

Bassetlaw Local Plan Junction Assessments Report

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1 Introduction

1.1 PREAMBLE

1.1.1 Bassetlaw District Council has commissioned WYG to undertake traffic capacity assessments at key junctions within the district and within neighbouring Doncaster Borough to help advise preparation of the new Bassetlaw Local Plan.

1.1.2 This report summarises the methodology and findings of the junction capacity assessment work and builds on the earlier district-wide transport study presented in the report titled 'Bassetlaw Local Plan Transport Study Update', dated January 2019.

1.1.3 The primary objective of this assessment is to identify the nature and scale of highway improvement works required at key junctions within the district and within neighbouring Doncaster to help facilitate the delivery of Local Plan development within Bassetlaw. This information will assist the Council with planning for the delivery of the necessary improvements to ensure that transport infrastructure does not constrain delivery of the Local Plan.

1.1.4 This study has been prepared in discussion with Highways England and Nottinghamshire County Council (NCC), who are the highway authorities responsible for roads within the district. Consultation has also been undertaken with Doncaster Metropolitan Borough Council (DMBC) regarding cross-boundary highway issues to the north of Bassetlaw.

1.1.5 This study addresses highway capacity issues only and has assessed the likely traffic implications of development sites being considered for possible allocation in the emerging Local Plan. Potential highway mitigation schemes are presented in a preliminary format and it will be necessary for more detailed analysis and design to be undertaken as individual sites come forward through the planning process.

1.2 PURPOSE OF THE STUDY

1.2.1 This study has examined the AM/PM peak period operation of 16 junctions, five of which are situated within Doncaster to the north of Bassetlaw and the remaining 11 are within Bassetlaw. Assessments have been undertaken at a 2019 Base Year to establish existing junction operation and at 2037, the end of the new Local Plan period, both with and without Local Plan allocation traffic. Possible junction improvements have been identified where necessary to mitigate the forecast impacts of Local Plan development traffic.

1.3 STRUCTURE OF THE REPORT

1.3.1 The structure and content of the remainder of this report is summarised as follows:

- Chapter 2: Outlines the scope of the study
- Chapter 3: Discusses existing conditions
- Chapter 4: Identifies committed developments and transport infrastructure schemes
- Chapter 5: Provides information on potential Local Plan allocations
- Chapter 6: Describes the assessment scenarios applied
- Chapter 7: Summarises the operational traffic capacity at the junctions
- Chapter 8: Identifies potential mitigation to address junction capacity issues
- Chapter 9: Examines link capacity on the A57 and at Twyford Bridge
- Chapter 10: Provides a summary of the findings of the assessment work

2 Study Scope

2.1 INTRODUCTION

2.1.1 This work builds on the earlier district-wide transport study presented in the report titled 'Bassetlaw Local Plan Transport Study Update'; dated January 2019. The earlier study identified eight junctions within the district that required further analysis to identify possible improvements to mitigate the forecast impacts of Local Plan development.

2.2 JUNCTION CAPACITY ASSESSMENTS

2.2.1 In addition to these eight junctions three further junctions within Bassetlaw were identified for assessment by Bassetlaw District Council following subsequent consultation with the highway authorities. These are summarised as follows:

- **Kilton Road/High Hoe Road (J16), Worksop** - mini-roundabout and adjacent priority junction. This junction was added at the request of NCC to address the likely traffic implications of a proposed housing allocation at Peaks Hill Farm on the northern edge of Worksop.
- **Dover Bottom/B6387 junctions north and south of the A1 (J14 & J15), Elkesley** – priority T-junctions between the A1 slip roads and the B6387. These junctions were added at the request of Highways England to address the likely traffic implications of a potential Garden Village allocation at Gamston Airport.

2.2.2 Doncaster Metropolitan Borough Council (DMBC) also raised concerns over the potential traffic implications of traffic at five junctions within their authority area. These junctions have therefore also been assessed to assist the Council's with their discussions. **Table 1** on the following page summarises all the junctions that have been assessed in this study. The five junctions within Doncaster are identified as junctions J9, J10, J11, J12, J13.

