public transport journeys can also be made from local bus stops and this is also considered in section 3.

2.4 Swale Local Plan – emerging (December 2014)

2.4.1 The Local Plan was submitted for independent examination in April 2015 and is the emerging policy to replace the adopted Local Plan from February 2008.

2.4.2 The Plan highlights that an efficient transport network is vital in realising the economic potential for the Borough. It mentions that at a local level this includes "*easy access to employment, education, shops, services and facilities".*

2.4.3 With respect to the Isle of Sheppey, it is noted that the Plan summarises progress so far in that providing the Queenborough and Rushenden Relief Road provides a link to the A249, opening up regeneration areas and in the longer term expansion of the Port of Sheerness. It then goes on to mention that these schemes have highlighted a remaining local pinch point at Barton Hill Drive/Lower Road where replacement of the existing traffic signals with a roundabout is required.

2.4.4 Policy CP2 relates to promoting sustainable transport. It states that "*Development proposals will, as appropriate:*

- *1. Contribute to transport network improvements, where capacity is exceeded and or safety standards are unacceptably compromised, with particular emphasis on those identified in the Infrastructure Delivery Schedule;*
- *2. Make best use of capacity in the network by working together with transport providers to improve the transport network in the most sustainable way, and extending it where necessary, as demonstrated by Transport Assessments and Travel Plans in support of development proposals;*
- *3. Support the provision of major new transport infrastructure in accordance with national and local transport strategies;*
- *4. Maintain and improve the highway network at key points to improve traffic flows and respond to the impact of new development and regeneration, as set out in the Local Transport Strategy;*
- *5. Improve safety, through measures such as adequate parking, lighting and traffic management schemes;*
- *6. Achieve alternative access to all services through promoting access to sustainable forms of transport particularly bus, cycling and rail transport and improving interchange between them from the earliest stages of development;*
- *7. Provide integrated walking and cycling routes to link existing and new communities with local services and facilities, public transport and the Green Grid network; and….."*

2.4.5 The development is located within an existing residential area with lit footways and a cycle route along Plover Road. There is a bus stop located on Barton Hill Drive approximately 250m from the site which provides access to routes within the Isle of Sheppey. The site provides pedestrian routes which link to the external network and cycle parking is provided within the curtilage of the residential properties.

2.4.6 Consideration has been given to the operation of the Barton Hill Drive/Lower Road traffic signalised junction with and without the development included. This is discussed in chapter 7.

3 Existing transport network

3.1.1 The following paragraphs summarise the existing transport network and opportunities for sustainable travel to / from the site.

3.2 Walking and cycling access

3.2.1 The site is within an existing residential area. Footways are available on both sides of Plover Road with a shared footway / cycleway on the south side (see photo opposite).

3.2.2 The footways are lit providing good pedestrian facilities.

3.2.3 There is a pedestrian refuge island located on Plover Road in the vicinity of the site access and this will need to be removed or relocated to the west as part of the development.

3.2.4 The existing cycle route on the south side of Plover Road (shared cycleway / footway) runs the full length of Plover Road. To the south east Plover Road intersects with Thistle Hill Way and the cycle route continues south on Thistle Hill Way (see photo below). To the south the cycle route continues west on Lower Road.

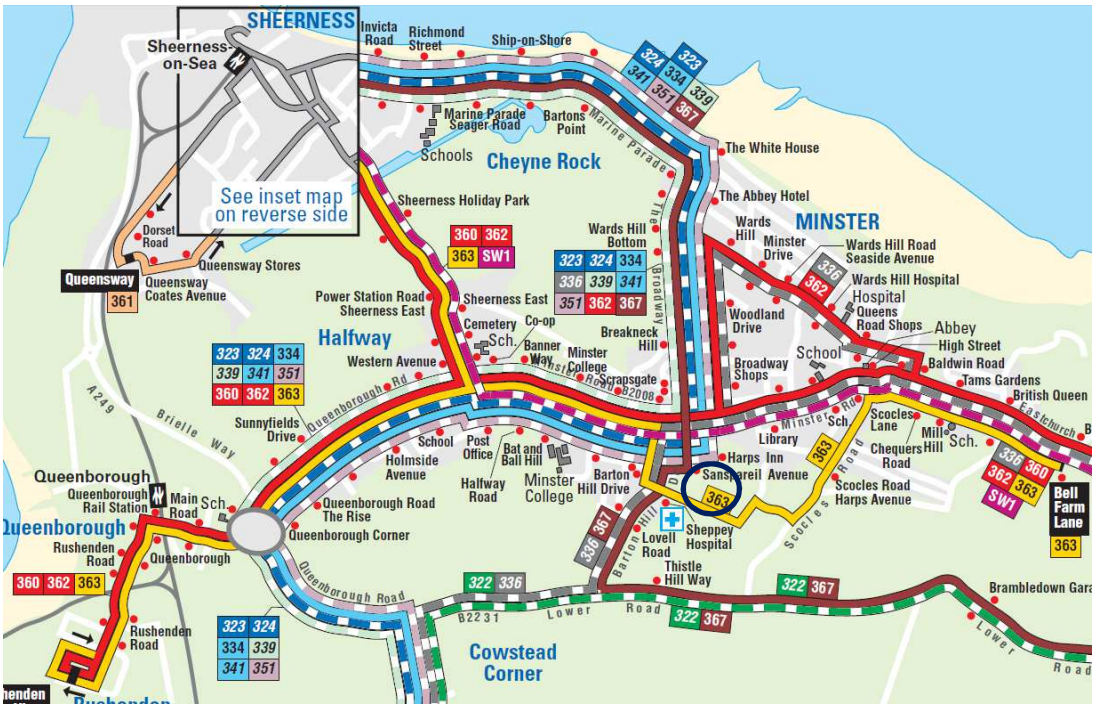
3.2.5 Further afield there is a strategic cycle route which runs along Sheppey Way from the B2231 / Queenborough Road junction (approximately 1.3 miles west of the site) over the bridge onto the mainland. This is known as National Cycle Route 174 (NCR174).

3.2.6 NCR174 is off road within the Isle of Sheppey as a dedicated cycleway adjacent to the carriageway and becomes on road on the other side of The Swale. The route continues to Iwade where it joins NCR1 (a long distance route between Dover and Scotland). Locally, NCR1 runs along the north Kent coast passing through Canterbury, Rochester and Dartford.

3.3 Public Transport Access

3.3.1 According to the KCC bus map for Swale (see extract below with approximate site location ringed) the nearest bus stops to the site are located on Plover Road and Barton Hill Road outside of the hospital (although pedestrian access to the hospital is from Plover Road).

3.3.2 The Barton Hill Road stop is a flag fastened to a lighting column and passengers wait on the concrete slabs set in the grass verge close to the carriageway. This stop is approximately 250m from the site access, There was no evidence of the bus stop on Plover Road during a site visit.



3.3.3 Reference to the KCC bus map and timetable confirms that the Plover Road stop serves the 363 service connects Rushenden to Bell Farm Lane via Sheerness, Minster and Sheppey Hospital. The service is operated by Arriva and is hourly Monday to Saturday. There is no evening or Sunday service.

3.3.4 Reference to the KCC bus map and timetable confirms that the Barton Hill Road stop serves the 336 and 370 service. The 336 service connects Leysdown to Maidstone via Warden Bay, Eastchurch, Minster and Milton Regis. The service is operated by Arriva and provides one journey daily on Tuesday and Friday.

3.3.5 The 367 service connects Sheerness to Warden Point via Minster and Eastchurch. The service is operated by Chalkwell Coaches and provides six journeys daily from Monday to Saturday. There is no evening or Sunday service.

3.3.6 The nearest train station is around 4 kilometres to the west at Queenborough. The station has car parking for 5 vehicles and covered storage facilities for 6 cycles. The station serves

the route to Sittingbourne where a connection can be made to London or the Kent coast to the east.

3.4 Highway Network

3.4.1 The local highway network is illustrated below:

3.4.2 Plover Road is a single carriageway between 7.0m - 7.6m wide which is lit with street lighting on both sides of the road. It has a shared footway / cycleway on the south side and a footway on the eastern side. It is residential in nature and has a speed limit of 30 mph.

3.4.3 At the north west extent Plover Road joins with Barton Hill Drive via a mini-roundabout (see photo below) and at the southern extent with Thistle Hill Way via a roundabout.

3.4.4 Barton Hill Drive is residential in nature and has a speed limit of 30mph. It is a single carriageway between 6.2m - 6.9m width which is lit with street lighting. There is a footway

available on both sides of the carriageway. Vehicles heading north arrive at the B2008 Minster Road and vehicles heading south arrive at the B2231 Lower Road. The Minster Road junction is a mini roundabout (see below left) whilst the Lower Road junction is signal controlled (see below right).

3.4.5 Thistle Hill Way is a newly constructed carriageway which was built as part of the Bovis development. It has a carriageway width of approximately 7.3m with a footway and verge on both sides. The west side also incorporates a cycleway shared with the footway. The speed limit on this route is 30mph. Vehicles heading south arrive at the B2231 Lower Road.

3.4.6 The B2231 Lower Road is an east west corridor that connects Leysdown On Sea to the east coast with the strategic network (A249) to the west. The B2008 Minster Road is also an east west corridor that connects to the B2231 to the east and the A250 Queensborough Road and strategic network (A249) to the west.

3.4.7 The A249 runs north to south across the Isle of Sheppey providing access between the mainland and the island. It connects the port on the north coast (Sheerness) with Maidstone via Sittingbourne.

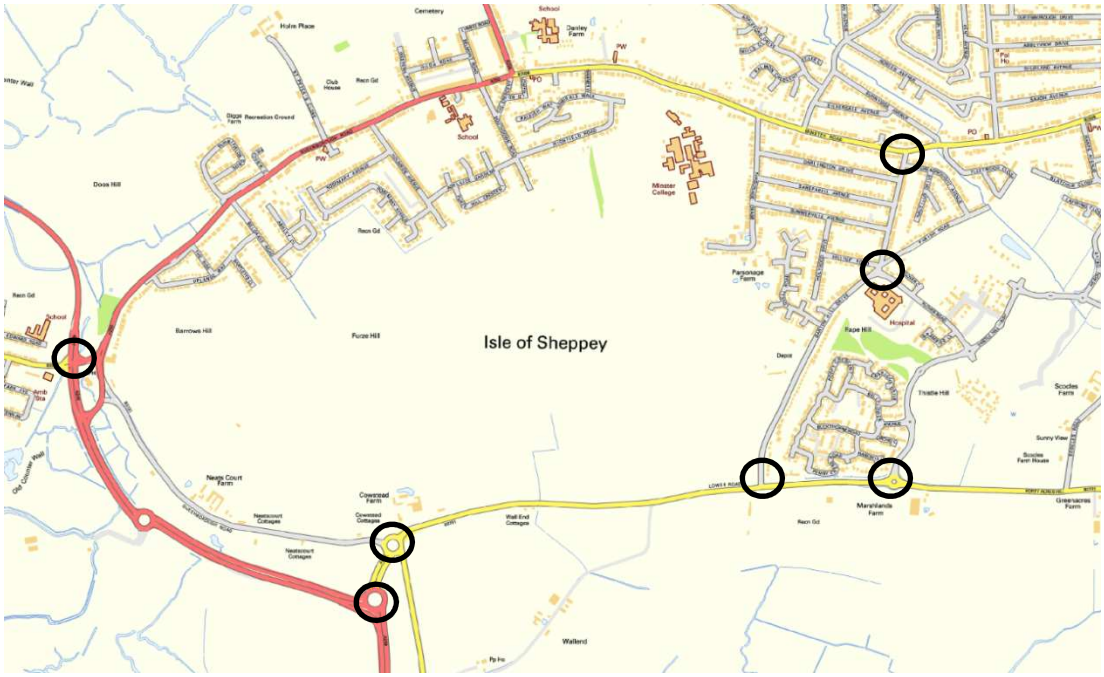
3.4.8 The junction of the A250 Queensborough Road is a signal controlled junction that is built to modern design standards (see photo below).

3.4.9 The junction of the B2231 Lower Road with the A249 is a three arm roundabout and has been constructed in recent years. The northbound traffic on the A249 uses a filter lane rather than entering the roundabout.

4 Existing highway conditions

4.1.1 In order to provide an understanding of existing traffic conditions, a series of traffic surveys were commissioned at locations agreed with KHS and HE Highway Officers during the scoping exercise. The surveys were conducted on Thursday 3rd May 2012 at the following assessed junctions:

- Barton Hill Drive / Lower Road - signals
- Barton Hill Drive / Plover Road - roundabout
- Barton Hill Drive / Minster Road (B2008) - roundabout
- Thistle Hill Way / Lower Road (B2231) - roundabout
- A249 / B2007 / A250 – signals
- A249 / B2231
- Lower Road (B2231) / Sheppey Way / B2231 / Queenborough Road (A250)



4.1.2 The surveys were conducted during the weekday morning and evening peak periods (0700-1000 and 1600-1900) and are included as Appendix A. In addition to classified turning movements, 5 minute queue observations were made to further describe the existing conditions.

4.1.3 The peak hours, for assessment purposes, have been derived based upon network throughput. The hours 0730hrs – 0830hrs and 1645hrs – 1745hrs have been assessed. A summary of the movements during these peak hours is shown in Figures 4.1 and 4.2.

4.1.4 The following points are noted with respect to the traffic movements observed at these junctions:

- The traffic flows along Plover road are similar in both directions and peaks – around 150-170 vehicles per hour. This is therefore considered a relatively lightly trafficked route.
- Tidal patterns are illustrated on A249 for the AM and PM peak hours, with the majority of traffic heading southbound in the morning peak and northbound in the evening peak.
- Queues are evident at the Lower Road / Barton Hill Drive during the morning peak although this is typical for signal controlled junctions. Similar queue lengths were recorded on each arm of the junction arms ranging between 8 to 18 vehicles queued. Similar queue lengths were recorded during the evening peak hour.
- Free flow conditions generally prevailed at the Thistle Hill Way roundabout with Lower Road during both peak hours. Intermittent minor queues were recorded on the Thistle Hill Way arm during the morning peak hour.
- Queues were recorded at the mini roundabout of Barton Hill Drive with Minster Road although these were relatively modest in nature during both peak hours.
- Free flow conditions generally prevailed at the Plover Road / Barton Hill Drive mini roundabout. Intermittent minor queues were recorded on the Plover Road arm during both peak hours.
- The A249 / B2231 roundabout experienced free flow conditions during both peak hours.
- The A249 / A250 junction experienced minor to modest queues during both peak periods typical of signal controlled junctions.

4.2 Crash data

4.2.1 Crash data has been requested in November 2014 for the previous 3 years from Jacobs who held the information on behalf of Kent County Council (see Appendix B for full output provided). This has been reviewed to provide an understanding of any existing and significant crash issues at the junctions that we are considering.

4.2.2 There were 26 crashes at or close to the 7 junctions considered, and they are summarised as follows:

Barton Hill Drive / Lower Road

4.2.3 There was one crash at this traffic signalised junction. It was classified as slight in severity and took place during fine weather conditions on a dry road surface. It related to a rear end shunt and occurred on the westbound carriageway.

4.2.4 There were two accidents on Lower Road which do not appear to be associated with the junction. One accident was classified as 'slight' and appeared to take place west of the junction with queuing traffic associated with a car boot sale. It occurred during fine weather conditions on a dry road surface. The other accident took place 200m east of the junction and was classified as serious. It took place in fine weather conditions on a dry road surface, and related to a pedal cyclist riding off the footway on the south side of Lower Road into the path of a vehicle travelling westbound along Lower Road.

4.2.5 There does not appear to be a common causation factor for these crashes.

Barton Hill Drive / Minster Road (B2008)

4.2.6 There were three incidents close to this mini roundabout junction. All occurred on Minster Road, and were on dry road conditions in fine weather. All were classifired as 'slight' in severity. One accident related to a cyclist driving off the footway into the path of a motorcyclist, the other was a pedestrian walking into the road without looking properly. The third accident related to a rear end shunt when a vehicle travelling eastbound hit a stationary vehicle turning right into a nearby priority junction (Fleetwood Close).

4.2.7 There does not appear to be a common causation factor for these crashes.

Thistle Hill Way / Lower Road (B2231)

4.2.8 Three crashes occurred at this roundabout junction. All were classified as 'slight'. One took place in rainy/windy conditions on a wet/damp road surface, and happened when a vehicle turning right from Thistle Hill Way hit the rear of a broken down vehicle that was being pushed onto the verge off the roundabout.

4.2.9 The other two crashes happened in fine weather and dry road conditions. Of these two accidents, one took place when a vehicle attempted to overtake a parked car on Thistle Hill which was pulling away. The other accident related to a cyclist travelling eastbound on a path and swerved to miss an overgrown bush causing them to travel close to the kerb edge. A van travelling eastbound clipped the bike resulting in the cyclist falling off.

4.2.10 There does not appear to be a common causation factor for these crashes.

A249 Brielle Way / B2007 Main Road / A250 Main Road

4.2.11 Three crashes occurred at or close to this traffic signalised junction. All were classified as 'slight' and happened on dry road conditions in fine weather. One accident involved a car turning right at the signals and colliding with another vehicle travelling southbound along A249 Brielle Way. One was a motorcyclist travelling up the nearside of a car which was

turning left. The other was a vehicle travelling through a red light whilst on their mobile phone colliding with two opposing cars at the crossroads.

4.2.12 There does not appear to be a common causation factor for these crashes.

A250 Queenborough Road/A250 Main Road

4.2.13 Six crashes occurred at or close to this junction. Of these, one was classified as 'serious'. It took place in dry weather conditions on a dry road surface and related to a pedestrian running into oncoming traffic when crossing over the road.

4.2.14 The other five crashes are classified as 'slight'. Of these, three occurred in dry weather conditions on a dry road surface. One of the three related to a vehicle losing control due to debris on the carriageway, the other was a vehicle pulling out of the petrol filling station into the path of another vehicle and the third was a motorcycle pulled across the path of a car close to the petrol filling station.

4.2.15 The other two crashes classified as 'slight' took place on wet/damp road conditions. One was in 'unknown' weather, and related to a taxi colliding with a pedestrian crossing over the road. It appears from the description that the taxi had the green light. The other was in fog/mist conditions and took place when a pedestrian was crossing the exit of the petrol filling station. It seems a vehicle had stopped but then pulled away when the pedestrian was halfway across.

Lower Road/A249/Queenborough Road/Sheppey Way and A249/B2231

4.2.16 Eight crashes took place at or close to these two roundabout junctions.

4.2.17 Three were in fine weather on a wet/damp road surface and were classified as 'slight' in severity. The first related to a motorcyclist who overtook a car as they travelled off the roundabout. The motorcyclist was in the car's blind spot, and as the driver of the car readjusted to take account of two lanes reducing to one lane the car hit the motorcycle. The second took place when a car and motorcyclist collided on the roundabout circulatory causing the rider to fall off. The third involved a vehicle losing control as they performed a right turn at the roundabout.

4.2.18 The other five crashes were in fine weather and on a dry road surface. One was classified as 'serious' and related to a motorcyclist colliding with the rear of a parked car. The others were classified as 'slight'. One involved a HGV turning right at the roundabout from Queenborough Road towards the A249. During the maneouvre the trailer overturned causing the cab to overturn. Two related to drivers changing lanes - one caused a motorcyclist to be pushed into a central island and the other collided with a car. One was a HGV which lost control after hitting a kerb side barrier.

4.2.19 There does not appear to be a common causation factor for these crashes.

Plover Road/Barton Hill Drive

4.2.20 There were no crashes shown at this junction.

5 Parking

5.1.1 Swale Borough Council are currently using Kent County Council's Residential Parking Interim Guidance Note 3 (IGN3). This is summarised below.

5.2 Car parking

5.2.1 The parking standards suggest the following minimum number of parking spaces for a "suburban" location:

Land Use	MinImum level of car parking
1 & 2 bed houses	1 space per unit
3 bed houses	1.5 spaces per unit
4 bed houses	2 spaces per unit
Visitor parking allowance	0.2 per unit on street

5.2.2 The masterplan generally allows for 2 spaces per house which equates to 210 spaces in total, as well as an allowance of 21 spaces for visitors parking on street. This is above the minimum level of car parking required in this type of location as the housing type is a mix of 2, 3 and 4 bed houses, and so conforms with local policy.

5.3 Cycle parking

5.3.1 Kent County Council's Supplementary Guidance (SPG4) provides details of the minimum cycle parking standards relevant to the residential development as follows:

Land Use	Minimum level of cycle parking (SPG4)
Individual residential dwellings	1 space per bedroom

5.3.2 At least the minimum number of cycle spaces will be provided within the curtilage of the residential properties in accordance with SPG4.

6 Trip generation and distribution

6.1.1 The following section sets out the trip rates and distribution methodology agreed during the scoping exercise. In summary, the trip rates are extracted from the TRICS database and the distribution has been calculated using journey to work census data.

6.2 Trip generation

6.2.1 Trip rates have been extracted for 'private housing' for England (excluding London) with filters on the location such that 'town centre', 'edge of town centre' and 'edge of town' are deselected (full TRICS output is provided in the appendix).

6.2.2 The following table provides the average trip rates using the criteria above and this methodology has been agreed with Officers during the scoping exercise. In addition, the trip rates have been applied to the 107 residential units to provide traffic generation to/from the site. The full TRICS output is provided in Appendix C.

Private Housing	AM Peak		PM Peak	
	Arrivals	Departures	Arrivals	Departures
Trip rates (per unit)	0.153	0.382	0.359	0.230
Trip generation (107 units)	16	41	38	25

6.3 Trip distribution

6.3.1 The trips have been distributed in accordance with journey to work data extracted from the census data an area surrounding the site.

6.3.2 Using GIS, the workplaces have been plotted to provide output areas with the centroid of each assigned to the nearest node on the highway network.

6.3.3 A route code was developed for each node so that this information, along with the proportion of trips to each "output area" from the site could be used to assign the development trips through each assessment junction.

6.3.4 The trip distribution is shown at Figure 6.1. The development traffic derived at each of the assessed junctions is shown at Figures 6.2 to 6.3.