Table 1 - Junctions Assessed in the Study

| Ref | Description | Junction/Link Standard | Location | District |
|-----|---------------------------------------|--------------------------------|---------------------|----------|
| J1 | A60 Mansfield Road/A619 | Priority Roundabout | Worksop | BDC |
| J2 | A57/Sandy Lane | Priority Roundabout | Worksop | BDC |
| J3 | A57/Claylands Ave/Shireoaks Common | Priority Roundabout | Worksop | BDC |
| J4 | A57/B6034/Netherton Road | Priority Roundabout | Worksop | BDC |
| J5 | A57/B6040 | Priority Roundabout | Mantonwood, Worksop | BDC |
| J6 | A1(T)/A57/A614 Blyth Road (Apleyhead) | Priority Roundabout | East of Worksop | BDC |
| J7 | Blyth Road/Snape Lane | Ghost-Island Priority Junction | Harworth | BDC |
| J8 | Blyth Rd/Scrooby Rd/Bawtry Rd/Main St | Mini-Roundabouts | Harworth | BDC |
| J9 | A631 Sunderland St/A60 Market Place | Priority T-Junction Complex | Tickhill | DMBC |
| J10 | A631/B6463 Blyth Rd/B6463 Stripe Rd | Priority Staggered Crossroads | Tickhill Spital | DMBC |
| J11 | A631 Bawtry Road/Bawtry Road | Priority T-Junction | Harworth | DMBC |
| J12 | A631 Tickhill Road/A638 High Street | Priority T-Junction | Bawtry | DMBC |
| J13 | A631 Gainsborough Rd/A638 High St | 3-Arm Traffic Signals | Bawtry | DMBC |
| J14 | Dover Bottom/B6387 (North) | Priority T-Junction | Gamston | BDC |
| J15 | Dover Bottom/B6387 (South) | Priority T-Junction | Gamston | BDC |
| J16 | Kilton Rd/High Hoe Rd | Mini-Roundabouts | Worksop | BDC |

2.2.3 A plan (**Figure 1**) showing the locations of the junctions listed above can be found appended to this report.

2.3 ADDITIONAL CONSIDERATIONS

2.3.1 In addition to assessing traffic capacity at the 16 junctions listed above the study has also assessed the following:

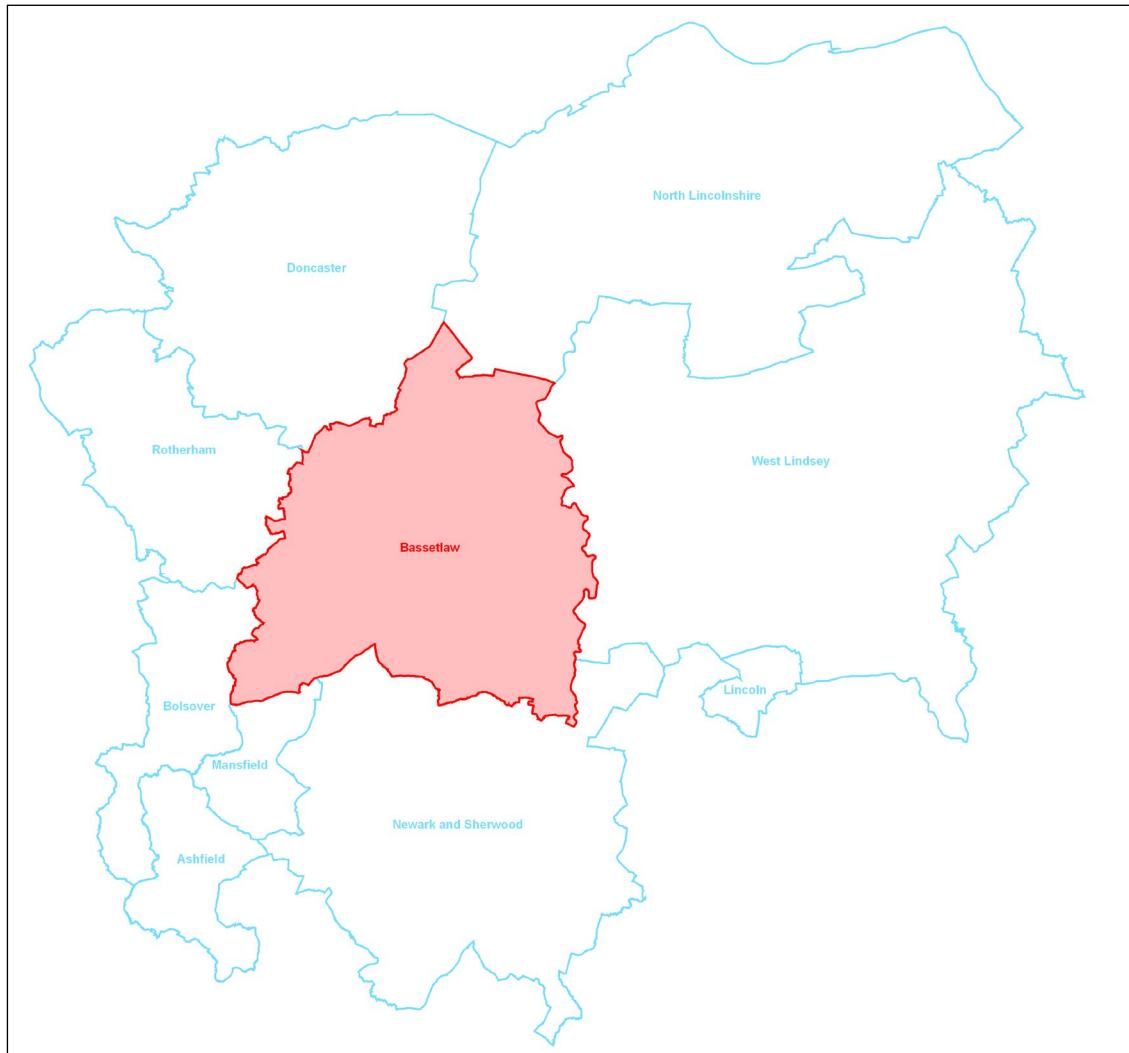
- **Merge/Diverge Facilities** – an assessment of merge/diverge requirements has been undertaken for the A1 slip roads at the A1(T)/A57/A614 'Five Lanes End' junction at Apleyhead, and at the A1/B6387 Dover Bottom (Twyford Bridge) junction at Elkesley.
- **Link Capacity** – has been considered on the A57 east of Worksop and at the A1/B6387 (Twyford Bridge) junction in Elkesley to examine link capacity on the bridge over the A1.

3 Existing Conditions

3.1 INTRODUCTION

3.1.1 Bassetlaw in the context of its neighboring authorities is shown in **Image 1** below.

Image 1 - Bassetlaw District and Adjacent Authorities



3.1.2 Bassetlaw is the northernmost district in Nottinghamshire, covering 30% of the County. Lincolnshire adjoins the district to the east (West Lindsey District), North Lincolnshire (Unitary Authority) to the north east, Doncaster (Unitary Authority) to the north west, Rotherham (Unitary Authority) to the west, Derbyshire to the south west (Bolsover District) and the Nottinghamshire Districts of Mansfield and Newark and Sherwood to the south.

3.1.3 Roads within the district fall into two categories; Motorway/Trunk Road (A1(M)/A1) which are the responsibility of Highways England and County Roads (all other roads in the district) which

are the responsibility of Nottinghamshire County Council (NCC). The key roads within the district are identified in **Figure 2**.

- 3.1.4 Existing conditions at the junctions listed in **Table 1** have been determined through the examination of relevant data sources (as discussed within this section) and through discussions with the highway authorities responsible for the road network within the district.

3.2 EXISTING TRAFFIC FLOWS

- 3.2.1 New AM/PM peak period traffic surveys were commissioned and undertaken by specialist survey sub-contractors at 12 of the 16 junctions. Video surveys were undertaken, and data presented as classified turning movements. All surveys were undertaken during school term time and the dates of the surveys were discussed with NCC and DMBC prior to surveys proceeding. The dates of the surveys are summarised in **Table 2** below.

Table 2 – Traffic Survey Dates/Data Sources

| Ref | Description | Date of Survey | Source of Data |
|-----|--|----------------|----------------|
| J1 | A60 Mansfield Road/A619 | 16/07/2019 | New Survey |
| J2 | A57/Sandy Lane | 16/07/2019 | New Survey |
| J3 | A57/Claylands Ave/Shireoaks Common | 16/07/2019 | New Survey |
| J4 | A57/B6034/Netherton Road | 16/07/2019 | New Survey |
| J5 | A57/B6040 | 16/07/2019 | New Survey |
| J6 | A1T(T)/A57/A614 Blyth Road (Apleyhead) | 16/07/2019 | New Survey |
| J7 | Blyth Road/Snape Lane | 16/07/2019 | New Survey |
| J8 | Blyth Rd/Scrooby Rd/Bawtry Rd/Main St | 16/07/2019 | New Survey |
| J9 | A631 Sunderland St/A60 Market Place | 23/05/2019 | DMBC |
| J10 | A631/B6463 Blyth Rd/B6463 Stripe Rd | 23/05/2019 | DMBC |
| J11 | A631 Bawtry Road/Bawtry Road | 23/05/2019 | DMBC |
| J12 | A631 Tickhill Road/A638 High Street | 23/05/2019 | DMBC |
| J13 | A631 Gainsborough Rd/A638 High St | 05/11/2019 | New Survey |
| J14 | Dover Bottom/B6387 (North) | 24/09/2019 | New Survey |
| J15 | Dover Bottom/B6387 (South) | 24/09/2019 | New Survey |
| J16 | Kilton Rd/High Hoe Rd | 31/10/2019 | New Survey |

- 3.2.2 During the survey at J3 one lane on each of the A57 approaches to the roundabout had been coned-off in preparation for planned roadworks. NCC therefore reviewed the count data and undertook a comparison against previous turning counts and data from permanent traffic counter sites on the A57.