6.4 Assessment traffic flows

6.4.1 Traffic flows have been derived for the following scenarios to be used for junction modelling purposes:

- 2017 / 2022 base case - Observed flows growthed to a future year of 2017 (for local junctions) and 2022 (for trunk road network) plus committed development.

- 2017 / 2022 “with development” case – This comprises the base case + traffic flows associated with the residential units. Local junctions assessed at 2017 and trunk road at 2022.

- Sensitivity test – This comprises the retail development flows added to an alternative base case (related to diverted trips on the local network) as taken from the Transport Assessment for the retail development. The residential flows have then been added to this.

6.5 Base case traffic flows

6.5.1 The Tempro database has been used to extract growth factors as agreed during the scoping exercise to be used for future traffic calculations. These growth factors allow for sites which have been allocated in the Local Development Framework for the Isle of Sheppey.

6.5.2 The Tempro database has been used to extract the following growth factors which have been agreed as part of the scoping exercise:

2017

AM peak	1.04 (principal, urban and minor, urban)
PM peak	1.04 (principal, urban and minor, urban)

2022

AM peak	1.11 (trunk, urban)
PM peak	1.12 (trunk, urban)

6.5.3 The trunk road growth factors have been applied to the mainline flow along the A249 and are based on the average of the growth factors for Minster, Queenborough and Sheerness. The principal and minor road growth factors are based on the area of Minster and are the same for both classifications of road.

6.5.4 During the scoping exercise, the Highway Officer highlighted two retail development proposals to be taken into account. One of these has received planning permission (Morrisons in Queenborough) and the other was withdrawn and has subsequently been submitted as a residential development for 160 houses (Sainsburys on Power Station Road).

6.5.5 Whilst the Morrisons in Queenborough has now been constructed, it was not open at the time of the traffic surveys undertaken in 2012.

6.5.6 In addition, a planning application has been submitted recently for 500 units at Thistle Hill. It is assumed that these units are not included in the Tempro factors as at the time of the Local Plan there was an approved Development Brief for 1750 dwellings. It is understood that there is planning permission for 1400 dwellings at Thistle Hill and that 1100 dwellings have been constructed (as of June 2014). Therefore, if permission is given to the additional units

this would take the total amount of permitted residential dwellings to 1900 dwellings. Thus, allowing explicitly for 500 units is considered robust, as the difference between the potential permitted (ie 1400+500) and Development Brief (1750) is 150 units.

6.5.7 All three developments taken as 'committed' have been included in the base flows.

6.5.8 The flows associated with the developments have been extracted from the Transport Assessment that accompanied the planning application and distributed through the junctions further afield using observed traffic flows.

6.5.9 The 2017 and 2022 background flows are shown in Figures 6.4 to 6.7, and the committed development is shown in Figures 6.8 – 6.13. The resulting 2017 and 2022 base flows are shown in Figure 6.14 – 6.17.

6.6 "With development" traffic case

6.6.1 The flows associated with the base case for 2017 and 2022 and the addition of development traffic flows for the residential units are shown in Figures 6.18 – 6.21.

6.7 Sensitivity case

6.7.1 The retail site proposed in front of the residential site forms part of a separate planning application which has been submitted. The retail development flows were applied to an alternative base which takes into account the diversion of trips from the existing foodstores to the west of the Isle. The alternative base + retail flows have been extracted from the Transport Assessment for the retail planning application and are shown at Figures 6.22 – 6.25. The residential flows were added to the alternative base + retail flows to provide a sensitivity scenario for 2017 and 2022 – the sensitivity flows are shown in Figures 6.26 – 6.29.

7 Junction assessment

7.1.1 The following junctions have been assessed to understand their existing and future operation for weekday morning and evening peak hours.

- Barton Hill Drive / Lower Road - signals
- Barton Hill Drive / Plover Road - roundabout
- Barton Hill Drive / Minster Road (B2008) - roundabout
- Thistle Hill Way / Lower Road (B2231) - roundabout
- A249 / B2007 / A250 – signals
- A249 / B2231 – roundabout
- Lower Road (B2231) / Sheppey Way / B2231 / Queenborough Road (A250) - roundabout

7.2 Barton Hill Drive / Lower Road

7.2.1 This junction is traffic signal controlled with three arms and has been modelled using the LINSIG software. There are no formal crossing points (either controlled or uncontrolled). The modelled layout is shown in Appendix D.

7.2.2 Cycle times for this junction were requested from Kent County Council, and used in the LINSIG model for calibration purposes. For the future scenarios it is assumed that the cycle times would be increased to take account of increases in traffic associated with background growth.

7.2.3 The following table provides a summary of the results for the 2012 observed peak hour flows output from the LINSIG model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Deg Sat %	Del (s/pcu)	Queue	Deg Sat %	Del (s/pcu)	Queue
Lower Road (West)	113.5	270.1	64.1	88.8	29.1	32.0
Barton Hill Drive	93.9	62.2	15.9	85.6	90.9	9.5
Lower Road (East)	63.4	16.0	9.8	37.1	9.2	5.3
Cycle Time	71 seconds			116 seconds		
PRC / Total Delay	-26.1%			1.4%		

7.2.4 The results illustrate that the model is fit for purpose as the observed queue lengths are similar to the model results for Barton Hill Drive and Lower Road (East). The queue lengths

for Lower Road (West) indicate 18 vehicles, however it is known from discussions with the Highway Officer and the traffic survey company that vehicles move slowly along Lower Road (West) between the junction with the A249 through to this junction. On this basis the queue length as included in the model is considered a reasonably representation of this phenomenon. Therefore, the model has been used to run the future year flows.

7.2.5 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the LINSIG model with an altered cycle time of 120 seconds assumed (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Deg Sat %	Del (s/pcu)	Queue (pcus)	Deg Sat %	Del (s/pcu)	Queue (pcus)
Lower Road (West)	95.1	62.5	33.6	101.0	82.6	62.9
Barton Hill Drive	95.7	83.6	25.9	95.9	135.4	13.5
Lower Road (East)	74.1	25.1	21.5	44.3	10.2	7.1
Cycle Time	120 seconds			120 seconds		
PRC	-6.4%			-12.2%		

7.2.6 It is noted that the junction is predicted to be above the desirable capacity of 90% for an existing junction with a maximum degree of saturation of 101% in the PM peak, an associated queue of 83 pcus and delay of 63 s/pcu. This is an improvement over the observed scenario as the cycle time is assumed to be increased to take account of the background growth and committed development flows through this junction.

7.2.7 The following table provides a summary of the 2017 “with development” results for the peak hour flows using the same cycle time assumed for the base case so as to illustrate the differences clearly. The output from the LINSIG model is shown in Appendix G.

2017 “with development”	08:00 - 09:00			17:00 - 18:00		
	Deg Sat %	Del (s/pcu)	Queue (pcus)	Deg Sat %	Del (s/pcu)	Queue (pcus)
Lower Road (West)	95.2%	64.6	32.6	101.7%	90.7	65.9
Barton Hill Drive	93.8%	72.7	24.7	99.9%	164.4	16.0
Lower Road (East)	74.2%	26.4	21.4	43.0%	10.1	6.7
Cycle Time	120 seconds			120 seconds		
PRC	-5.7%			-12.9%		

7.2.8 With the residential flows included with the base flows in 2017, the junction operates slightly above the theoretical capacity for an existing junction. The maximum degree of saturation increases by 0.7% in the PM peak (Lower Road (West)) arm) and by 4% on the Barton Hill Drive arm. The associated queues increase by 3 pcus when the ‘with development’ scenario is compared with the base case on Lower Road (W). The associated delays increase by 8.1 s/pcu.

7.2.9 In summary the junction operates just above theoretical capacity for an existing junction for the 2017 base case and 2017 'with development' flows. The difference in operation is considered negligible when comparing the base case and 'with development' scenarios.

7.2.10 However, it is understood that this junction is currently under scrutiny from Kent Highway Services and local members due to ongoing queuing issues on Lower Road. Kent Highway Services have indicated that the junction is sensitive to any increase in traffic. They have advised that a roundabout is required at this location to replace the current traffic signal junction.

7.2.11 Recent discussions with Kent Highway Services suggest that to enable residential development in the area the option of providing a roundabout through developer contributions is the preferred solution. It is understood that Kent Highway Services have applied for funding for this roundabout on the basis that local developers in the area will provide contributions towards it. The highway authority will then implement the design and construction of the roundabout.

7.2.12 Kent Highway Services have further advised that a level of residential development could be implemented prior to the construction of the roundabout which would enable developers to collect monies from the sale of the properties to assist with paying for the upgrade.

7.2.13 Further discussions are expected post application to discuss the detail of this mitigation proposal, including the level of development that could be implemented prior to the roundabout being operational and the level of contribution expected. Therefore, it is anticipated that should the development be successful through the planning process that it would be subject to a S106 agreement which requires an appropriate contribution to be made to KHS towards the provision of the roundabout.

7.3 Barton Hill Drive / Plover Road

7.3.1 This junction is a three arm mini roundabout with a cross roads located close to the junction on the Barton Hill Drive (N) arm. The traffic surveys indicate there is no queuing on the arms of the roundabout and so the impact from the crossroads is not considered to be significant in terms of junction modelling.

7.3.2 The junction has been modelled using JUNCTIONS 8 software. The layout includes dropped kerbs on Plover Road and Barton Hill (S) arms with splitter islands to assist pedestrians in crossing. The layout is shown in Appendix D.

7.3.3 The following table provides a summary of the results for the 2012 observed peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Plover Road	0.38	0.60	0.19	0.34	0.50	0.14
Barton Hill Drive (S)	0.38	0.59	0.13	0.55	1.19	0.17
Barton Hill Drive (N)	0.86	4.90	0.51	0.50	0.97	0.17

7.3.4 The results illustrate that the model is fit for purpose as the queue lengths reflect the model results. Therefore, the model has been used to run the future year flows.

7.3.5 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q	Delay
Plover Road	0.52	1.03	0.24	0.42	0.70	0.16
Barton Hill Drive (S)	0.41	0.69	0.14	0.62	1.56	0.21
Barton Hill Drive (N)	0.95	8.94	0.85	0.60	1.45	0.21

7.3.6 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 for an existing junction for the AM peak period. The highest RFC value is 0.95 in the AM peak with an associated queue length of 9 vehicles and delay of under a minute.

7.3.7 The following table provides a summary of the 2017 “with development” results for the peak hour output from the JUNCTIONS 8 model (full output is shown in Appendix G).

2017 “with development”	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q	Delay
Plover Road	0.59	1.35	0.28	0.45	0.80	0.17
Barton Hill Drive (S)	0.43	0.74	0.14	0.65	1.80	0.23
Barton Hill Drive (N)	0.96	9.89	0.94	0.63	1.61	0.23

7.3.8 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 for an existing junction for both peak periods.

7.3.9 The maximum RFC value in the AM peak increases from 0.95 in the base case to 0.96 in the ‘with development’ case, with an associated queue length of 9.89 vehicles and delay of 0.94 minutes (which is an increase of 0.95 vehicles queuing and 0.09 minutes compared to the base case).

7.3.10 In summary, the junction operates below the theoretical maximum of 1.0 for both peak periods. As the difference between the base case and ‘with development’ scenarios are

negligible it is anticipated that there would be no perceptible difference in operation of the junction with the proposed development implemented. Therefore, no mitigation is proposed at this junction.

7.4 Barton Hill Drive / Minster Road (B2008)

7.4.1 This junction is a three arm mini roundabout and has been modelled in JUNCTIONS 8. The layout includes dropped kerbs and tactile paving on the Barton Hill Drive arm only. The layout is shown in Appendix D.

7.4.2 The following table provides a summary of the results for the 2012 observed peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Barton Hill Drive	0.57	1.28	0.20	0.74	2.59	0.34
Minster Road (E)	0.75	2.70	0.32	0.48	0.90	0.16
Minster Road (W)	0.49	0.92	0.19	0.54	1.13	0.19

7.4.3 The results illustrate that the model is fit for purpose as the observed queue lengths are similar to the model results. Therefore, the model has been used to run the future year flows.

7.4.4 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Barton Hill Drive	0.69	2.13	0.28	0.92	6.78	0.99
Minster Road (E)	0.91	6.83	0.68	0.64	1.73	0.23
Minster Road (W)	0.62	1.58	0.26	0.76	2.84	0.35

7.4.5 It is noted that the junction is predicted to operate below the theoretical maximum of 1.0 for both peak periods. The maximum RFC value in the AM peak is 0.91 on Minster Road (E) with an associated queue of 6.83 vehicles and delay of 0.68 minutes.

7.4.6 The maximum RFC value in the PM peak is 0.92 on Barton Hill Drive with an associated queue of 6.78 vehicles and delay of 0.99 minutes.

7.4.7 The following table provides a summary of the 2017 “with development” results for the peak hour output from the JUNCTIONS 8 model (full output is shown in Appendix G).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Barton Hill Drive	0.71	2.29	0.30	0.92	7.10	0.81
Minster Road (E)	0.92	7.16	0.71	0.65	1.78	0.24
Minster Road (W)	0.63	1.61	0.27	0.77	2.97	0.36

7.4.8 The model results above illustrate that the maximum RFC value for both peak periods is below the theoretical maximum capacity of 1.0 for an existing junction (as for the base case).

7.4.9 The maximum RFC value is 0.92 in the AM peak period on Minster Road (E), which is 1% higher than the base case. The associated queue length increases by 0.33 vehicles and the delay by 0.03 minutes compared to the base case.

7.4.10 The maximum RFC value in the PM peak period is 0.92 on Barton Hill Drive, which is the same as the base case. The associated queue length increases by 0.32 vehicles and the delay by 0.18 minutes compared to the base case.

7.4.11 In summary, the junction operates below the theoretical capacity for the base case and the 'with development' case for both peak hours. There is a negligible difference in the maximum RFC value in the AM peak and no difference in the maximum RFC value in the PM peak between the base case and 'with development' case. It is anticipated that there would be no perceptible difference in operation with the proposed development implemented.

7.5 Thistle Hill Way / Lower Road (B2231)

7.5.1 This junction is a three arm roundabout and has been modelled using JUNCTIONS 8 software. The layout includes dropped kerbs on Thistle Hill Way and Lower Road (B2231) eastern arm with splitter islands to assist pedestrians in crossing. The layout is shown in Appendix D.

7.5.2 The following table provides a summary of the results for the 2012 observed peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Lower Road (W)	0.33	0.48	0.06	0.43	0.76	0.07
Thistle Hill Way	0.28	0.39	0.06	0.07	0.08	0.05
Lower Road (E)	0.40	0.67	0.08	0.43	0.73	0.07

7.5.3 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 in both peak hours. The results illustrate that the model is fit for purpose as the observed queue lengths reflect the model results. Therefore, the model has been used to run the future year flows.

7.5.4 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
Lower Road (W)	0.38	0.60	0.06	0.54	1.15	0.08
Thistle Hill Way	0.41	0.67	0.08	0.14	0.17	0.06
Lower Road (E)	0.46	0.85	0.09	0.48	0.92	0.08

7.5.5 It is noted that the junction is predicted to operate well below the theoretical maximum capacity of 1.0 for both peak periods. The maximum RFC is 0.54 in the PM peak on Lower Road (W), with associated queue lengths of 1.15 vehicles and a maximum delay of 0.08 minutes.

7.5.6 The following table provides a summary of the 2017 “with development” results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix G).

2017 “with development”	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
Lower Road (W)	0.38	0.60	0.06	0.54	1.15	0.08
Thistle Hill Way	0.41	0.68	0.08	0.15	0.17	0.06
Lower Road (E)	0.47	0.86	0.09	0.49	0.93	0.08

7.5.7 It is noted that the junction is predicted to operate well below the theoretical maximum capacity of 1.0 in both peak periods. The maximum RFC in the AM peak increases by 1% when comparing the base case and with development flows as there is minimal development traffic predicted to use this junction. In the PM peak the maximum RFC remains the same in both scenarios.

7.5.8 In summary, the junction operates well below the theoretical maximum capacity for the base case and the ‘with development’ case for both peak hours.

7.6 A249 / B2007 / A250

7.6.1 This junction is traffic signalised cross roads. Both arms of the A249 have a banned right turn into the minor roads of the B2007 and A250. There are controlled crossing points over all arms.

7.6.2 A total of 1129 vehicles were observed passing through this crossroads during the morning peak hour and 1354 vehicles during the evening peak hour. Average queue lengths on all arms during this period were 3-4 vehicles across a number of lanes. Therefore the junction is observed to be working well within capacity under present day conditions.

7.6.3 Based upon the traffic flows derived within this Transport Assessment a total of 9 residential development vehicles are calculated to pass through the crossroads during the morning peak hour and 10 during the evening peak hour. This relates to a percentage impact of 3.3% during the morning peak hour and 3.0% during the evening peak at 2022 (based upon 2022 base + residential development throughput of 1391 during the morning and 1671 during the evening).

7.6.4 On the basis of this analysis it was not considered necessary to model this junction in detail and this approach was agreed with Highways England. It has significant spare capacity at present, is relatively modern and hence is anticipated to have a significant design life, and the residential development would have an imperceptible impact at this location.

7.7 A249 / B2231

7.7.1 This junction is a three arm roundabout with a left turn / straight ahead filter on the A249 south arm. It has been modelled using JUNCTIONS 8 software. The layout is shown in Appendix D.

7.7.2 The following table provides a summary of the results for the 2012 observed peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
A249 (S)	0.46	0.84	0.04	0.57	1.34	0.05
A249 (N)	0.29	0.40	0.04	0.35	0.54	0.05
B2231	0.47	0.88	0.05	0.32	0.46	0.04

7.7.3 It is noted that the junction is predicted to operate well below the theoretical maximum capacity of 1.0 in both peak hours. The results illustrate that the model is fit for purpose as the observed queue lengths reflect the model results. Therefore, the model has been used to run the future year flows.

7.7.4 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
A249 (S)	0.50	1.00	0.05	0.63	1.66	0.06
A249 (N)	0.32	0.47	0.04	0.43	0.75	0.05
B2231	0.56	1.28	0.07	0.37	0.59	0.05

7.7.5 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 for an existing junction in both peak periods. The maximum RFC is 0.63 in the PM peak

on A249 (S), with associated queue lengths of 1.66 vehicles and a maximum delay of 0.06 minutes.

7.7.6 The following table provides a summary of the 2017 "with development" results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix G).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
A249 (S)	0.51	1.01	0.05	0.63	1.70	0.06
A249 (N)	0.32	0.48	0.04	0.44	0.77	0.05
B2231	0.58	1.34	0.07	0.38	0.60	0.05

7.7.7 With the development flows included the junction is predicted to still operate well below the theoretical maximum capacity of 1.0 in both peak periods. The maximum RFC is 0.63 in the PM peak on A249 (S) is the same as the base case. The associated queue length is 1.70 vehicles and the delay is 0.06 minutes which is a negligible increase over the base case.

7.7.8 In summary, the junction operates well below the theoretical maximum capacity for the base case and the 'with development' case for both peak hours.

7.7.9 The following table provides a summary of the 2022 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix H).

2022 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
A249 (S)	0.54	1.14	0.05	0.67	2.00	0.07
A249 (N)	0.35	0.53	0.04	0.47	0.87	0.06
B2231	0.61	1.52	0.08	0.41	0.68	0.05

7.7.10 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 for both peak periods. The maximum RFC is 0.67 in the PM peak on A249 (S), with an associated queue length of 2.00 vehicles and a maximum delay of 0.07 minutes.

7.7.11 In summary, the junction operates below the theoretical maximum capacity for the base case for both peak hours.

7.7.12 The following table provides a summary of the 2022 "with development" results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix I).

2022 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
A249 (S)	0.54	1.16	0.05	0.68	2.07	0.07
A249 (N)	0.35	0.53	0.04	0.47	0.89	0.06
B2231	0.62	1.60	0.08	0.41	0.69	0.05

7.7.13 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 in both peak periods. The maximum RFC is 0.68 in the PM peak on A249 (S) which is an increase of 1% on the base case. The associated queue length is 2.07 vehicles and the delay is 0.07 minutes which is a minimal increase over the base case.

7.7.14 In summary, the junction operates below the theoretical maximum capacity for the base case and the 'with development' case for both peak hours. The difference in operation between the two scenarios (ie 2017 and 2022) in both peak hours is negligible.

7.8 Lower Road (B2231) / Sheppey Way / B2231 / Queenborough Road (A250) - roundabout

7.8.1 This junction is a four arm roundabout and has been modelled using JUNCTIONS 8 software. The layout is shown in Appendix D.

7.8.2 The following table provides a summary of the results for the 2012 observed peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix E).

2012 observed	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay (min)	Max RFC	Max Q	Delay (min)
Lower Road (B3321)	0.55	1.19	0.07	0.38	0.61	0.05
Sheppey Way	0.11	0.12	0.06	0.19	0.23	0.06
B3321 (S)	0.30	0.42	0.30	0.43	0.74	0.05
Queenborough Road	0.14	0.16	0.14	0.11	0.12	0.06

7.8.3 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 in both peak hours. The results illustrate that the model is fit for purpose as the observed queue lengths reflect the model results. Therefore, the model has been used to run the future year flows.

7.8.4 The following table provides a summary of the 2017 baseline results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix F).

2017 baseline	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Lower Road (B3321)	0.64	1.73	0.08	0.44	0.77	0.05
Sheppey Way	0.12	0.14	0.07	0.20	0.25	0.06
B3321 (S)	0.33	0.50	0.04	0.50	1.00	0.06
Queenborough Road	0.15	0.17	0.06	0.12	0.14	0.06

7.8.5 For the base case the junction is predicted to operate below the theoretical maximum capacity of 1.0 for both peak periods. The maximum RFC value is 0.64 on Lower Road in the morning peak, with an associated queue length of 1.73 vehicles and a delay of 0.08 minutes.

7.8.6 The following table provides a summary of the 2017 “with development” results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix G).