- 3.2.3 The comparison highlighted that slightly lower flows were recorded on the A57 during 2019 than in previous years so NCC provided peak period conversion factors that were applied to uplift the A57 flows. The factors are summarised as follows:
- AM factor of **5.3%** to convert July 2019 to 2018 average weekday
 - PM factor of **9.2%** to convert July 2019 to 2018 average weekday
- 3.2.4 These factors were applied to the 2019 survey data at J2, J3, J4 and J5 (to the A57 flows only). Details of the base traffic count data and adjusted flows can be found in **Appendix A**.
- 3.2.5 Traffic data for four of the five junctions (J9, J10, J11 & J12) located within Doncaster was provided by the DMBC Highways Team. This survey data was taken from a recent planning application from surveys undertaken on Thursday 23rd May 2019. No data was available for J13, so a new survey was commissioned and undertaken by a specialist survey sub-contractor on Tuesday 5th November 2019.
- 3.2.6 New surveys were commissioned and undertaken by a specialist survey sub-contractor at the Twyford Bridge slip road junctions onto the B6387 (J14 & J15) on Tuesday 24th September 2019 during school term time.
- 3.2.7 A new survey was also commissioned and undertaken by a specialist survey sub-contractor at the High Hoe Road/Kilton Road mini-roundabout and adjacent priority junction (J16) on Thursday 31st October 2019.
- 3.2.8 Traffic flows for the A1 mainline were obtained from the Department for Transport (DfT) WebTRIS website using site number: 26089. This site was selected as it had the most recent data (2018) in comparison to other sites.
- 3.2.9 To estimate Base 2019 flows on the A1, the difference between recorded AM/PM peak 2017 and 2018 movements was added to 2018 flows in order to estimate 2019 Base Flows (i.e. annual growth assumed to remain consistent). This is the same methodology applied by the DfT and therefore considered acceptable.
- 3.2.10 Details of the traffic count data for all locations can be found in **Appendix A**.

3.3 ROAD SAFETY

3.3.1 Injury collision records for the most recently available 5-year period available were obtained from NCC and DMBC for the junctions covered by this study. A summary of this data is presented in **Table 3** below. No fatal accidents were recorded during this period. Further details of the collision data, including location plans can be found in **Appendix B**.

Table 3 – Injury Collision Record Summary

| Ref | Junction | Slight | Severe | Fatal | Total |
|-----|---|--------|--------|-------|-------|
| J1 | A60 Mansfield Road/A619 | 2 | 0 | 0 | 2 |
| J2 | A57/Sandy Lane | 12 | 1 | 0 | 13 |
| J3 | A57/Claylands Ave/Shireoaks Common | 6 | 2 | 0 | 8 |
| J4 | A57/B6034/Netherton Road | 2 | 2 | 0 | 4 |
| J5 | A57/B6040 | 4 | 1 | 0 | 5 |
| J6 | A614 Blyth Road/A57/A1(T) | 10 | 1 | 0 | 11 |
| J7 | Blyth Road/Snape Lane | 0 | 0 | 0 | 0 |
| J8 | Blyth Road/Scrooby Road/Bawtry Road/Main Street | 7 | 0 | 0 | 7 |
| J9 | A631 Sunderland Street/A60 Market Place | 1 | 1 | 0 | 2 |
| J10 | A631 Bawtry Road/B6463 Blyth Road/B6463 Stripe Road | 6 | 3 | 0 | 9 |
| J11 | A631 Bawtry Road/Bawtry Road | 7 | 2 | 0 | 9 |
| J12 | A631 Tickhill Road/A638 High Street | 4 | 0 | 0 | 4 |
| J13 | A631 Gainsborough Road/A638 High Street | 0 | 0 | 0 | 0 |
| J14 | Dover Bottom/B6387 (Northern) | 2 | 0 | 0 | 2 |
| J15 | Dover Bottom/B6387 (Southern) | 1 | 0 | 0 | 1 |
| J16 | Kilton Rd/High Hoe Rd | 4 | 0 | 0 | 4 |

- 3.3.2 A review of the collision data has not identified any consistent factors that point to deficiencies or problems with the geometry or condition of the existing highway. No mitigation improvements are therefore considered necessary to specifically address highway safety issues.

4 Committed Transport Infrastructure and Land-Use Developments

4.1 INTRODUCTION

- 4.1.1 For the purposes of this study committed transport infrastructure and land-use schemes have been assumed to be in accordance with the details contained within the 'Bassetlaw Local Plan Transport Study Update' report dated January 2019.

4.2 COMMITTED TRANSPORT INFRASTRUCTURE SCHEMES

- 4.2.1 No committed infrastructure schemes were considered in the Local Plan Transport Study and no schemes have therefore considered in this study.

4.3 COMMITTED LAND-USE DEVELOPMENTS

- 4.3.1 For the purposes of the Local Plan Transport Study land-use developments were split into two categories; committed land-use developments located within the district and committed land-use developments located in adjacent districts/boroughs likely to result in trips through Bassetlaw.
- 4.3.2 To avoid double counting, trips between origins/destinations within the district and land-use developments outside of the district were ignored since these were accounted for in the trips to/from committed and future Local Plan development within the district (although it was acknowledged that land-use developments in adjacent districts/boroughs may change the distribution of trips to/from the district).
- 4.3.3 For this study no changes have been made to the earlier assumptions regarding committed land-use developments outside of the district and trips associated with these remain unchanged. However, committed land-use developments within the district have been updated to reflect any changes since January 2019.
- 4.3.4 BDC provided up-to-date details of committed land-use developments within the district and these are summarised in **Table 4** on the following page. Sites that have been updated since the January 2019 Transport Study are highlighted green in the table. Committed development site locations are shown in **Figure 3**.
- 4.3.5 Only one committed employment site was identified; Gateford Common, a mixed-use residential/employment site with 380 dwellings and 19,000 sqm of B1 use-class employment.

Table 4 - Committed Residential Development Sites

| Development | Planning Application Ref | Dwellings |
|--|-----------------------------|-----------|
| Harworth & Bircotes | | |
| Plumtree Farm, Harworth | 13/00793/FUL | 95 |
| Bryndale 223, Scrooby Road | 16/00473/FUL | 25 |
| Land off Hawkins Close | 17/01073/RES | 24 |
| Harworth Colliery (Jones), Scrooby Road | 17/01566/RES | 71 |
| Harworth Colliery (Kier), Scrooby Road | 17/01575/RES | 125 |
| Land off Bramble Way | 14/00389/OUT | 10 |
| Harworth Colliery | Pending | 1,300 |
| 125 Scrooby Road, Bircotes | 17/00517/FUL | 17 |
| Worksop | | |
| Stanton House, 43 Westgate | 13/00471/RENU | 10 |
| Phase 2: Land at Ashes Park (originally 750 dwellings) | 14/00431/OUT | 332 |
| Land at Gateford Park (Barratt S81 7RD) | 16/01487/RES | 168 |
| Land at Monmouth Road | 16/01556/FUL | 14 |
| Land At Gateford Park, Ashes Park Avenue, Worksop | 17/00033/RES | 155 |
| 239 Sandy Lane | 17/00053/FUL | 10 |
| Abbey Street, Worksop | 17/00215/FUL | 51 |
| Land south of Gateford Road | 17/00213/OUT | 380 |
| North of Thievedale Road (Phase 2) | 15/01477/OUT | 137 |
| North of Thievedale Road (Phase 1) | 18/00862/RES & 15/01477/OUT | 45 |
| Old Manton Allotments (219) | 19/00399/FUL | 120 |
| Turner Road | 19/00644/FUL | 111 |
| Retford | | |
| Land at London Road | 01/06/00280 | 1 |
| Former Newell and Jenkins Site, Thrumpton Lane | 01/08/00182 | 24 |
| Idle Valley, Amcott Way | 01/11/00242 | 41 |
| Fairy Grove Nursery | 01/11/00284 | 16 |
| King Edward VI School, London Road | 12/01312/FUL | 7 |
| Land off West Hill Road | 13/01025/RES | 17 |
| Kenilworth Nurseries, London Road | 16/01777/FUL | 110 |
| 18-20 West Street | 18/00748/FUL | 12 |
| Land West of Tiln Lane | 14/00503/OUT | 107 |
| Land West of Tiln Lane | 18/01445/RES & 14/00503/OUT | 68 |
| Land adjacent to 17 Dunham Grove | 15/00495/RSB | 10 |
| Land adjacent to 17 Dunham Grove | 18/00141/FUL | 4 |
| Former Retford Oaks School, Pennington Walk | 16/00363/OUT | 28 |
| Former Yates Pub, Chapelgate | 18/01037/FUL | 21 |
| Land to the rear of Kenilworth Nurseries | 18/00695/FUL | 109 |
| Bridgegate | 19/00348/FUL | 15 |
| Land at North Road | 15/00493/OUT | 196 |
| The Church of St Albans | 19/00455/FUL | 10 |
| Gateford Common | 14/00213/OUT | 380 |
| Villages in Functional Clusters 20% increase in housing provision | | |
| Ranskill | N/A | 122 |
| Blyth | N/A | 111 |
| Scrooby | N/A | 30 |
| Torworth | N/A | 23 |
| Carlton-in-Lindrick | N/A | 520 |
| Styrrup with Oldcotes | N/A | 59 |
| Hodsock | N/A | 227 |
| Shireoaks | N/A | 124 |
| Rhodesia | N/A | 84 |
| Cuckney | N/A | 21 |
| Holbeck | N/A | 19 |
| Norton | N/A | 14 |
| Nether Langwith | N/A | 42 |
| Hayton | N/A | 32 |
| Clarborough and Welham | N/A | 99 |
| Sutton-cum-Lound | N/A | 65 |
| Lound | N/A | 43 |