2017 “with development”	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Lower Road (B3321)	0.65	1.82	0.09	0.44	0.79	0.05
Sheppey Way	0.12	0.14	0.07	0.20	0.25	0.06
B3321 (S)	0.34	0.51	0.04	0.51	1.05	0.06
Queenborough Road	0.15	0.17	0.06	0.12	0.14	0.06

7.8.7 With the development flows included, the junction is predicted to operate below the theoretical maximum capacity of 1.0 in both peak periods. The maximum RFC is 0.65 in the AM peak on Lower Road which is an increase of 1% on the base case. The associated queue length is 1.82 vehicles and the delay is 0.09 minutes, which is a minimal increase compared to the base case.

7.8.8 In summary, the junction operates below the theoretical maximum capacity for the base case and the ‘with development’ case for both peak hours. The difference in operation between both scenarios (base case and ‘with development’ scenario) is negligible.

8 Sensitivity assessment

8.1.1 The following section considers the scenario where the proposed residential units are also built out alongside the proposed retail. Therefore a sensitivity assessment for the cumulative impact has been completed.

8.2 Barton Hill Drive / Lower Road

8.2.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the LINSIG model (full output is shown in Appendix J).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Deg Sat %	Del (s/pcu)	Queue	Deg Sat %	Del (s/pcu)	Queue
Lower Road (West)	96.7	70.0	36.0	99.5	67.0	56.3
Barton Hill Drive	95.7	83.6	25.9	95.5	132.9	13.3
Lower Road (East)	74.1	25.1	21.5	44.3	10.2	7.1
Cycle Time	120 seconds			120 seconds		
PRC	-7.5%			-10.6%		

8.2.2 It is noted that the junction is predicted to operate below the theoretical capacity of 100% for both peak periods. However, whilst there is a slight decrease in capacity in the AM peak compared to the 'with development' scenario (ie with just the residential development included) and the base case, there is an increase in capacity in the PM peak when compared to the same scenarios. This is due to the change in local traffic patterns for residents in Minster who will be able to use the nearby foodstore rather than travelling to the west of the Isle.

8.2.3 The highest degree of saturation occurs in the evening peak on Lower Road (West) with 99.5% which is a decrease of 2.2% on the base case. The associated maximum queue length is 56.3 pcus and delay of 67.0 s/pcu, which is a decrease of 6.6 pcus queue length and 15.6 s/pcu delay when compared to the base case.

8.2.4 The highest degree of saturation in the AM peak is 96.7% which is an increase of 1.6% compared to the base case. The associated queue length is 36 pcus and the delay is 70 s/pcu. This relates to a queue increase of 2.4 pcus and average delay increase of 7.5 s/pcu when compared to the base case. This minimal increase is not anticipated to be perceptible in practice.

8.2.5 In summary, the junction operates below the theoretical maximum capacity for both the base case and the sensitivity case for both peak periods. There is an increase in capacity in the PM peak and a slight decrease in the AM peak. As discussed in the previous chapter, this

junction is to be upgraded to a roundabout by contributions from local development sites and funding from Kent Highway Services.

8.3 Barton Hill Drive / Plover Road

8.3.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
Plover Road	0.59	1.36	0.28	0.53	1.07	0.20
Barton Hill Drive (S)	0.43	0.74	0.14	0.68	2.02	0.26
Barton Hill Drive (N)	0.97	10.56	1.00	0.68	2.01	0.26

8.3.1 It is noted that the junction is predicted to operate below the theoretical maximum capacity of 1.0 in the AM peak for both the base (0.95) and sensitivity (0.97) scenarios and well below for the PM peak.

8.3.2 The maximum RFC value in the AM peak increases from 0.95 in the base case to 0.97 in the sensitivity scenario, which is an increase of 2%. There is an associated queue length of 10.56 vehicles (an increase of 1.62 vehicles when compared to the base case) and delay of 1.00 minute (an increase of 0.15 minutes compared to the base case).

8.3.3 In summary, the junction operates below the theoretical maximum capacity for both the base case and the sensitivity case for both peak periods.

8.3.4 The difference between the base case and the sensitivity case is negligible in the AM peak and it is anticipated that any change in operation of the junction would be imperceptible in practice. Particularly, when it is considered that the maximum queue length increases by around 2 vehicles when compared to the base case.

8.4 Barton Hill Drive / Minster Road (B2008)

8.4.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Barton Hill Drive	0.71	2.29	0.30	0.99	12.05	1.33
B2008 Minster Road (E)	0.92	7.31	0.72	0.68	1.97	0.26
Minster Road (W)	0.63	1.65	0.27	0.80	3.55	0.42

8.4.2 It is noted that the junction is predicted to operate below the theoretical maximum capacity value of 1.0 in both peak hours.

8.4.3 The maximum RFC value is in the PM peak and is 0.99 on the Barton Hill Drive arm. This is an increase of 7% from 0.92 in the base case for the PM peak. There is an associated queue length of 12 vehicles and delay of 1.33 minutes, which is an increase of 5 vehicles queuing and a delay of 0.34 minutes when compared with the base case.

8.4.4 In summary, the junction operates below the theoretical maximum capacity for the base case and the 'with development' scenario for both peak periods. There would be minimal impact at this junction with the proposed development implemented, particularly when the difference in queue lengths (around 5 vehicles which equates to additional 1 vehicle every 12 minutes over the peak hour) and delay (around 20 seconds) are considered.

8.5 Thistle Hill Way / Lower Road (B2231)

8.5.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
Lower Road (W)	0.38	0.60	0.06	0.54	1.16	0.09
Thistle Hill Way	0.41	0.68	0.08	0.15	0.18	0.06
Lower Road (E)	0.47	0.86	0.09	0.49	0.96	0.08

8.5.2 It is noted that the junction is predicted to operate well below the theoretical maximum capacity value of 1.0 (as for the base case) for both peak hours.

8.5.3 The maximum RFC value is in the PM peak of 0.54 with an associated queue length of 1.16 vehicles and delay of 0.09 minutes.

8.5.4 In summary, the junction operates well below the theoretical maximum capacity for the base case and the sensitivity case for both peaks.

8.6 A249 / B2007 / A250

8.6.1 A total of 1129 vehicles were observed passing through this crossroads during the morning peak hour and 1354 vehicles during the evening peak hour. Average queue lengths on all arms during this period were 3-4 vehicles across a number of lanes. Therefore the junction is observed to be working well within capacity under present day conditions.

8.6.2 Based upon the traffic flows derived within this Transport Assessment a total of 9 retail and residential development vehicles are calculated to pass through the crossroads during the morning peak hour and 21 during the evening peak hour. This relates to a percentage impact of 3.6% during the morning peak hour and 6.3% during the evening peak at 2022 (based upon 2022 'with development' throughput of 1392 during the morning and 1682 during the evening).

8.6.3 On the basis of this analysis it was not considered necessary to model this junction in detail and this approach was agreed with the Highways Agency (now known as Highways England). It has significant spare capacity at present, is relatively modern and hence is anticipated to have a significant design life, and the retail development would have an imperceptible impact at this location.

8.7 A249 / B2231

8.7.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2017 "with development"						
	Max RFC	Max Q	Delay	Max RFC	Max Q	Delay
A249 (S)	0.50	1.0	0.05	0.63	1.69	0.06
A249 (N)	0.32	0.47	0.04	0.43	0.71	0.05
B2231	0.56	1.28	0.07	0.37	0.59	0.05

8.7.2 It is noted that the junction is predicted to operate below the theoretical maximum capacity value of 1.0 (as for the base case) for both peak hours.

8.7.3 The maximum RFC value is in the PM peak of 0.63 with an associated queue length of 1.69 vehicles and delay of 0.06 minutes.

8.7.4 In summary, the junction operates below the theoretical maximum capacity for the base case and the sensitivity case for both peaks.

8.7.5 The following table provides a summary of the 2022 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2022 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q (vehs)	Delay (mins)	Max RFC	Max Q (vehs)	Delay (mins)
A249 (S)	0.54	1.14	0.05	0.68	2.04	0.07
A249 (N)	0.35	0.53	0.04	0.45	0.82	0.06
B2231	0.61	1.52	0.08	0.40	0.67	0.05

8.7.6 It is noted that the junction is predicted to operate below the theoretical maximum capacity value of 1.0 (as for the base case) for both peak hours.

8.7.7 The maximum RFC value is in the PM peak of 0.68 with an associated queue length of 2.04 vehicles and delay of 0.07 minutes.

8.7.8 In summary, the junction operates below the theoretical maximum capacity for the base case and the sensitivity case for both peaks

8.8 Lower Road (B2231) / Sheppey Way / B2231 / Queenborough Road (A250) - roundabout

8.8.1 The following table provides a summary of the 2017 sensitivity results for the peak hour flows output from the JUNCTIONS 8 model (full output is shown in Appendix J).

2017 "with development"	08:00 - 09:00			17:00 - 18:00		
	Max RFC	Max Q	Delay (mins)	Max RFC	Max Q	Delay (mins)
Lower Road (B3321)	0.64	1.73	0.08	0.45	0.80	0.05
Sheppey Way	0.12	0.14	0.07	0.20	0.26	0.06
B3321 (S)	0.34	0.50	0.04	0.52	1.06	0.06
Queenborough Road	0.15	0.17	0.06	0.12	0.14	0.06

8.8.2 In the sensitivity scenario the junction is predicted to operate below the theoretical maximum capacity value of 1.0 (as for the base case) for both peak hours.

8.8.3 The maximum RFC value is in the AM peak of 0.64 with an associated queue length of 1,73 vehicles and delay of 0.08 minutes.

8.8.4 In summary, the junction operates below the theoretical maximum capacity of 1.0 for the base case and the sensitivity case for both peaks.

9 Summary

9.1.1 Peter Brett Associates LLP (PBA) have been appointed by Starnes plc to provide transport support to a planning application for a proposed residential development on land close to Plover Road in Minster, Isle of Sheppey.

9.1.2 The scope and structure of this report has been discussed and agreed with Highway Officers at both Kent Highway Services (KHS) and the Highways Agency (now Highways England)

9.1.3 The site is located in a residential area opposite Sheppey Community Hospital and is approximately 1.6Km from Minster High Street.

9.1.4 The existing site is scrub land and does not have any pre-existing use.

9.1.5 The dwellings will be directly accessed from Yarrow Drive which forms an existing simple priority junction with Plover Road.

9.1.6 Pedestrian connectivity to the site will be available from Plover Road via Yarrow Drive, Parish Road and through to the existing residential development at Clover Close and Mistletoe Drive.

9.1.7 A separate planning application is to be submitted at the same time as this one for a foodstore and retail units. This will provide an opportunity for the new residents to undertake a proportion of regular retail related trips by walking and cycling.

9.1.8 The development is located within an existing residential area with lit footways and a cycle route along Plover Road. There is a bus stop located on Barton Hill Drive approximately 250m from the site which provides access to routes within the Isle of Sheppey. The site provides pedestrian routes which link to the external network and cycle parking facilities are proposed within the curtilage of the residential dwellings.

9.1.9 Traffic surveys were undertaken in the peak periods at Barton Hill Drive / Lower Road; Barton Hill Drive / Plover Road; Barton Hill Drive / Minster Road (B2008); Thistle Hill Way / Lower Road (B2231); A249 / B2007 / A250; A249 / B2231 and Lower Road (B2231) / Sheppey Way / B2231 / Queenborouh Road (A250). These were assessed using appropriate junction modelling software or considered for the % impact of the development flows at the junction.

9.1.10 Crash data was requested in November 2014 for the previous 3 years for the junctions to be considered. There does not appear to be a common causation factor for the crashes.

9.1.11 The proposed number of car parking spaces and cycle spaces are in accordance with local parking guidance.

9.1.12 The trip rates for the residential proposals are extracted from the TRICS database and the distribution has been calculated using ‘journey to work’ data from Census information.

9.1.13 Traffic flows have been derived for 2017 / 2022 base case, 2017 / 2022 'with development' and 2017 / 2022 sensitivity case ('with development' + potential retail development adjacent to the site) cases.

9.1.14 The modelling results for the base and 'with development' scenario shows:

- Lower Road/Barton Hill Drive is predicted to operate just above theoretical capacity for an existing junction for both the base case and the 'with development' scenarios. The difference in operation between the two scenarios is negligible. However, Kent Highway Services have advised that the junction is sensitive to increases in traffic.

- All remaining junctions operate within the theoretical capacity with negligible impacts of 1% at Barton Hill Drive/Plover Road and Barton Hill Drive/Minster Road when comparing the base and 'with development' scenarios

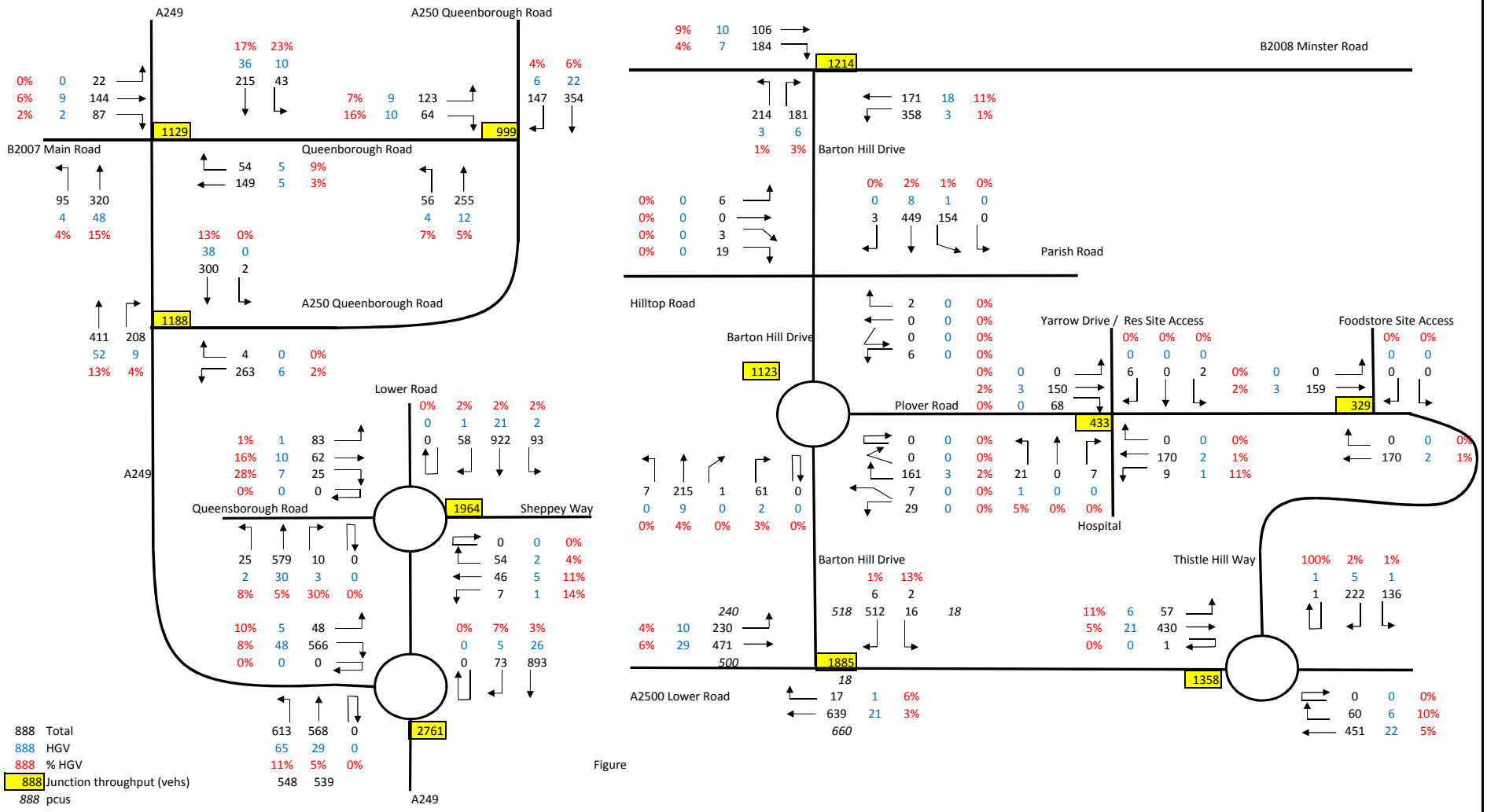
- There is a minimal % impact of development traffic at the A249 / B2007 / A250 crossroads junction. It is anticipated that there would be an imperceptible impact at this location.

9.1.15 The modelling results for the base and 'sensitivity' scenario shows for:

- Lower Road/Barton Hill Drive - the junction operates below the theoretical maximum capacity for both peak periods. There is a slight reduction in capacity in the AM peak when compared to the base case and the 'with development'. However, there is an increase in capacity in the PM peak as a result of the change in local traffic patterns for existing residents should the nearby foodstore be granted permission.

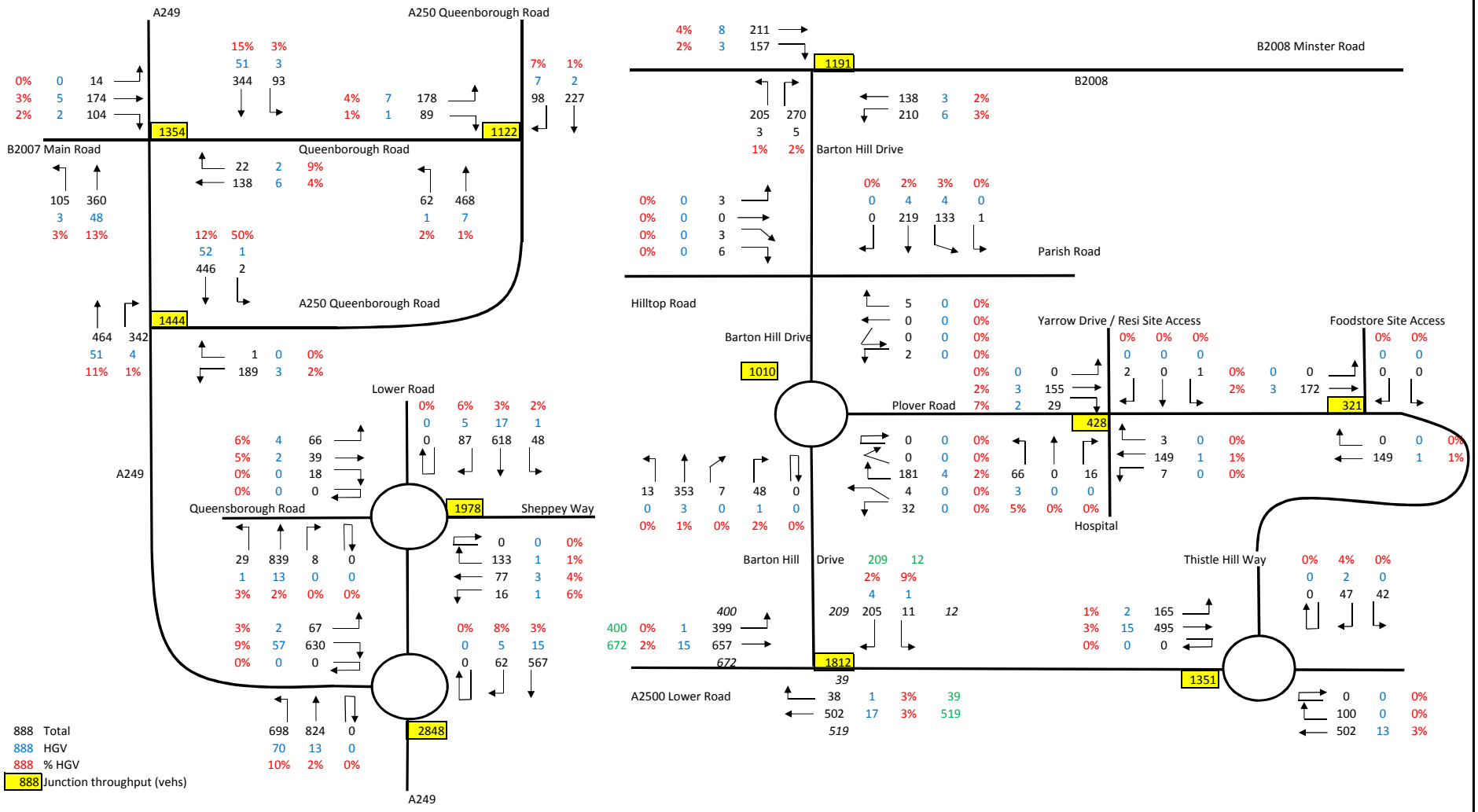
- All remaining junctions operate within the theoretical capacity with negligible impacts of 2% at Barton Hill Drive/Plover Road and minimal impact at Barton Hill Drive/Minster Road when comparing the base and 'with development' scenarios

- There is a minimal % impact of development traffic at the A249 / B2007 / A250 crossroads junction. It is anticipated that there would be an imperceptible impact at this location.