| | | |
|----------------------------------|-----|-------|
| Barnby Moor | N/A | 24 |
| Babworth | N/A | 53 |
| Tuxford | N/A | 246 |
| Askham | N/A | 16 |
| East Markham | N/A | 103 |
| West Markham | N/A | 15 |
| Normanton | N/A | 15 |
| Marnham | N/A | 31 |
| North Leverton with Hablesthorpe | N/A | 93 |
| Stokeham | N/A | 4 |
| Laneham | N/A | 34 |
| North Wheatley | N/A | 44 |
| South Wheatley | N/A | 9 |
| South Leverton | N/A | 43 |
| Sturton-le-Steeple | N/A | 42 |
| Cottam | N/A | 9 |
| Treswell | N/A | 21 |
| Rampton | N/A | 75 |
| Gringley-on-the-Hill | N/A | 69 |
| Misterton | N/A | 192 |
| Walkeringham | N/A | 96 |
| Beckingham | N/A | 109 |
| West Stockwith | N/A | 31 |
| Everton | N/A | 74 |
| Mattersey | N/A | 66 |
| Total | | 7,145 |

4.3.6 The plan presented as **Figure 3** only depicts the larger committed development sites and for ease of presentation doesn't depict any of the village commitments. Sites of 10 or less dwellings were excluded from the calculations.

5 Local Plan Development

5.1 POTENTIAL ALLOCATION SITES

5.1.1 BDC provided details of potential allocation sites to form the basis for the junction assessment work. **Table 5** below summarises the potential residential allocations and **Table 6** on the following page summarises the potential employment allocations. Allocation site locations are depicted in **Figure 4**.

Table 5 – Potential Residential Allocation Sites

| Development | Planning Application reference | Residential Dwellings |
|---|--------------------------------|-----------------------|
| Worksop | | |
| Peaks Hill Farm (210) | - | 750 |
| Former Bassetlaw Learning Centre (142) | - | 23 |
| Canal Road | - | 80 |
| Former Manton Primary School (147) | - | 100 |
| Talbot Road (149) | - | 15 |
| Shireoaks Common | 14/00223/OUT | 167 |
| Gateford Common | 14/00213/OUT | 380 |
| Woodend Farm | 18/00648/RES | 73 |
| Former Knitwear Factory | - | 40 |
| Retford | | |
| Land South East of Ollerton Road (276) | - | 275 |
| Sandhills (218) | - | 120 |
| Garden Villages (GV)* | | |
| Potential Morton Garden Village | - | 4,000 |
| Potential Gamston/Bevercotes Garden Village | - | 4,000 |
| Total | | 6,023* |

***Note:** Only one GV site used per assessment given that only one will come forward as an allocated site.

5.1.2 Two potential Garden Village (GV) sites are being considered and these are located at Morton to the east of the A1 Apleyhead junction, and at Gamston Airport/Bevercotes Colliery. Each would accommodate circa 4,000 dwellings along with employment land uses, education and health facilities, local shops (both food and non-food) and leisure / green space provision. Only one GV site will be allocated and promoted for development within this plan period to 2037.

5.1.3 Details of employment floor areas and use-class splits were unavailable for some of the potential allocation sites listed in **Table 6** on the following page so this has been estimated in consultation with BDC. Where only site areas were available the Gross Floor Area (GFA) has been estimated based on 40% of the total site area to represent a typical employment development density. In the absence of any land-use splits, it was agreed with BDC that the following will be applied for

the purposes of this study: 12.5% B1c, 37.5% B2 and 50% B8. **Table 6** below provides a summary of the employment allocation assumptions applied for the purposes of this assessment.

Table 6 – Potential Employment Allocation Sites

| Development | Planning Application Reference | Size of Development (Gross Floor Area sqm) | | |
|--|--------------------------------|--|---------|---------|
| | | B1 | B2 | B8 |
| Workshop | | | | |
| Carlton Forest | N/A | 6,800 | 20,400 | 27,200 |
| Gateford Common | 14/00213/OUT | 19,000 | N/A | N/A |
| A57 South of Manton | 18/00737/OUT | 4,650 | 30,690 | 62,310 |
| Shireoaks Common | 14/00223/OUT | 4,000 | 12,000 | 44,000 |
| Blyth Road East | 16/01636/FUL | 710 | | N/A |
| Retford | | | | |
| West of North Road (071) | N/A | 5,350 | 16,050 | 21,400 |
| Trinity Farm | 15/00493/OUT | 1,839 | 18,650 | 0 |
| Other* | | | | |
| Symmetry Park (Blyth) | 17/00617/FUL | 5,000 | 2,000 | 2,000 |
| South of Snape Lane | 15/00971/OUT | 66,203 | | 148,616 |
| Land off the A57 Apleyhead | N/A | | 78,596 | 314,384 |
| Land at Steetley | 02/07/00278 | | 21,500 | |
| Renewable Energy Allocation (High Marnham Power Station) | N/A | 18,800 | 56,400 | 75,200 |
| Welbeck Colliery | 15/01037/FUL | 2,885 | 6,462 | 3,231 |
| Morton Garden Village * | N/A | 7,500 | 22,500 | 30,000 |
| Gamston Garden Village * | N/A | 7,500 | 22,500 | 30,000 |
| Totals | | 109,635 | 301,609 | 684,631 |