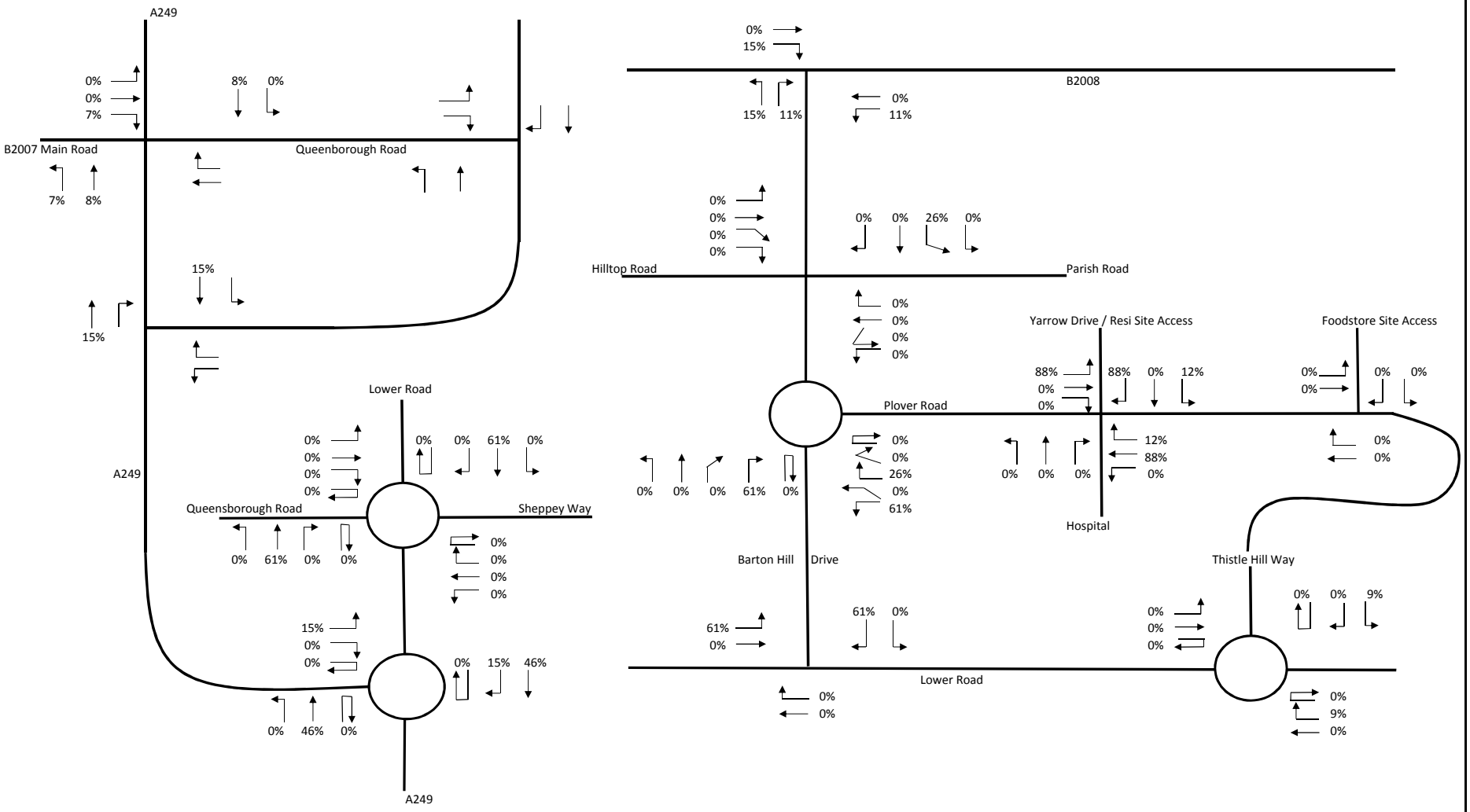
Figure

pba peterbrett	2012 AM Observed	Figure 4.1



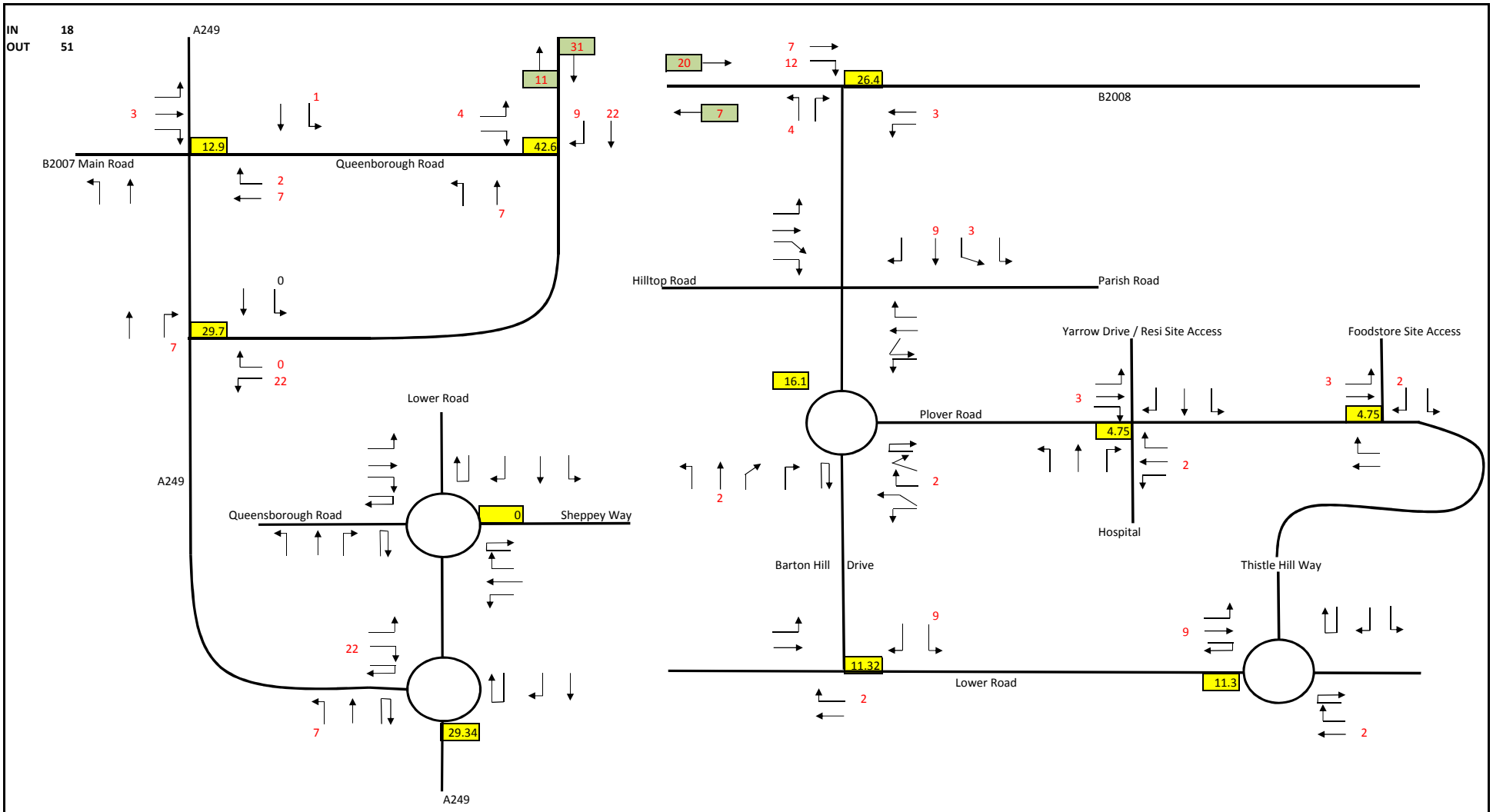
2012 PM Observed

Figure 4.2

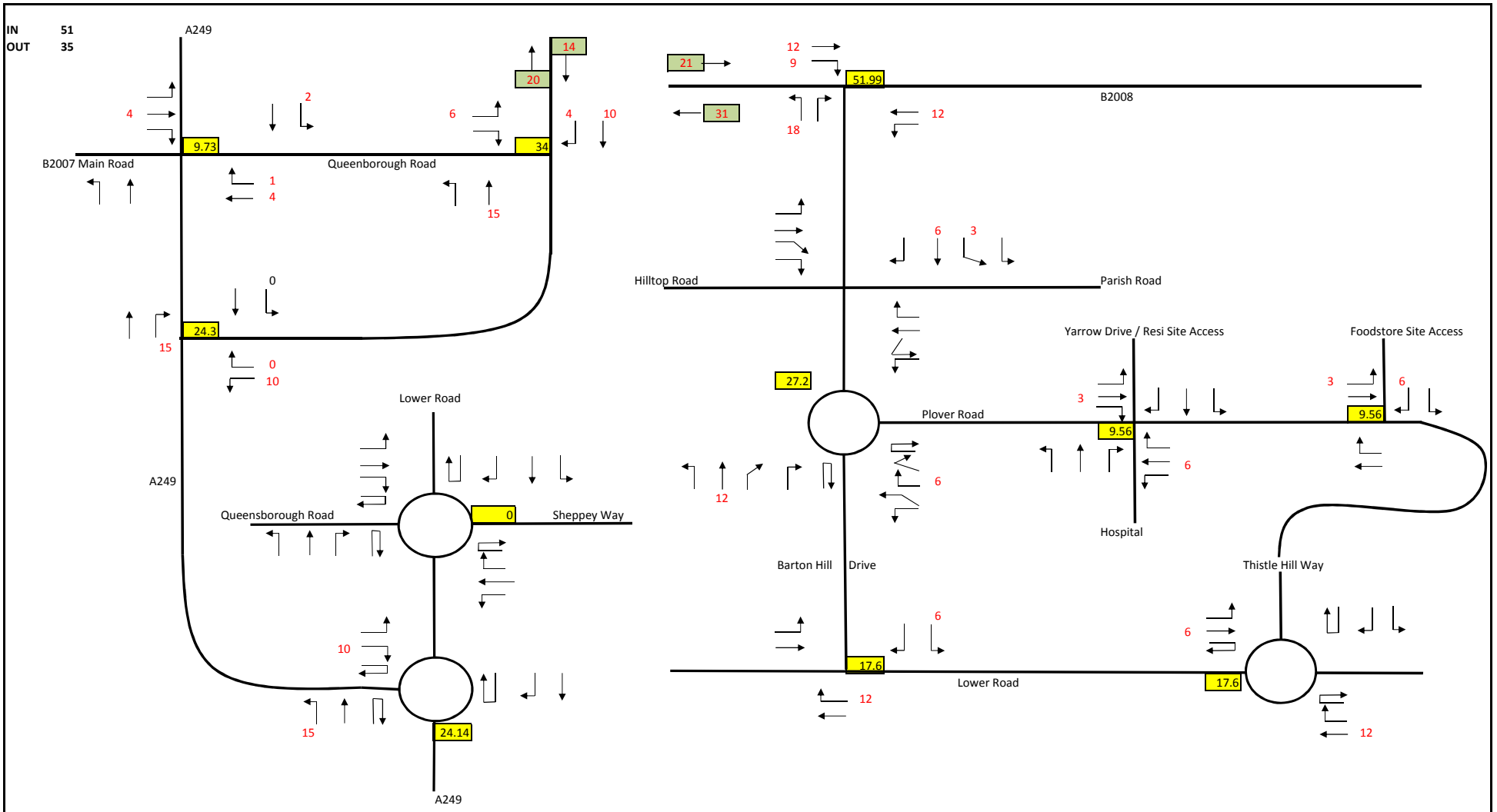


Dwelling Distribution

Figure 6.1

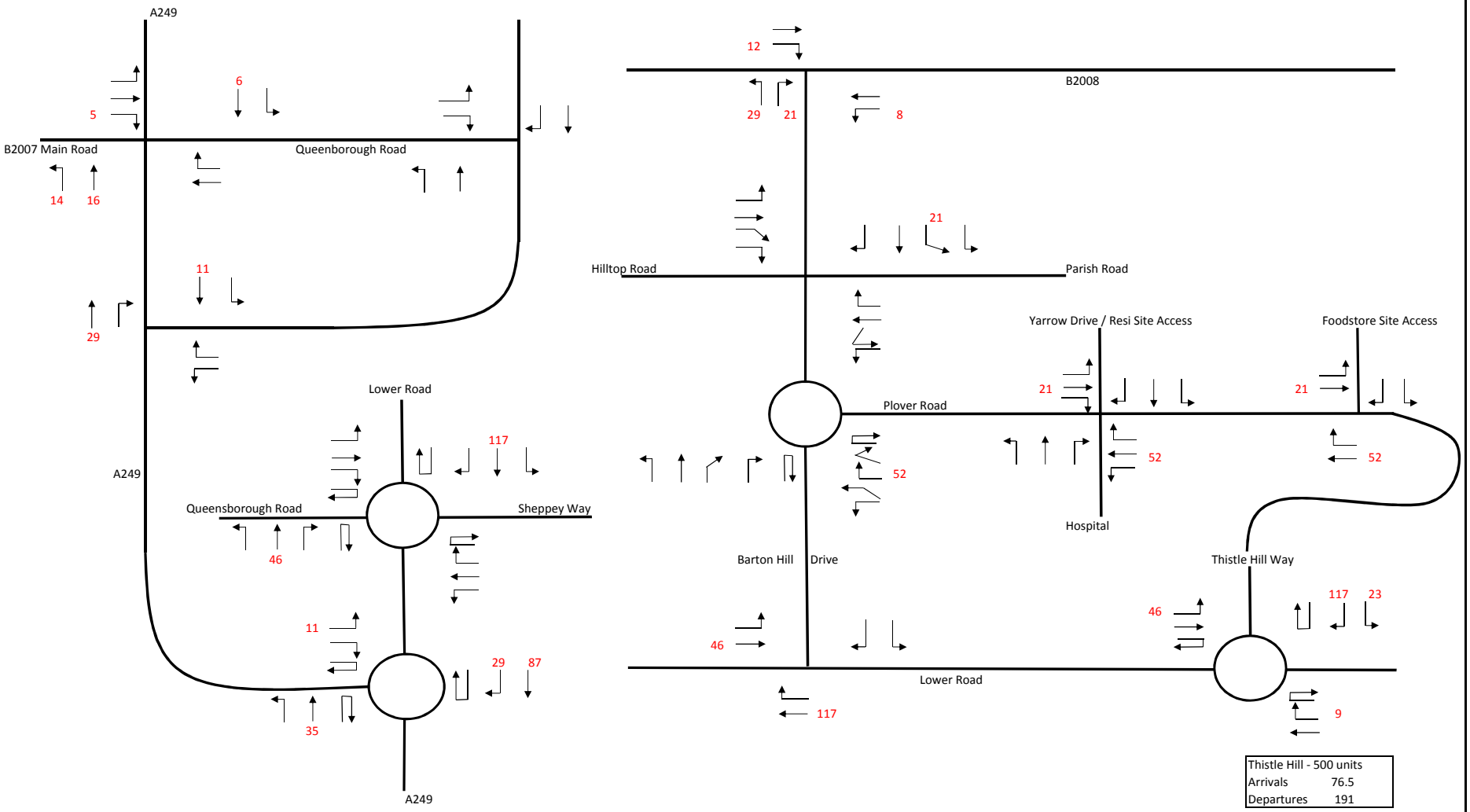


	AM Committed Development-Power Station Road residential development (160 houses)	Figure 6.10



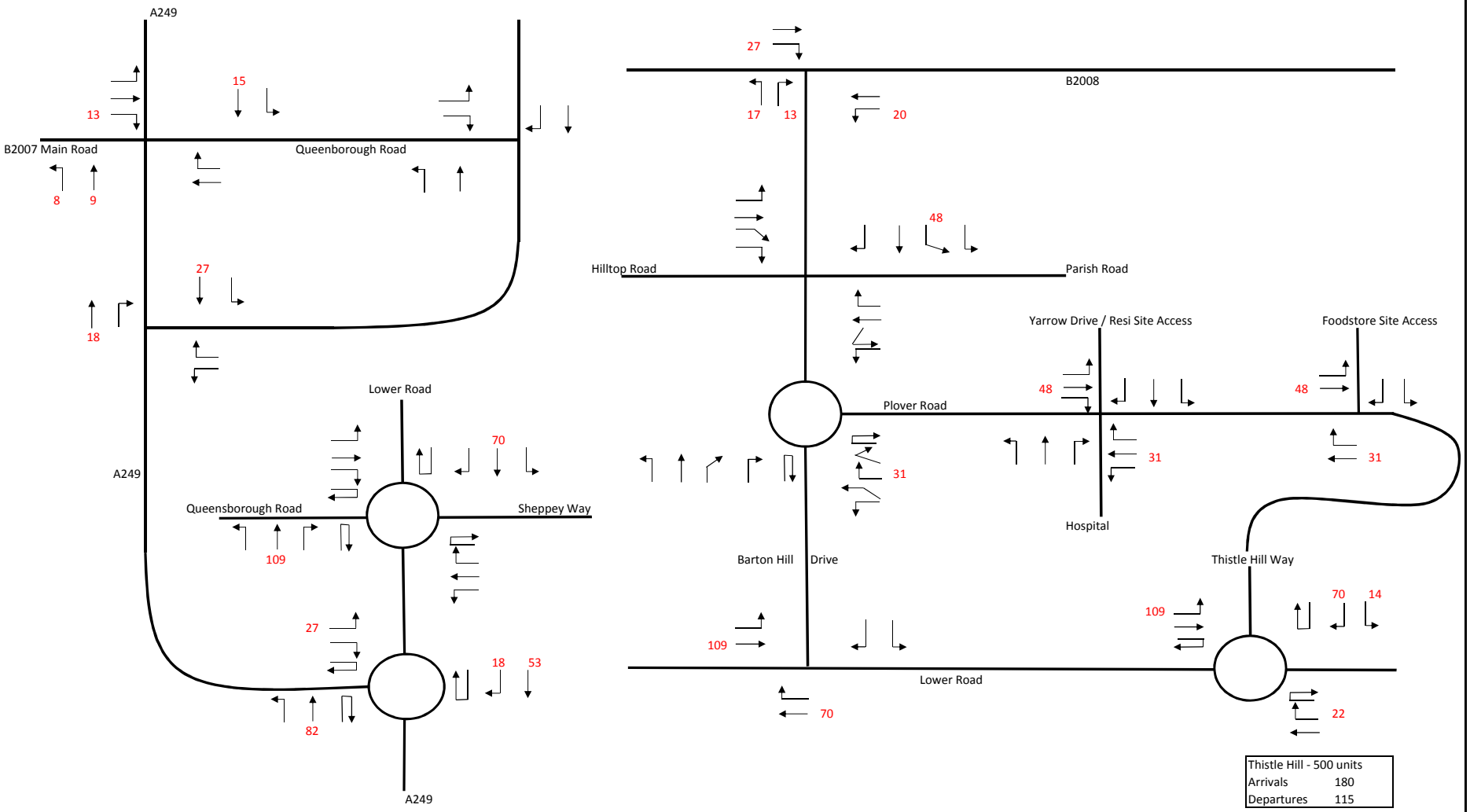
PM Committed Development-Power Station Road residential development (160 houses)

Figure 6.11



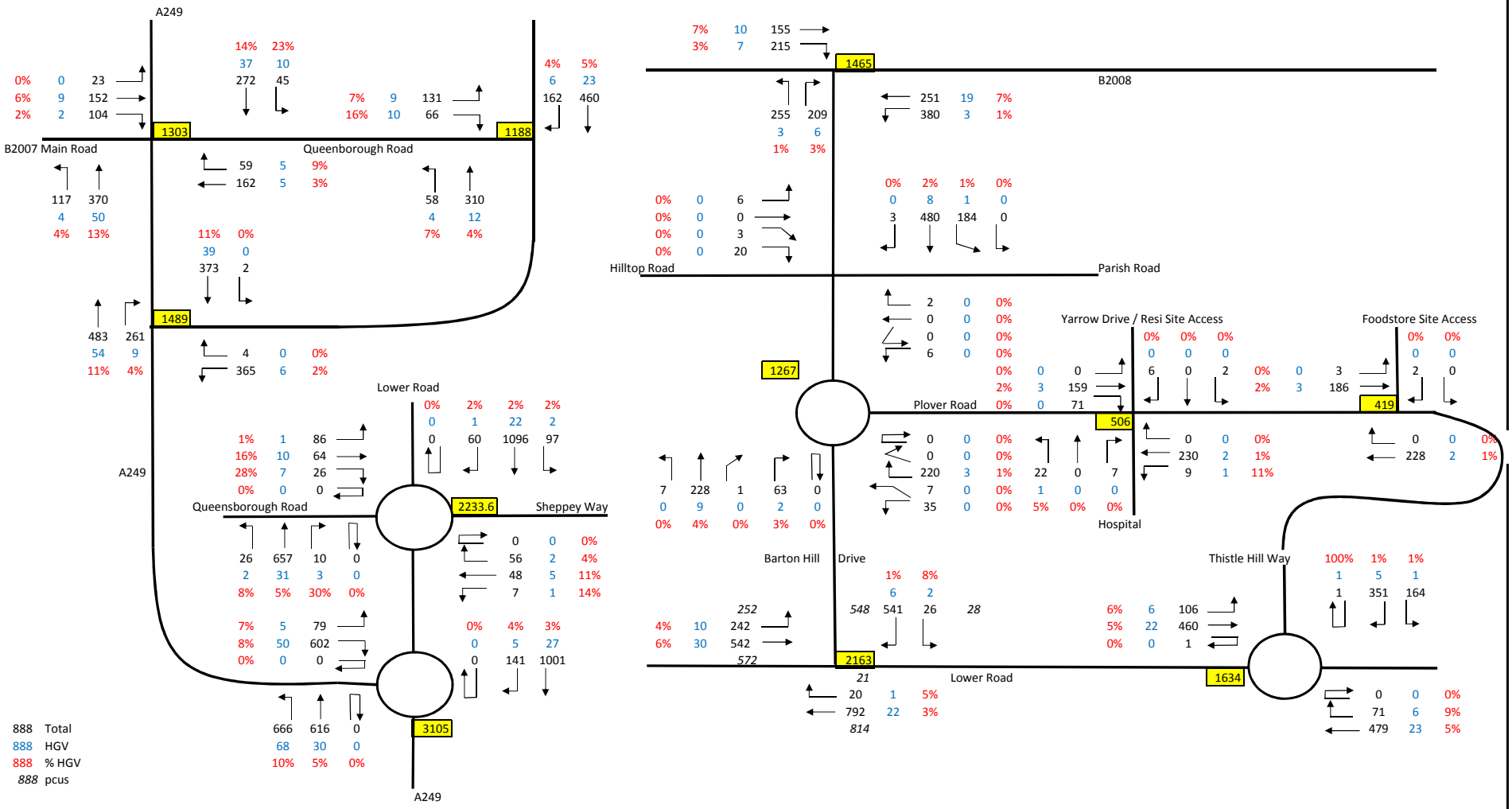
AM Peak Thistle Hill (500 units) - potential committed