***Note:** Only one GV site used per assessment given that only one will come forward as an allocated site.

6 Assessment Scenarios & Trip Generation

6.1 FORECAST YEARS

6.1.1 A future year of 2037 has been applied which is consistent with the end of the new Local Plan period. The study assesses the following scenarios:

- 2019 Base Year
- 2037 Reference Case (2019 Base + Committed Developments)
- 2037 Design Flows (Reference Case + Allocations including Morton GV)
- 2037 Design Flows (Reference Case + Allocations including Gamston GV)
- 2037 Design Flows (Reference Case + Allocations including Morton GV & Internalisation)
- 2037 Design Flows (Reference Case + Allocations including Gamston GV & Internalisation)

6.2 TEMPRO COMPARISON

6.2.1 No background traffic growth has been applied as traffic flows from committed developments have been estimated separately and added to the 2019 Base Year flows to obtain 2037 Reference Case flows.

6.2.2 A comparison has been undertaken between the growth assumptions included in the DfT trip-end model (TEMPro dataset v7.2) programme which provides summaries of National Trip End Model (NTEM) forecast data for transport planning purposes. Details of which can be found in **Appendix C**.

6.2.3 This analysis confirms that the combination of 'Committed + Local Plan development' assumptions for Bassetlaw District applied in this study (residential and employment combined) exceeds the future growth assumptions contained within the National Trip End Model. As a result, the assessment is robust and no additional allowance for 'background' traffic growth is necessary.

6.2.4 As this study is assessing proposed Local Plan allocations for the district the information contained within this study on proposed future Local Plan development is also more up to date than the assumptions in the National Trip End Model, which will need to be updated to reflect the new Local Plan once it is adopted.

6.3 TRIP GENERATION

- 6.3.1 Trip Generation for committed development and potential allocation sites has been undertaken using the same methodology as applied for the Bassetlaw Local Plan Transport Study Update, dated January 2019. This methodology is described in the Transport Study Update report. Details of the trip generation calculations can be found in **Appendix D**.
- 6.3.2 For the potential Garden Village (GV) sites the trip generation methodology is as described in the accompanying Garden Village Trip Generation Methodology Report, dated October 2019 (Ref: A113816-03).
- 6.3.3 Two scenarios have been tested for each GV site, the first is based on trip rates obtained from the TRICS database with no car trip reductions applied for 'trip internalisation' or modal shift to reflect sustainable travel. The second scenario applies car trip reductions to reflect 'trip internalisation' and in the case of the Morton GV site some modal shift away from private car to rail use¹. The first scenario is therefore the 'worst case' with the highest car trip generation.

TRIP DISTRIBUTION & ASSIGNMENT

- 6.3.4 Trip distribution and assignment for all sites has been undertaken using the same (hybrid spreadsheet/VISUM) methodology as applied for the Bassetlaw Local Plan Transport Study Update, dated January 2019. This methodology is described in the Transport Study Update report.

OTHER ASSUMPTIONS

- 6.3.5 In relation to the Blyth Road/Scrooby Road/Bawtry Road/Main Street double mini-roundabout junction (J8), discussions with NCC suggest that traffic flows through the southern roundabout are likely to be reduced by the 2037 Design Year following completion of the spine road through the Harworth Colliery redevelopment site (between Blyth Road and Scrooby Road). See **Image 2** on the next page.
- 6.3.6 Completion of this link road will provide an alternative route for some south-east/east-south movements which will help to reduce traffic through the southern mini-roundabout. It has therefore been assumed that 70% of future south-east/east-south movements between Blyth

¹ Full details of the Garden Village trip generation assumptions can be found in the accompanying Garden Village Trip Generation Methodology Report (Ref: A113816-03), dated October 2019. Details of the potential new rail station to serve the Morton GV site can be found in the accompanying Technical Note 'Review of Rail Issues associated with Potential Garden Village at Morton' (ref: A113816-01), dated August 2019.

Road and Scrooby Road will transfer to the new link road. This assumption has been applied for the purposes of testing the operation of J8.

Image 2 – Harworth Colliery Redevelopment Spine Road



- 6.3.7 The Peaks Hill Farm (210 dwellings) potential allocation site is located north of Worksop between the A60 and the B6045 with the potential for a new link road to be provided through the site joining the A60 to the B6045. Following discussion with NCC this site has been assessed assuming that a link is provided through the site onto the A60 and B6045. Development trips to/from this site have been split equally between the two site accesses².

² No reassignment of base traffic flows has been assumed with the provision of a link road.

Image 3 – Peaks Hill Farm Access Assumptions



7 Junction Capacity Assessments

7.1 INTRODUCTION

7.1.1 Capacity assessments have been undertaken for the AM and PM peak hours, for the 2019 Base Year and at 2037 both with and without Local Plan allocation development flows. Where appropriate, potential improvements have also been assessed to identify potential mitigation.