Figure 6.12



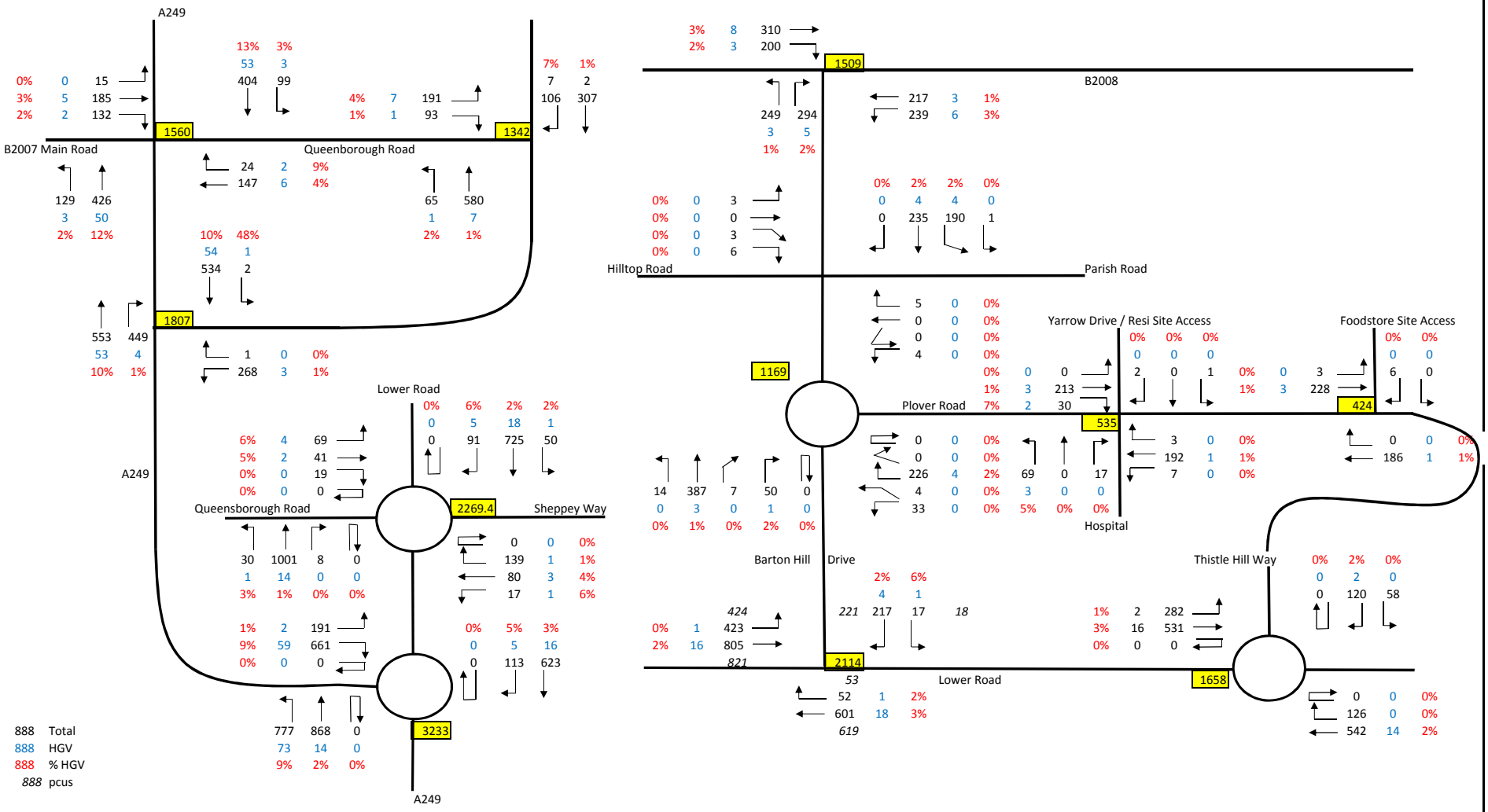
PM Peak Thistle Hill (500 units) - potential committed

Figure 6.13



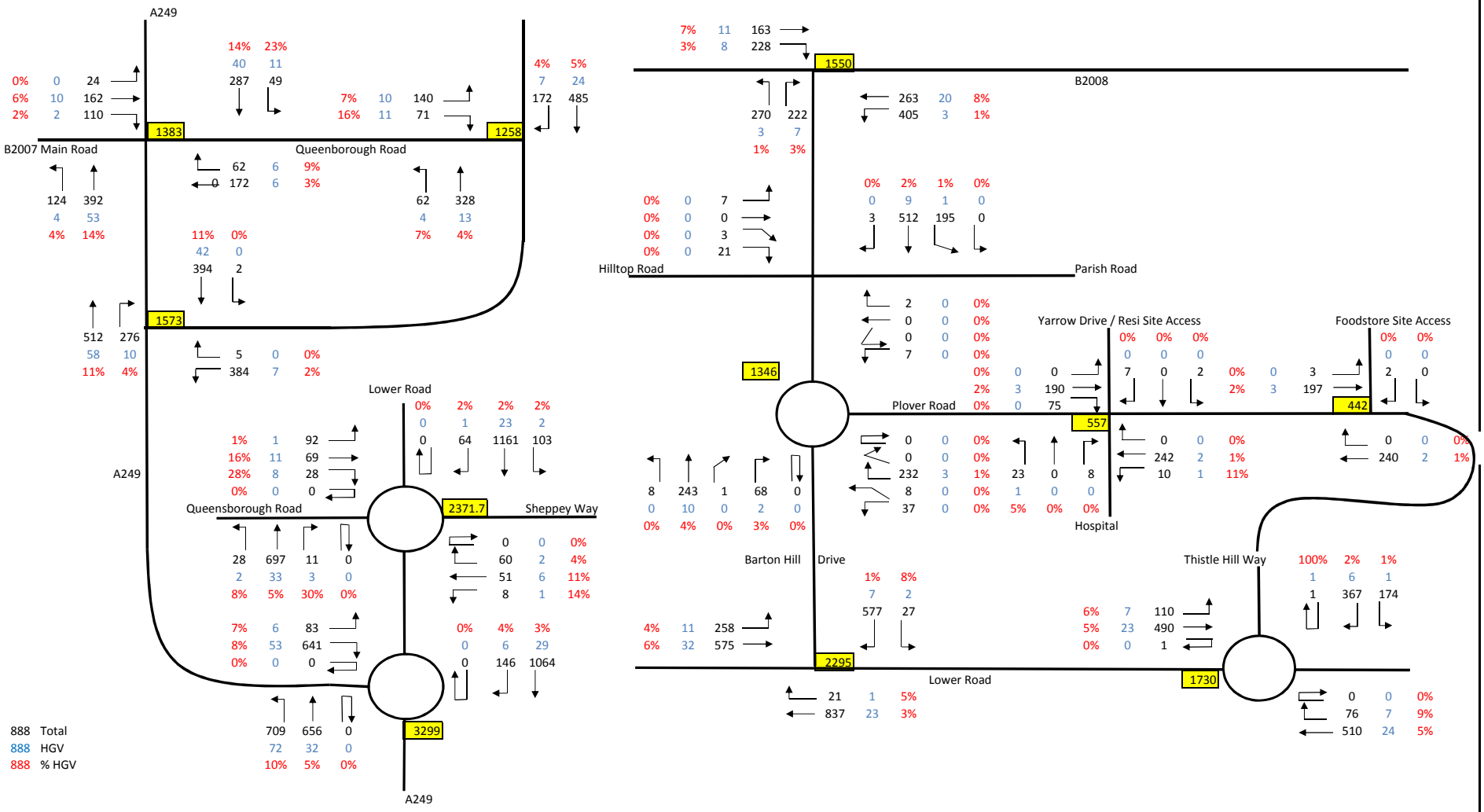
2017 AM Base

Figure 6.14



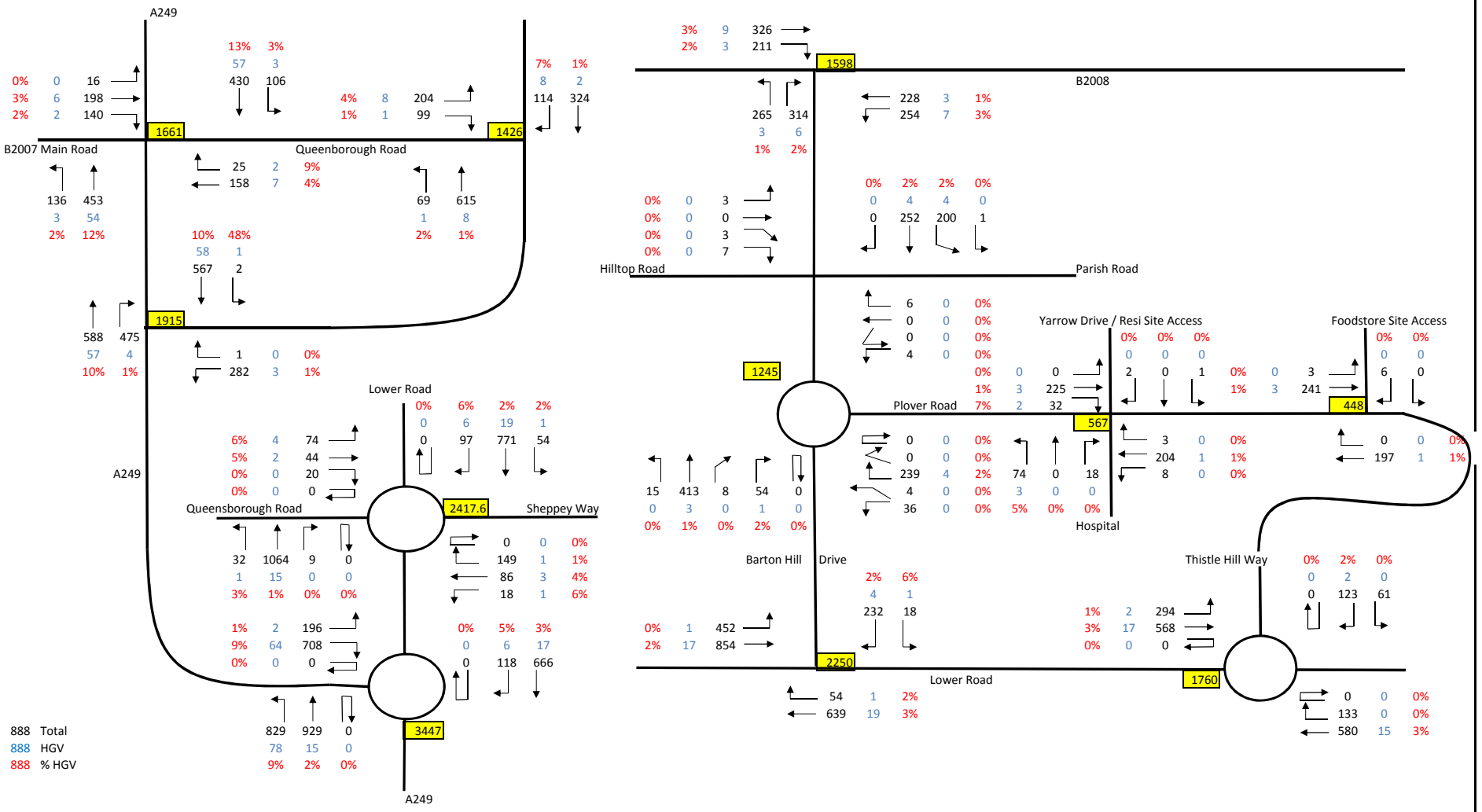
2017 PM Base

Figure 6.15



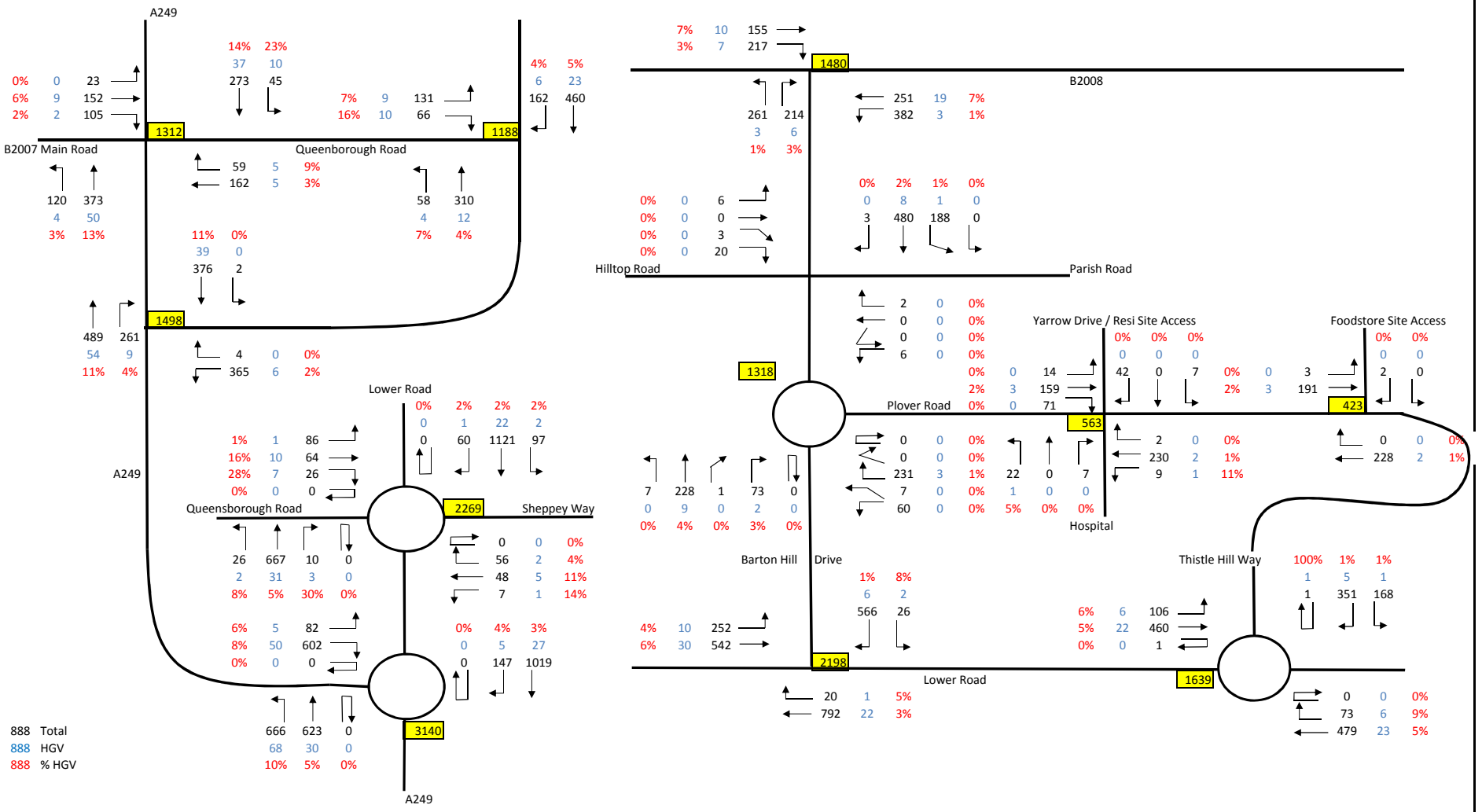
2022 AM Base

Figure 6.16



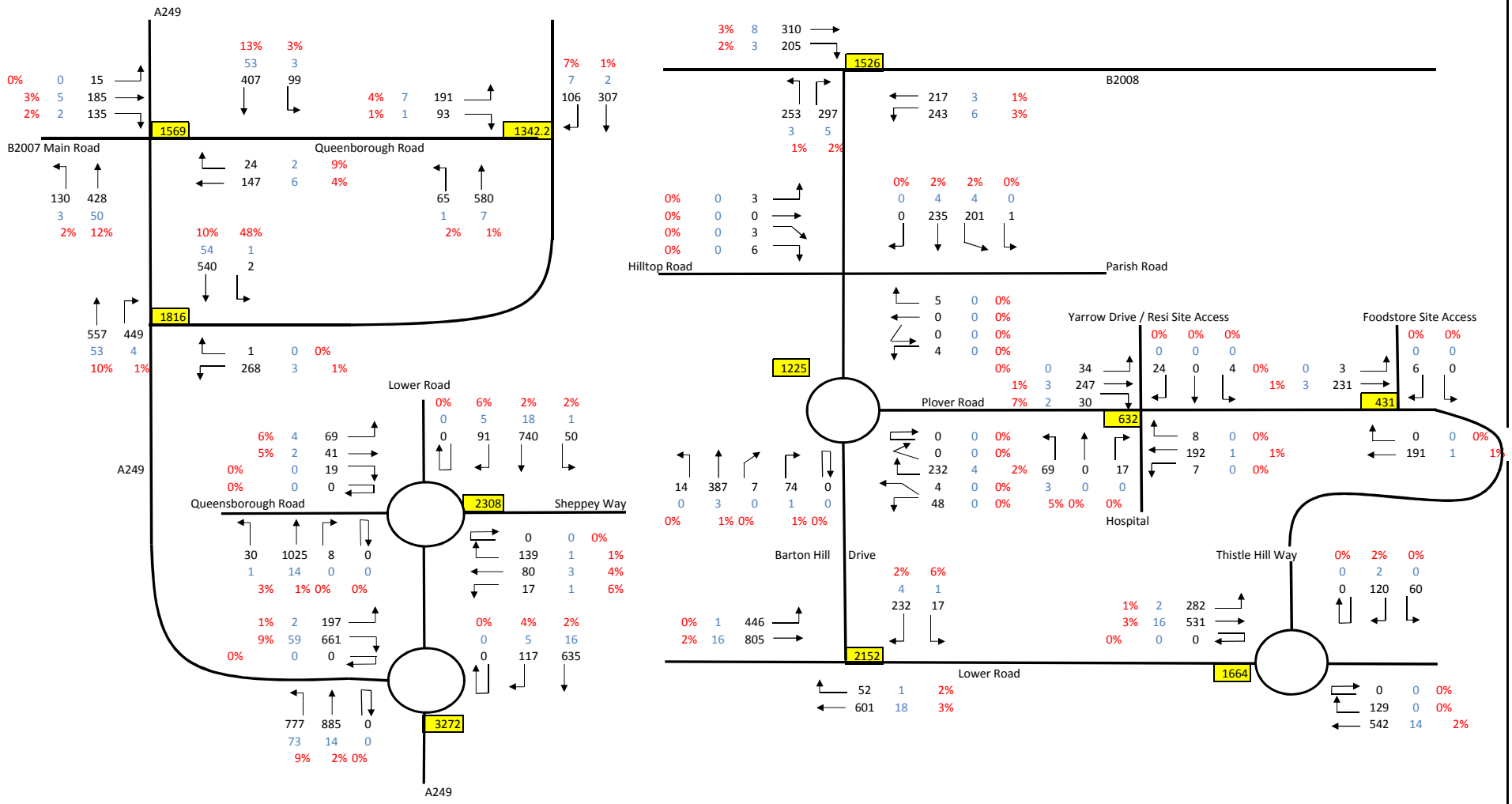
2022 PM Base

Figure 6.17



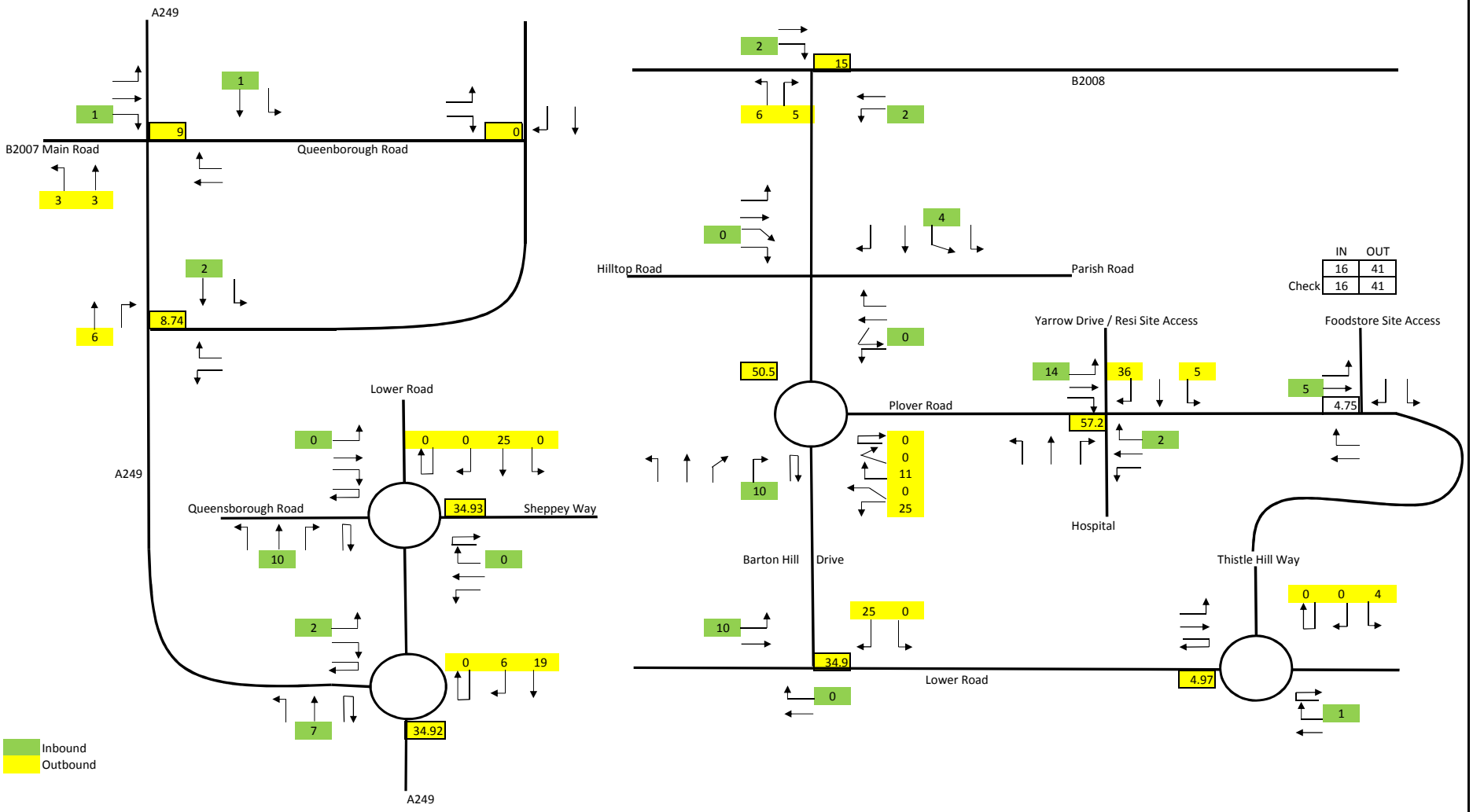
2017 AM Base + Residential Development

Figure 6.18



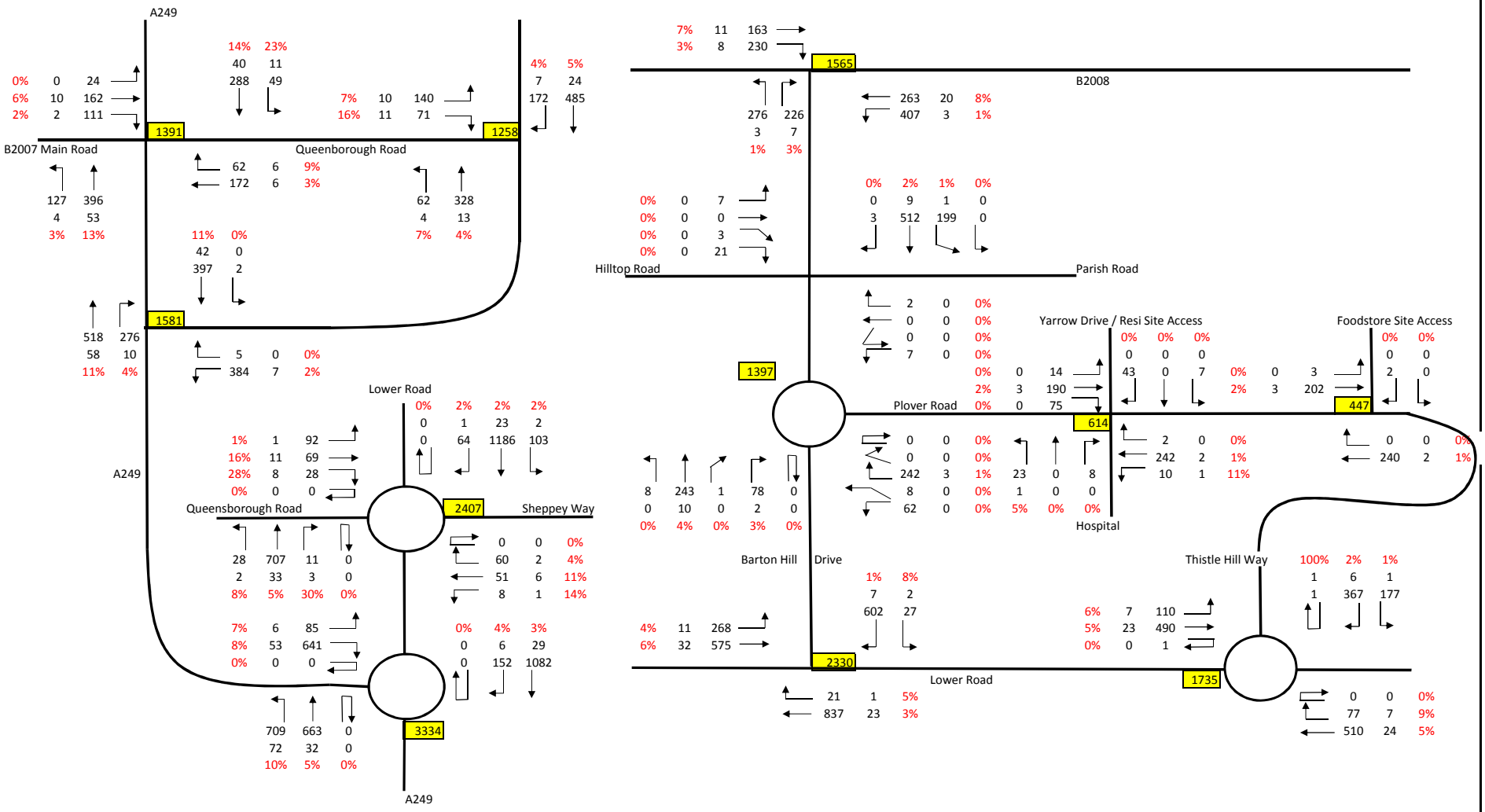
2017 PM Base + Residential Development

Figure 6.19



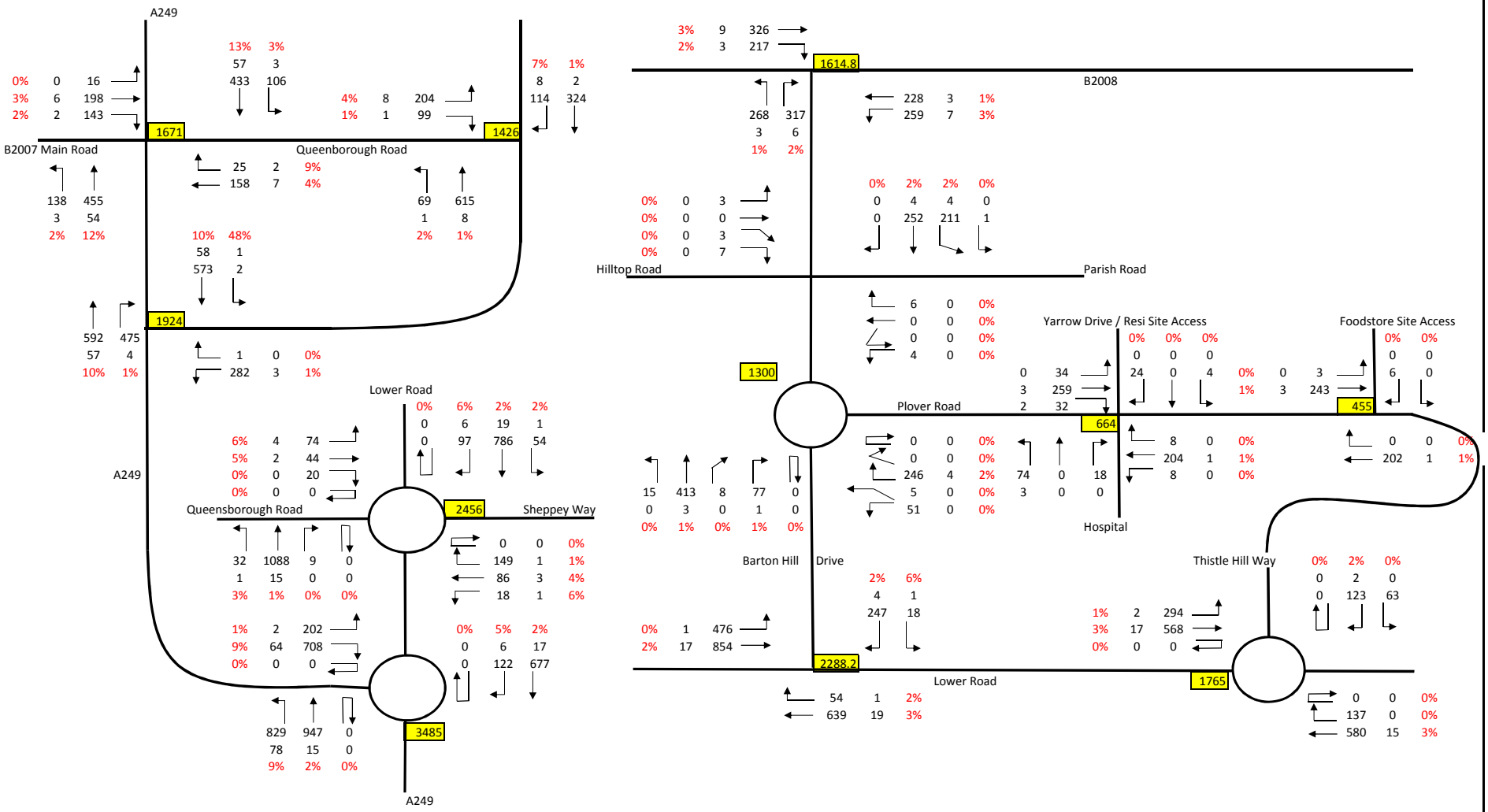
AM Residential Development

Figure 6.2



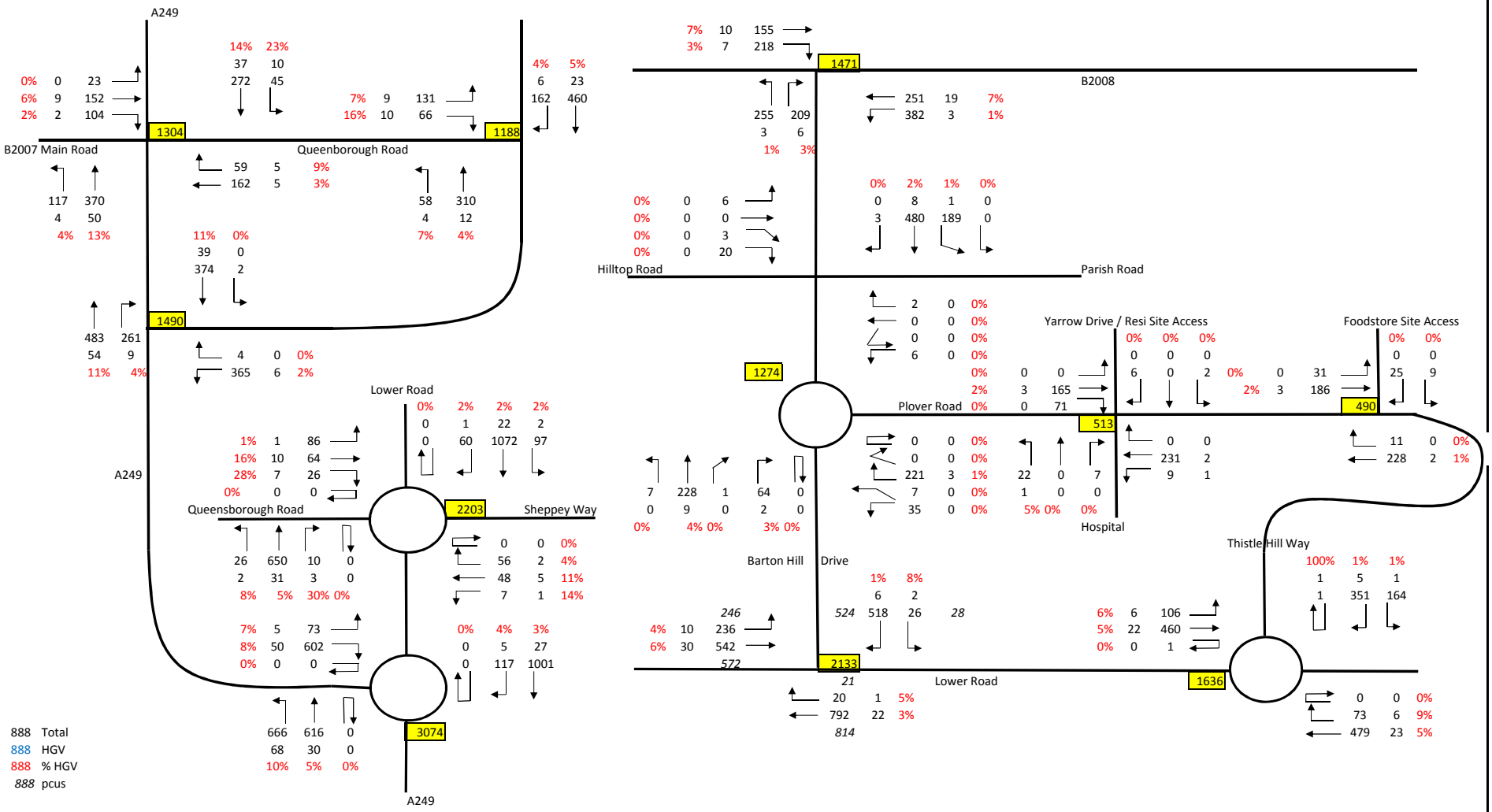
2022 AM Base + Residential Development

Figure 6.20



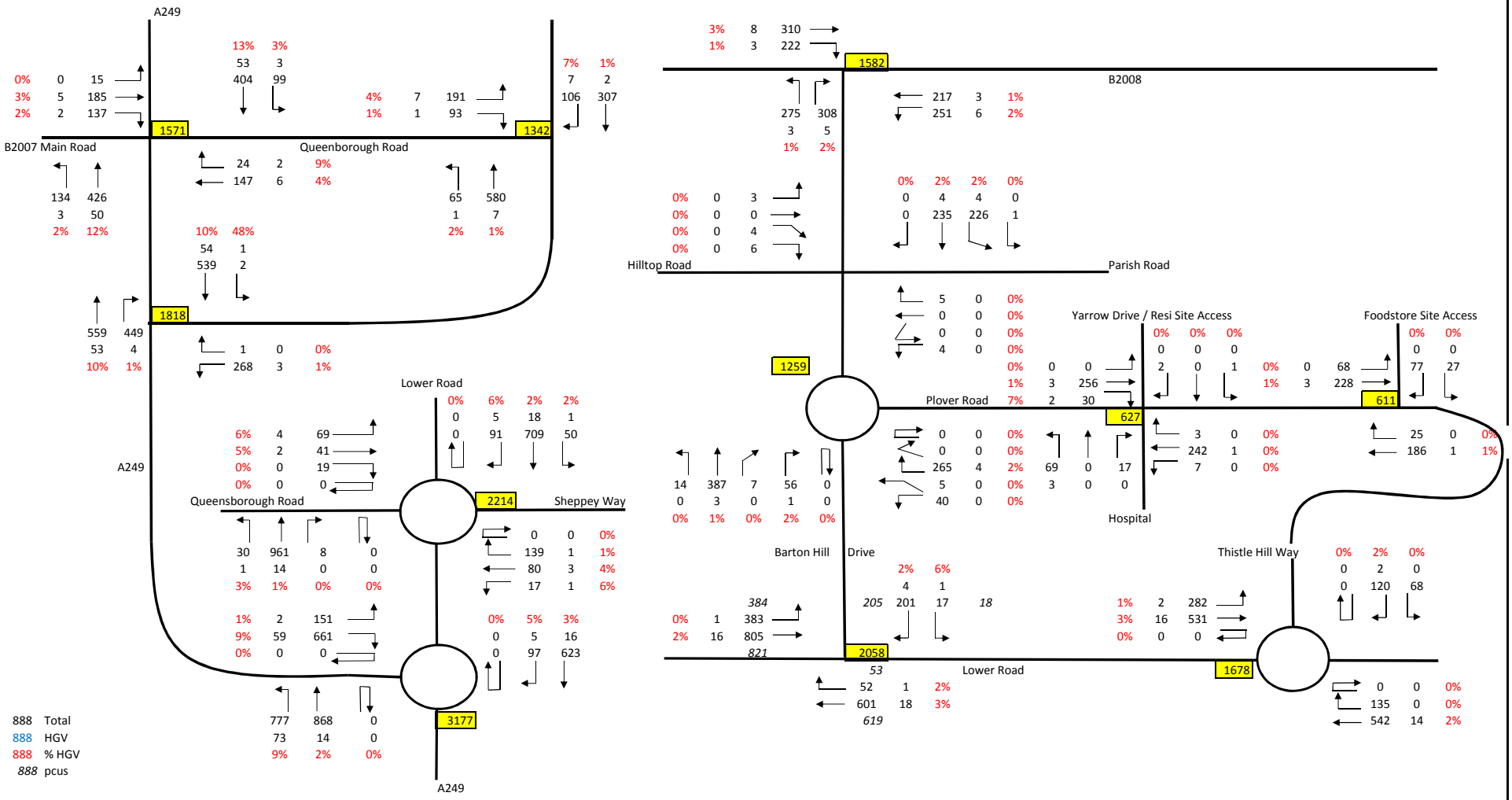
2022 PM Base + Residential Development

Figure 6.21



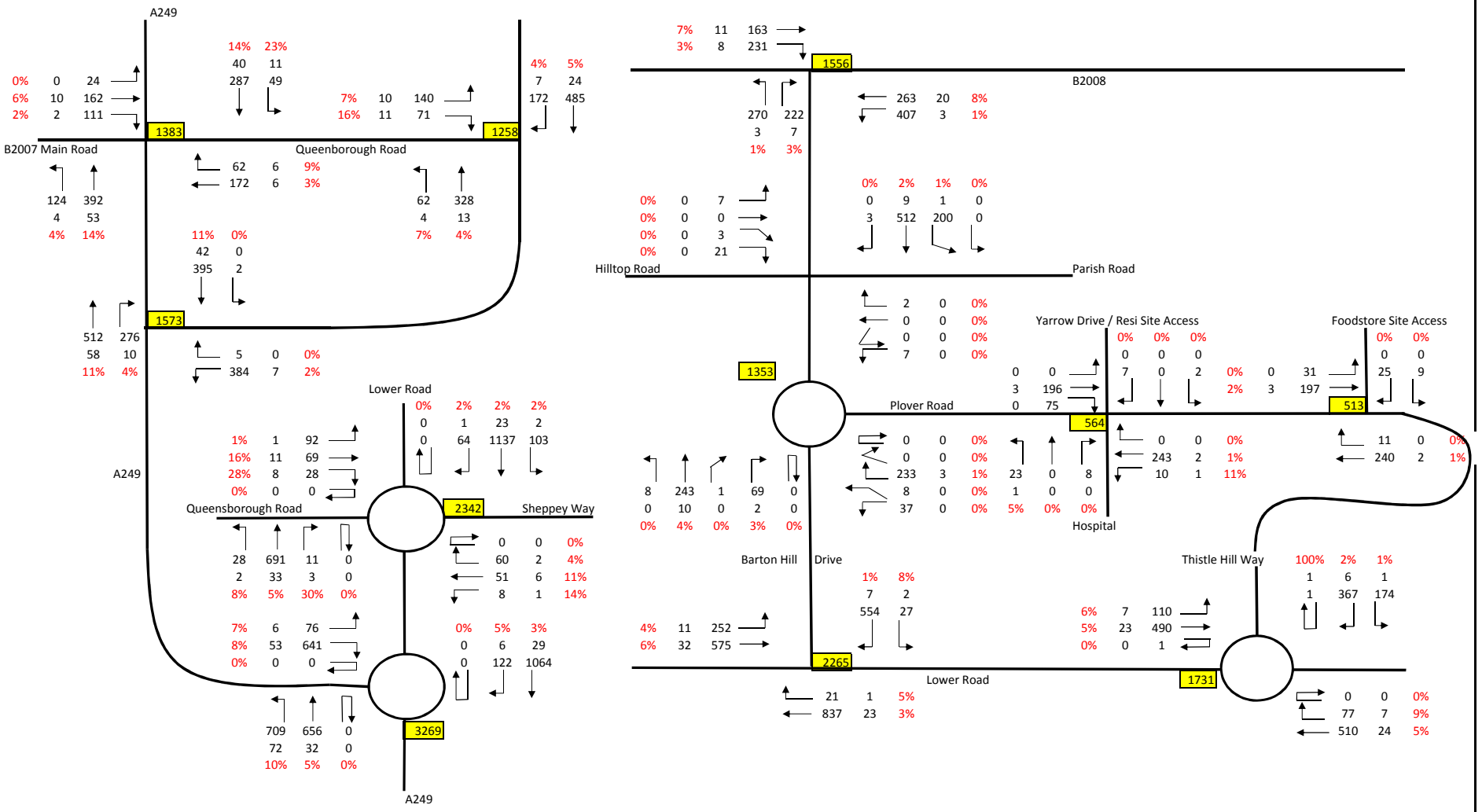
2017 AM Alt Base (with localised trips removed) + Foodstore Development

Figure 6.22



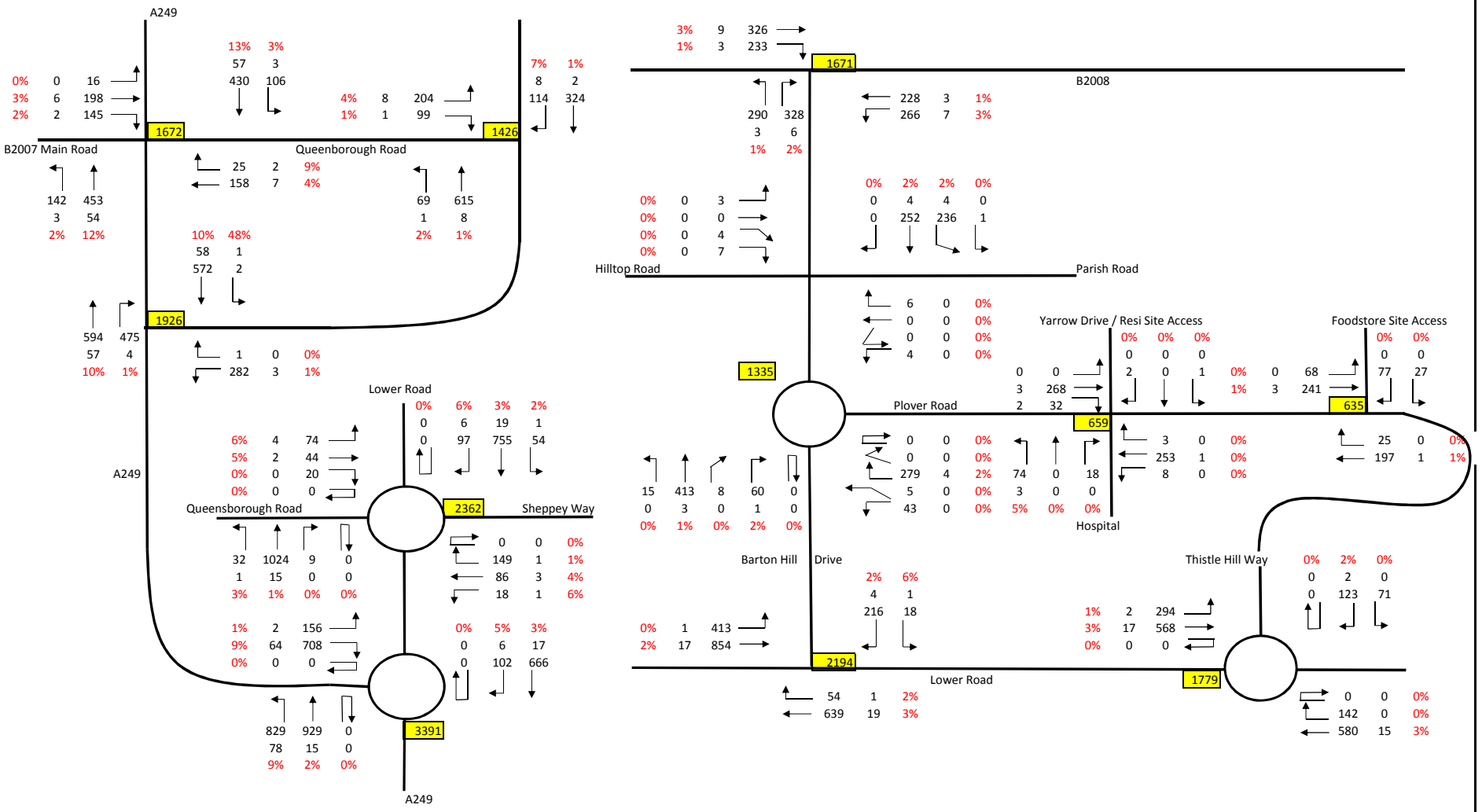
2017 PM Alt Base (with localised trips removed) + Foodstore Development

Figure 6.23



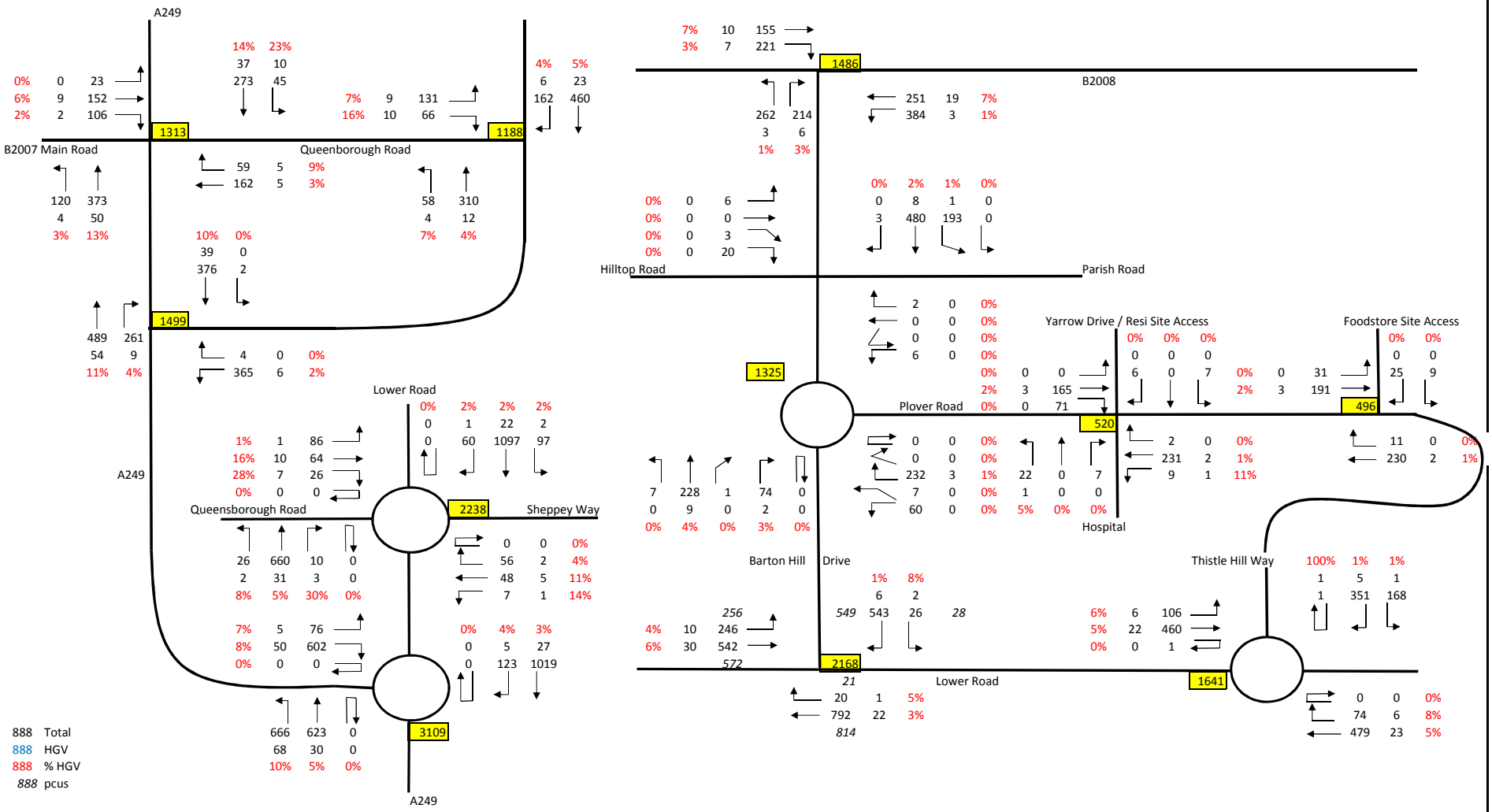
2022 AM Alt Base (with localised trips removed) + Foodstore Development

Figure 6.24



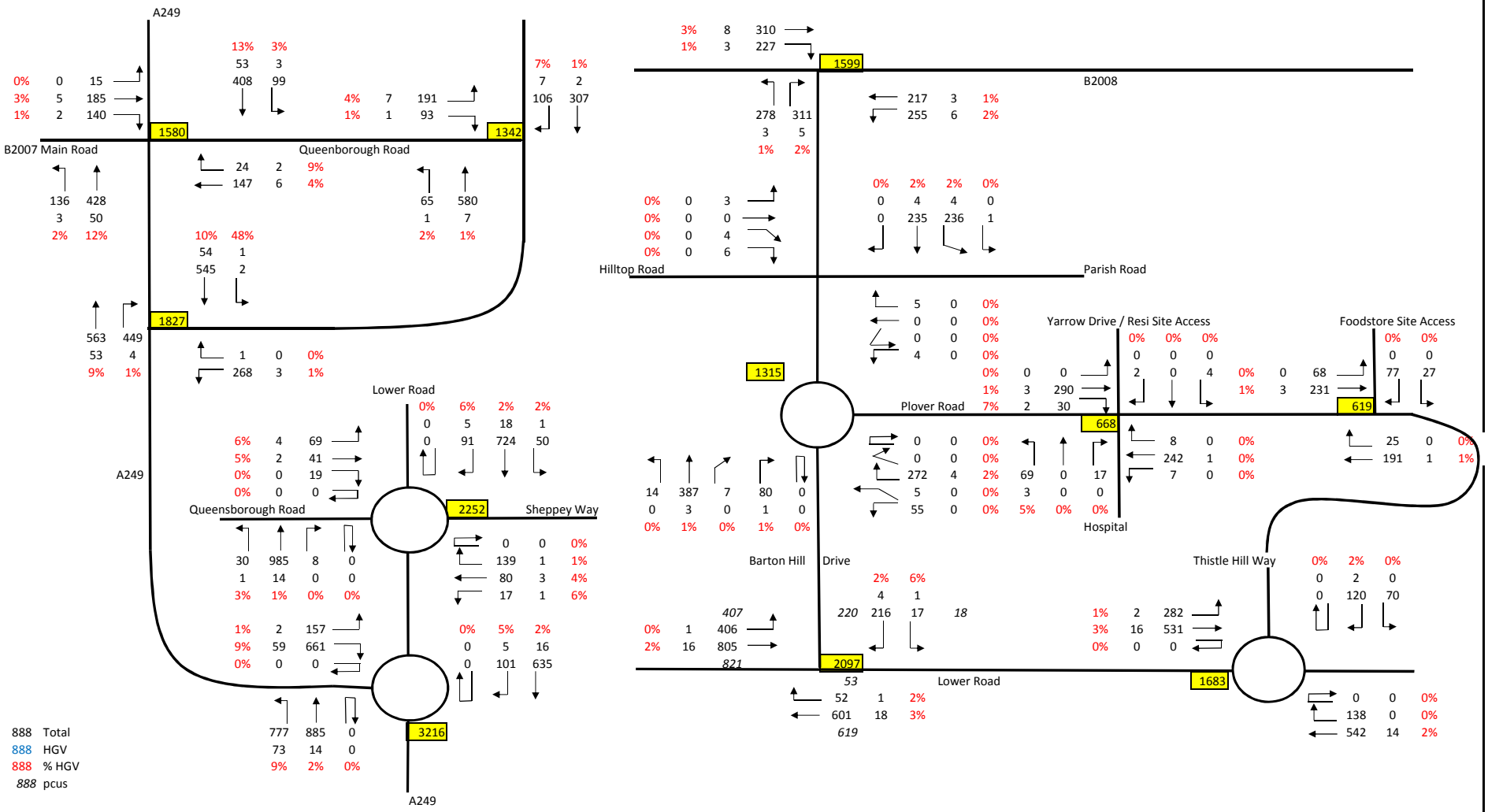
2022 AM Alt Base (with localised trips removed) + Foodstore Development

Figure 6.25



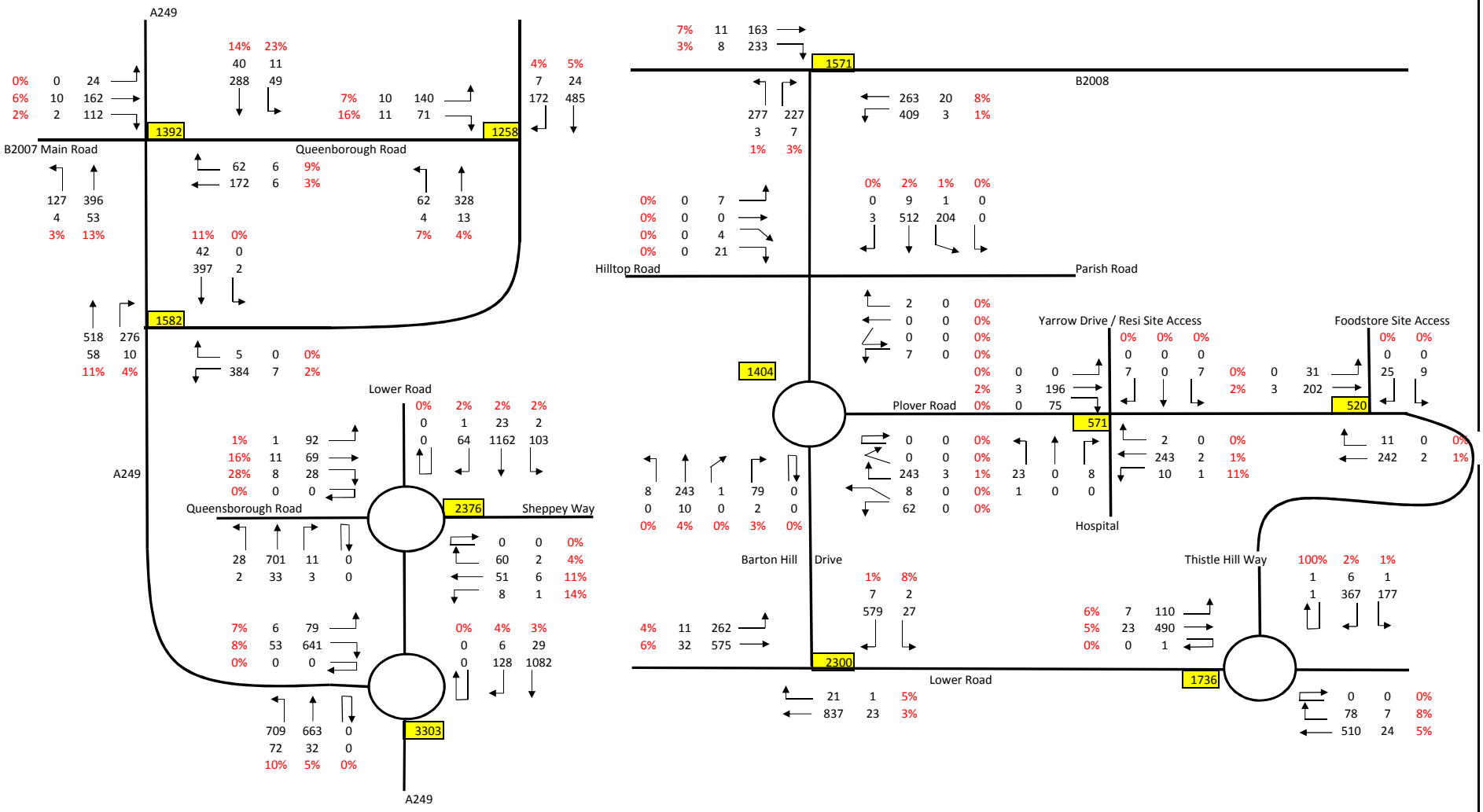
2017 AM Alt Base (with localised trips removed) + Sensitivity Development

Figure 6.26



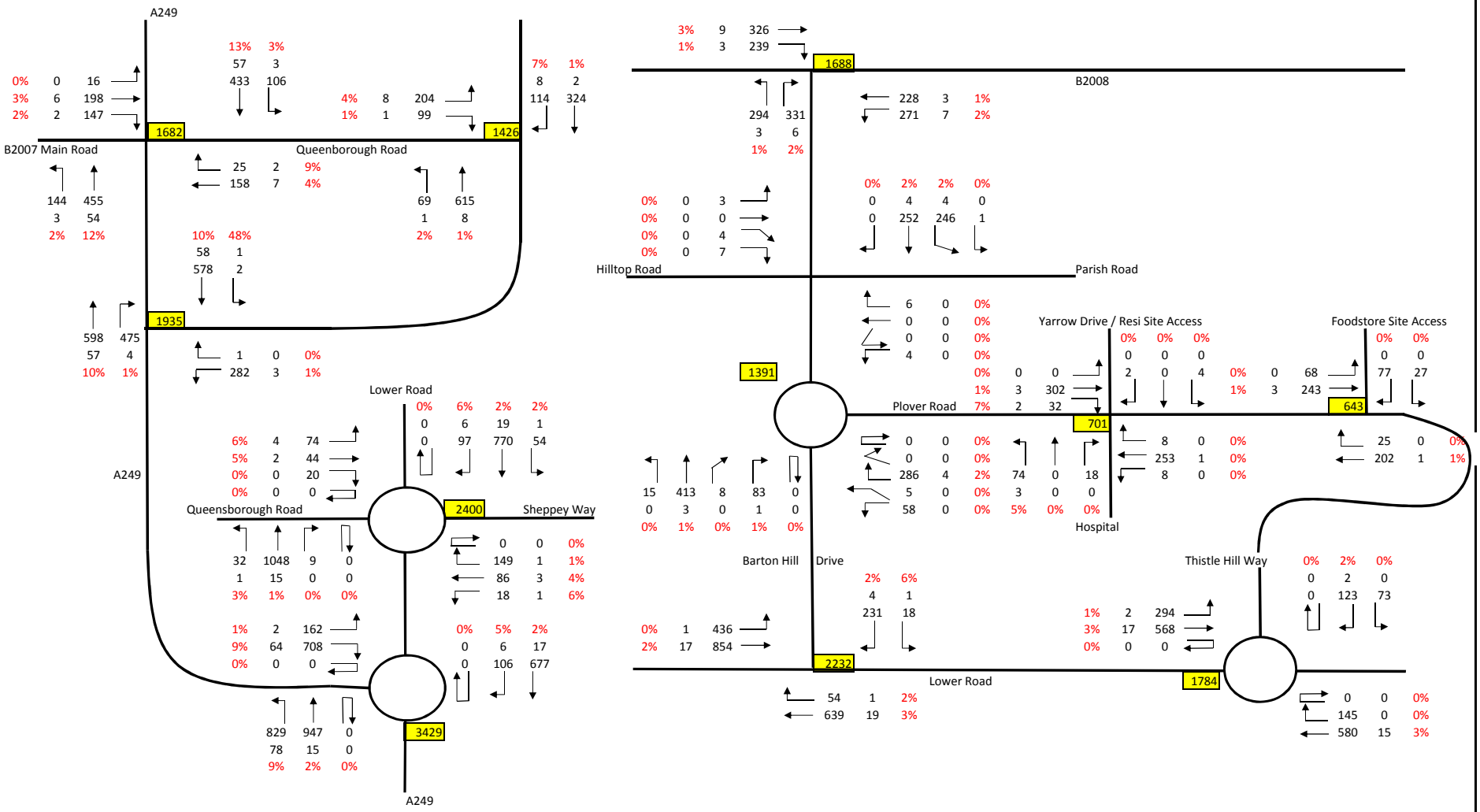
2017 PM Alt Base (with localised trips removed) + Sensitivity Development

Figure 6.27



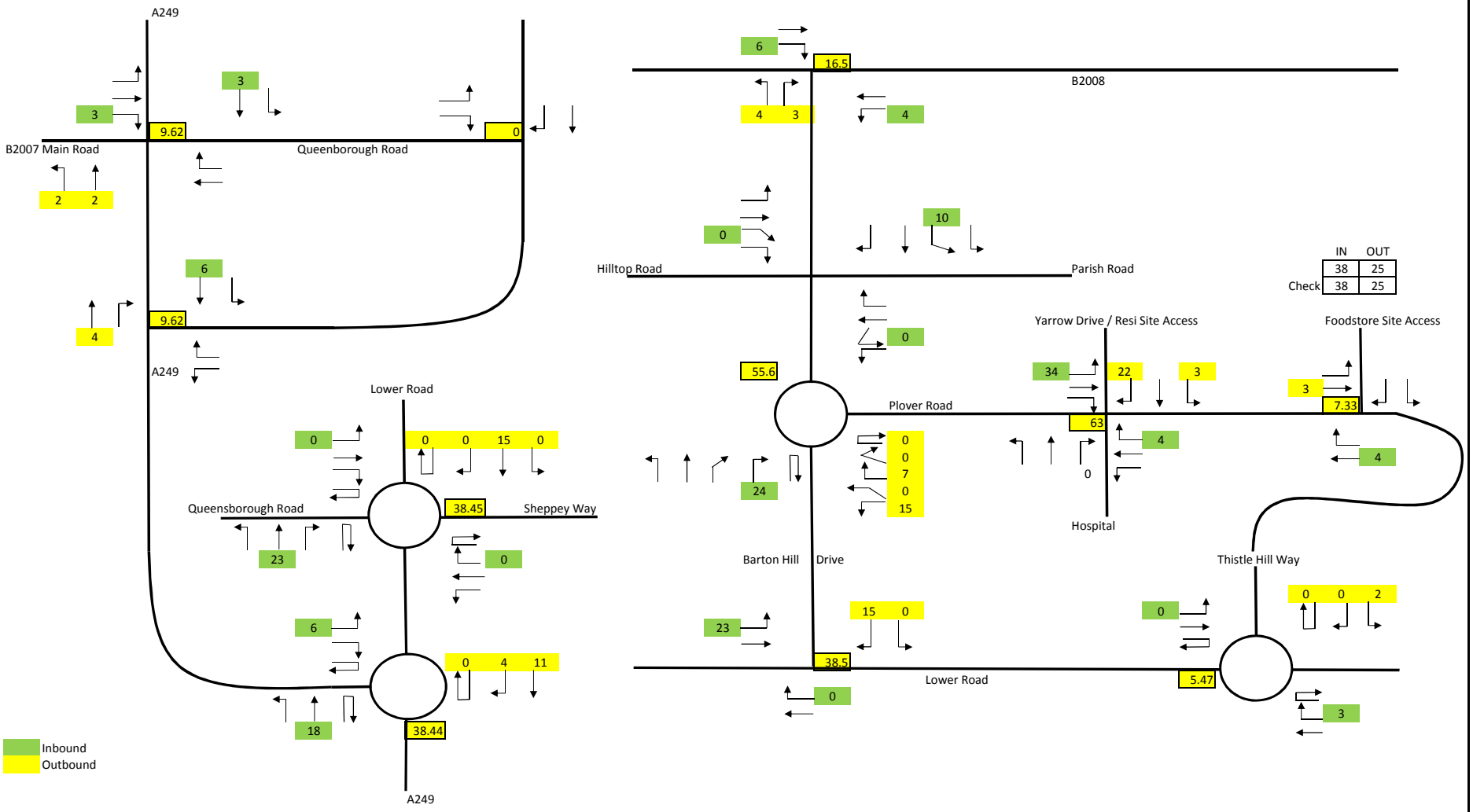
2022 AM Alt Base (with localised trips removed) + Sensitivity Development

Figure 6.28



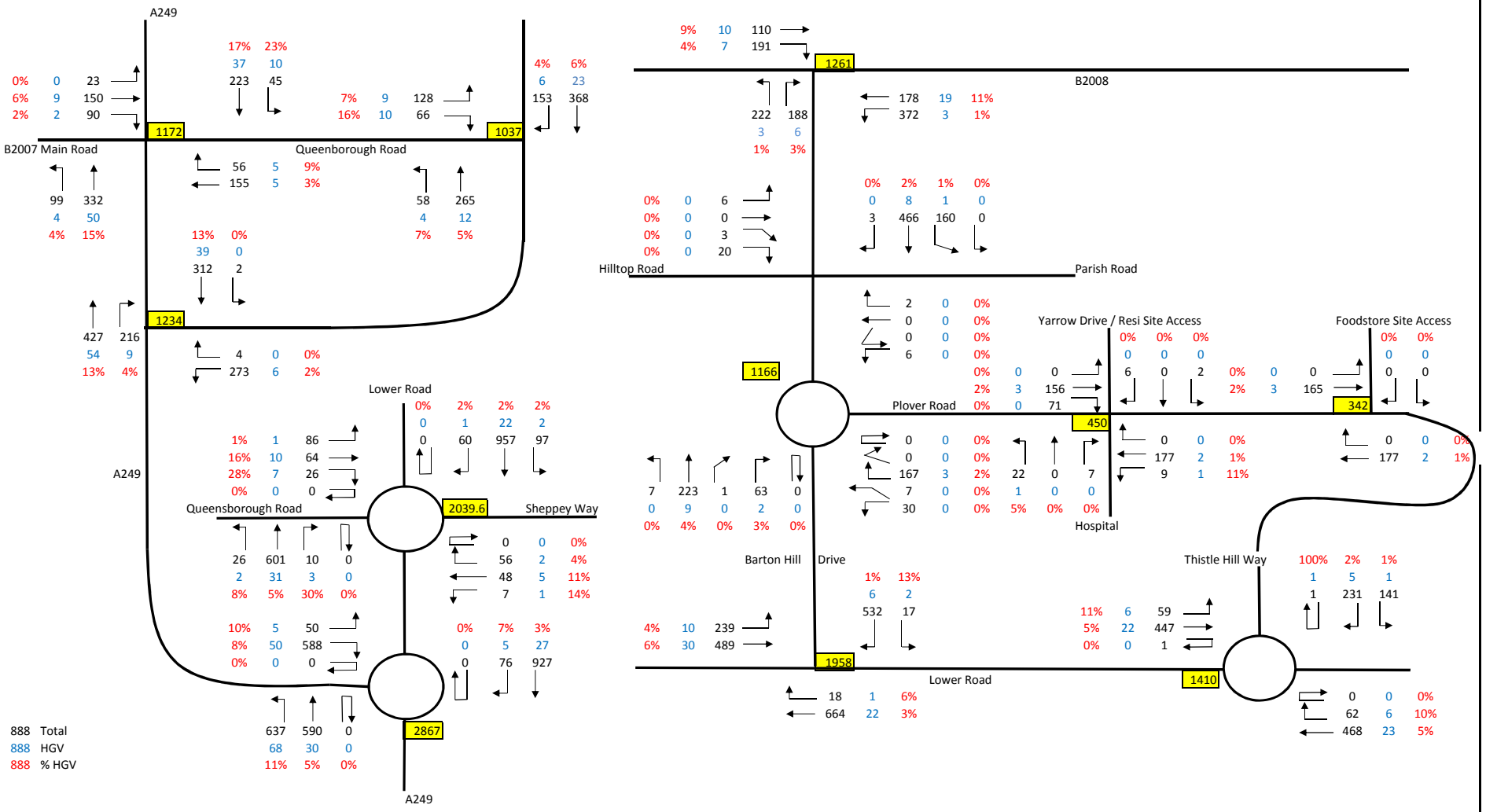
2022 PM Alt Base (with localised trips removed) + Sensitivity Development

Figure 6.29



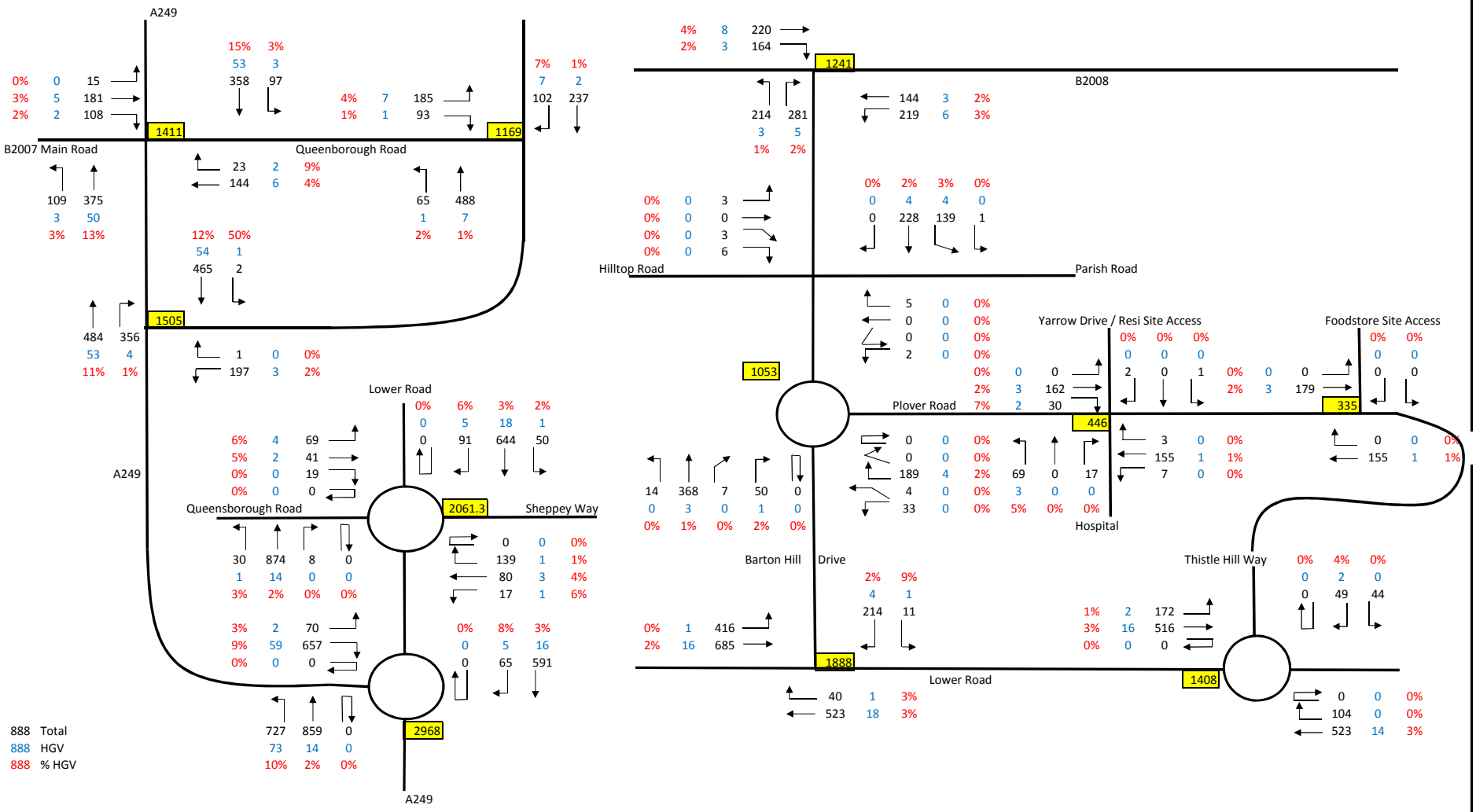
PM Residential Development

Figure 6.3



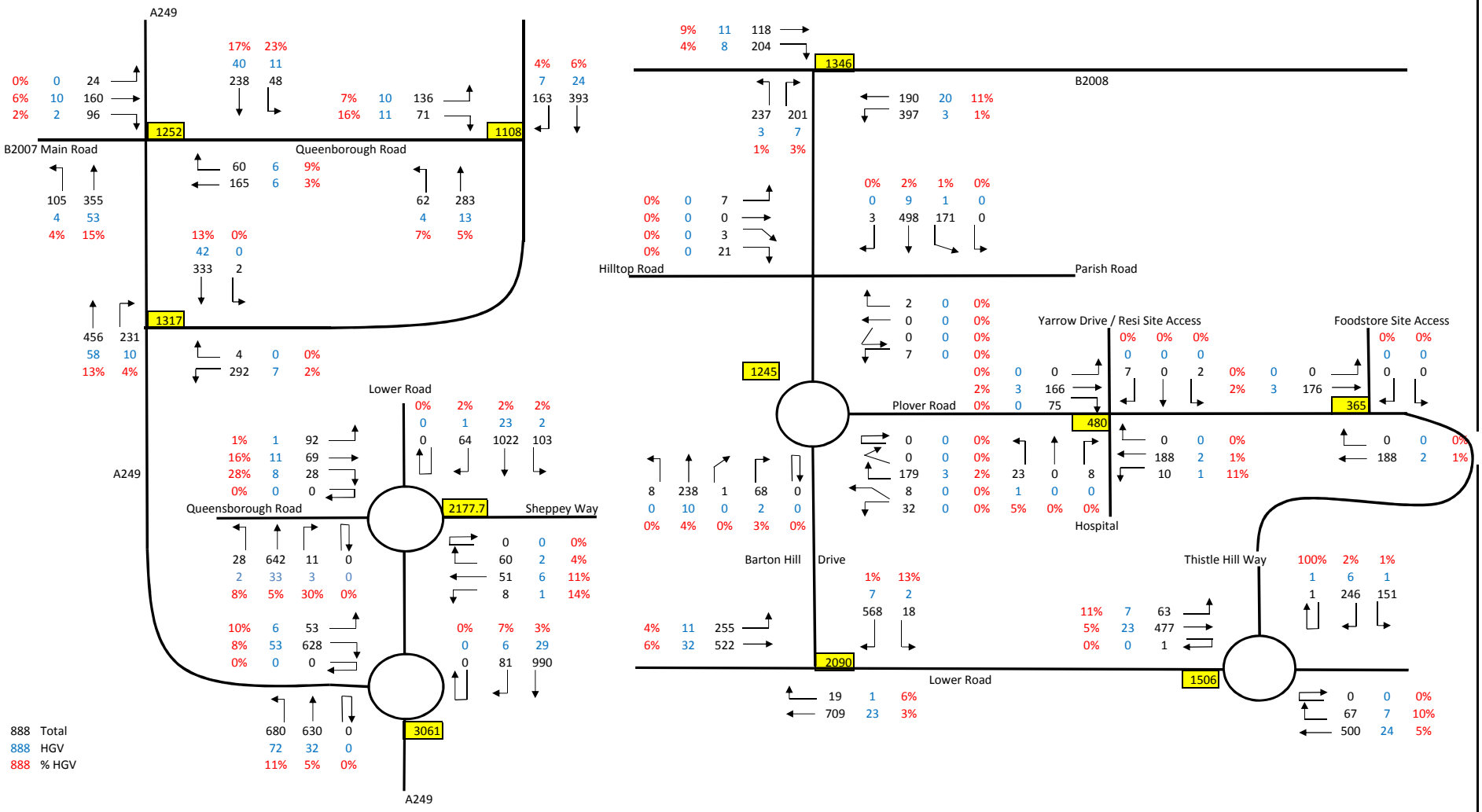
2017 AM Background

Figure 6.4



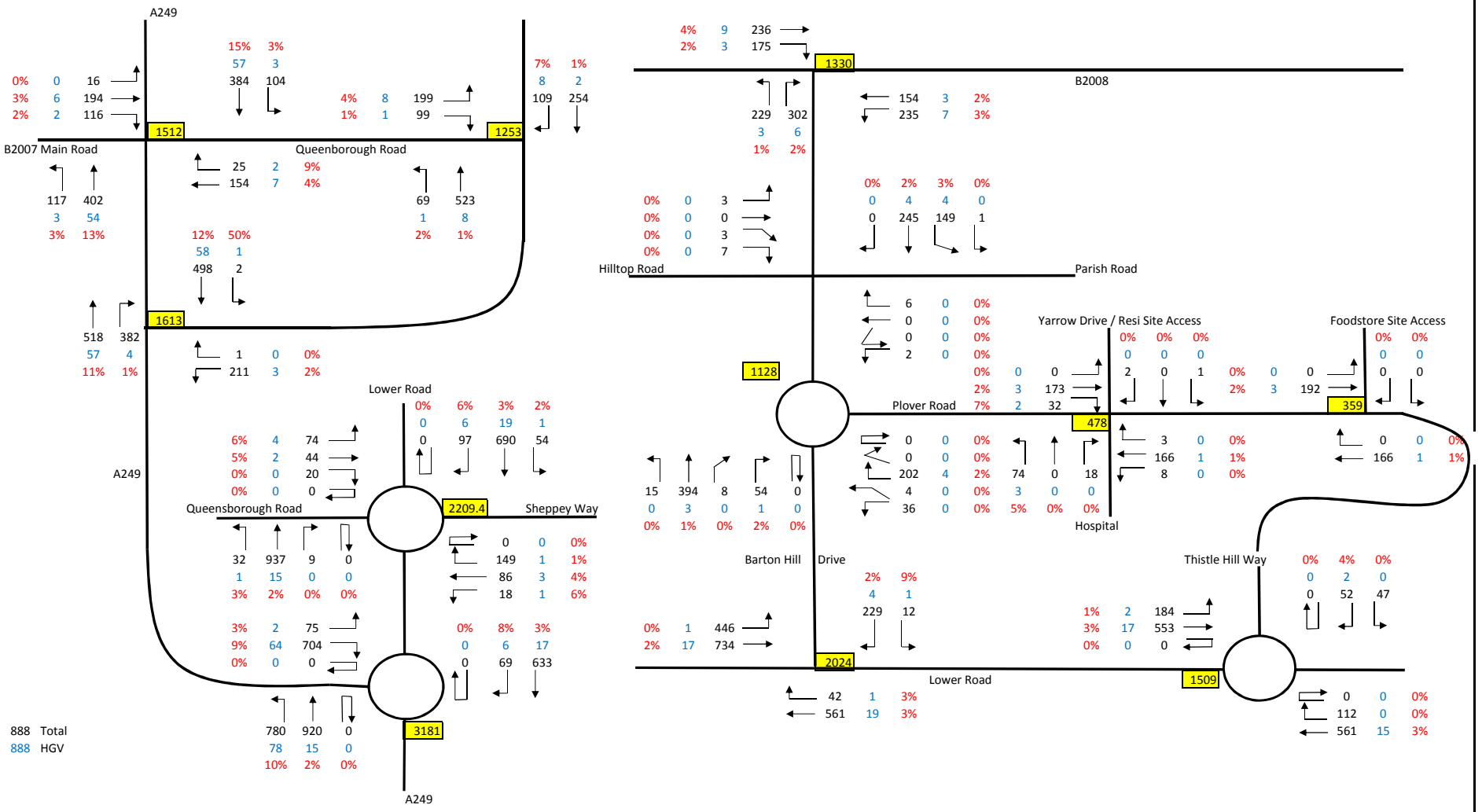
2017 PM Background

Figure 6.5



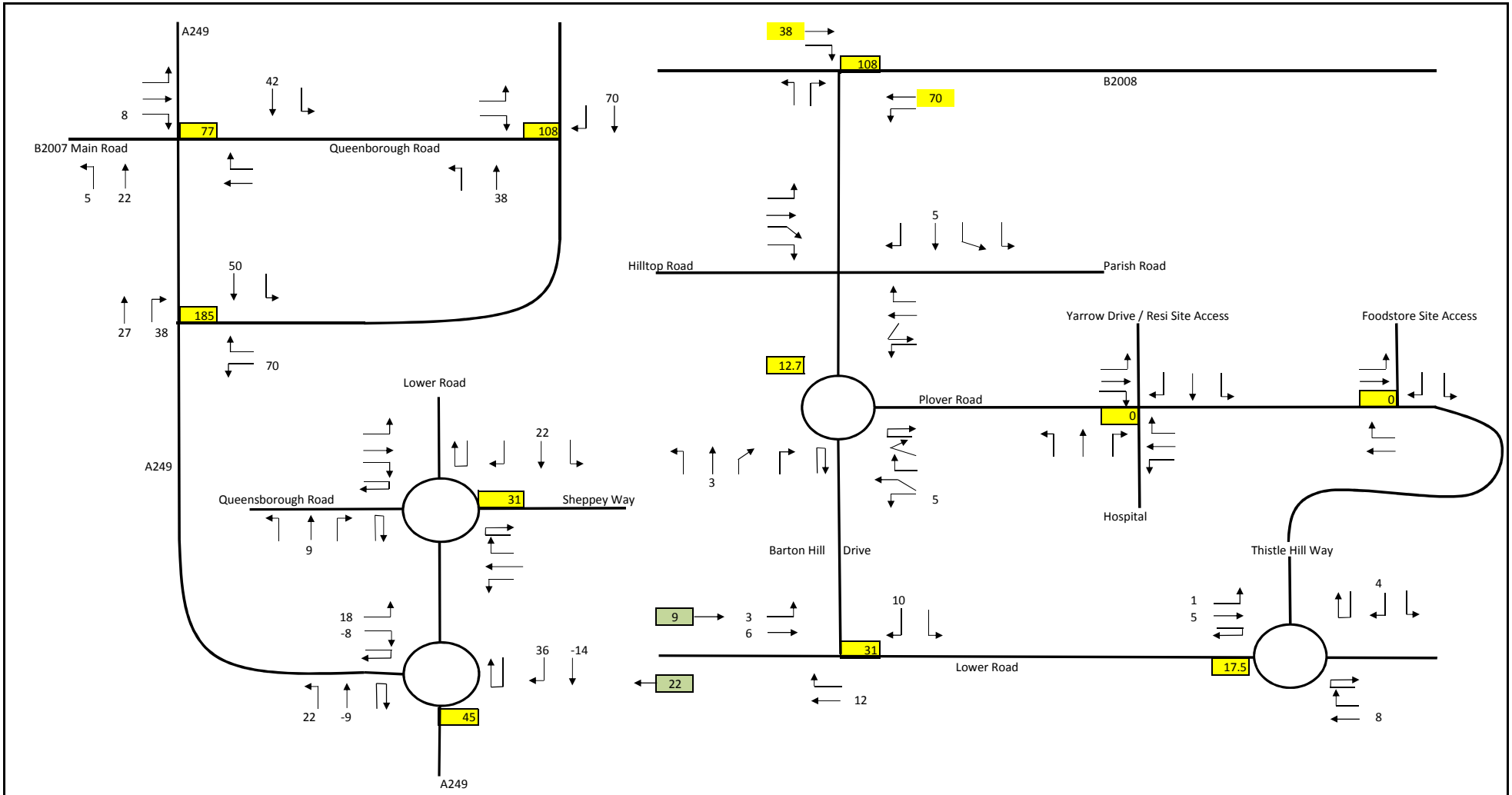
2022 AM Background

Figure 6.6

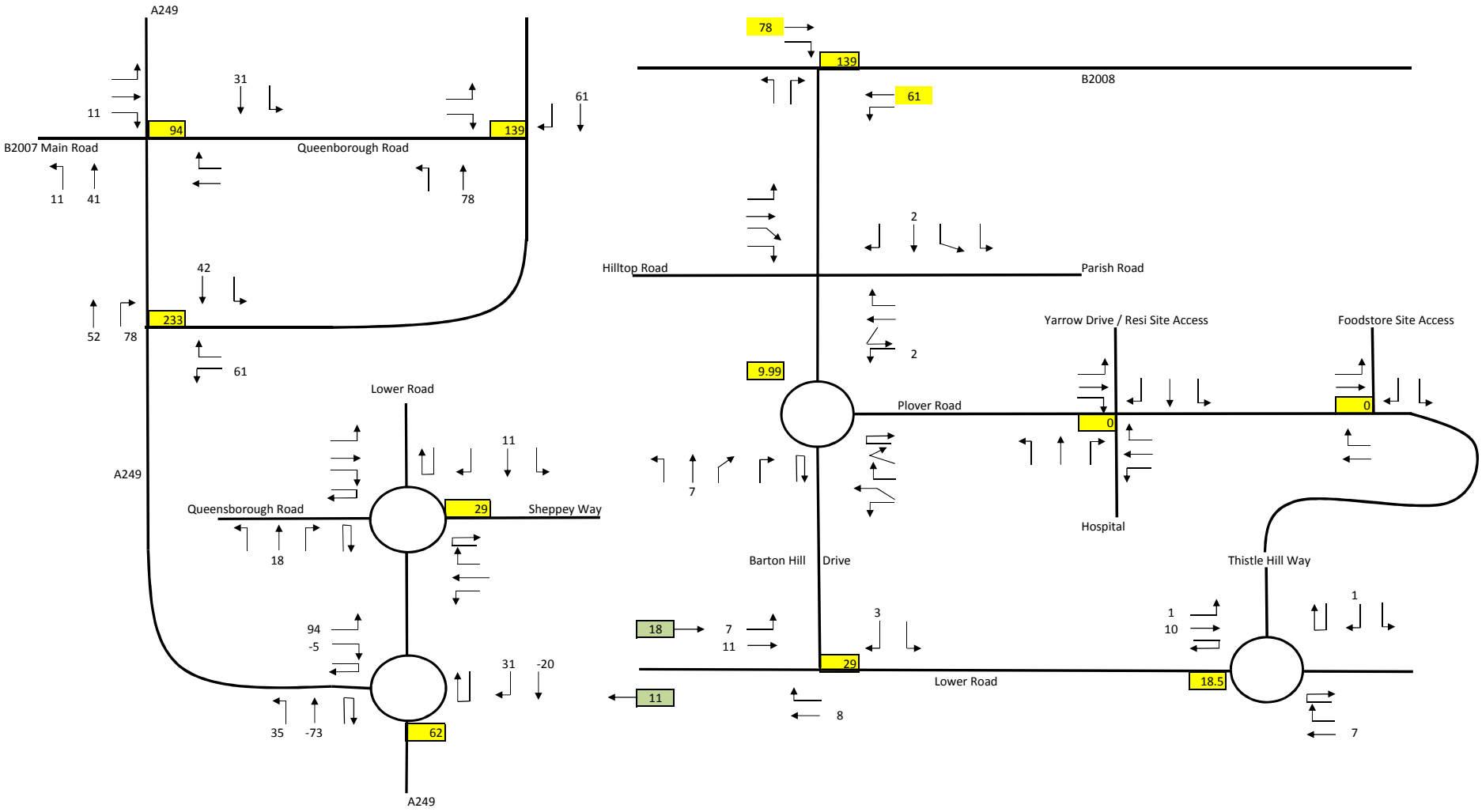


2022 PM Background

Figure 6.7



pba peterbrett	AM Committed Development - Morrisons	Figure 6.8



PM Committed Development-Morrisons

Figure 6.9