7.1.2 The assessment of junctions has been undertaken using the 'Junctions 9' and LinSIG computer programmes which are the 'industry standard' traffic modelling computer software packages used for assessing the traffic capacity of priority junctions and signalised junctions respectively. The operation of merge/diverge facilities onto the A1 has been assessed using the methodology set out in CD122 of the Design Manual for Roads and Bridges (DMRB).

7.2 MERGE/DIVERGE ASSESSMENTS

7.2.1 The operation of the existing merge/diverge facilities onto the A1 at the Apleyhead and Twyford Bridge junctions have been assessed. Merge assessments have been undertaken using Figure 3.12a (all purpose) from CD122 of the DMRB and diverge assessments using Figure 3.26a (all purpose). The results of the assessment can be found in **Appendix E** and are summarised in **Table 7** and **Table 8**.

Table 7 - A1 Merge/Diverge Assessment Results (No GV Internalisation)

| Junction | Type | Existing Merge/Diverge Type | CD 122 Merge/Diverge Types | | | | | |
|--------------------------|-------------|-----------------------------|----------------------------|----|-------------------------------|----|--------------------------------|----|
| | | | 2037 Reference Case Flows | | 2037 Design Flows (Morton GV) | | 2037 Design Flows (Gamston GV) | |
| | | | AM | PM | AM | PM | AM | PM |
| A1(T)/B6387 Dover Bottom | SB Diverge | A | A | A | A | A | A | C |
| A1(T)/B6387 Dover Bottom | SB Merge | A | A | A | A | A | A | A |
| A1(T)/B6387 Dover Bottom | NB Diverge | A | A | A | A | A | A | A |
| A1(T)/B6387 Dover Bottom | NB Merge | A | A | A | A | A | B | A |
| A1(T)/A57/A614 | NWB Diverge | A | A | A | A | A | A | A |
| A1(T)/A57/A614 | NWB Merge | A | D* | D* | D* | D* | D* | A |

7.2.2 The results in **Table 7** above reflect the 'worst case' Design Flows which include all the potential Local Plan allocations and the Garden Village flows assume no trip internalisation, or modal shift to reflect improved sustainable travel. As can be seen from the results all existing merge/diverge facilities are forecast to operate satisfactorily except for the southbound diverge and northbound merge at Twyford Bridge in the scenario where the Garden Village is assumed to be provided at Gamston Airport. In this scenario it is likely that these merge/diverge facilities would require upgrading.

- 7.2.3 The results in **Table 8** below reflect the Design Flows which include all the potential Local Plan allocations and the Garden Village flows assume vehicle trip reductions to reflect trip internalisation and some modal shift from car to rail (at the Morton Garden Village site only).
- 7.2.4 As can be seen from the results all existing merge/diverge facilities are forecast to operate satisfactorily. In this scenario no improvements would be required to the existing merge/diverge facilities.

Table 8 - A1(T) Merge/Diverge Assessment Results (With GV Internalisation)

| Junction | Type | Existing Merge/Diverge Type | CD 122 Merge/Diverge Types | | | | | |
|--------------------------|-------------|-----------------------------|----------------------------|----|-------------------------------|----|--------------------------------|----|
| | | | 2037 Reference Case Flows | | 2037 Design Flows (Morton GV) | | 2037 Design Flows (Gamston GV) | |
| | | | AM | PM | AM | PM | AM | PM |
| A1(T)/B6387 Dover Bottom | SB Diverge | A | A | A | A | A | A | A |
| A1(T)/B6387 Dover Bottom | SB Merge | A | A | A | A | A | A | A |
| A1(T)/B6387 Dover Bottom | NB Diverge | A | A | A | A | A | A | A |
| A1(T)/B6387 Dover Bottom | NB Merge | A | A | A | A | A | A | A |
| A1(T)/A57/A614 | NWB Diverge | A | A | A | A | A | A | A |
| A1(T)/A57/A614 | NWB Merge | A | D* | D* | D* | D* | D* | A |

7.3 PRIORITY JUNCTIONS AND SIGNAL JUNCTIONS

- 7.3.1 For priority junctions a Ratio of Flow to Capacity (RFC) value below 0.85 indicates that a junction operates 'within' capacity. An RFC value between 0.85 and 1.00 indicates that there may be occasions during the period modelled when queues will develop, and delays occur. An RFC value greater than 1.00 indicates that a junction operates 'above' capacity.
- 7.3.2 For traffic signal junctions, Practical Reserve Capacity (PRC) is used to indicate whether a junction operates within its practical capacity (90% of theoretical maximum capacity). PRC figures between 0% and -11% indicate that a junction is operating over its practical maximum, but under its theoretical maximum. Experience with PRC calculations at existing junctions indicates that delays and queues becomes increasingly unpredictable as the degree of saturation exceeds practical reserve capacity but not excessive until the degree of saturation exceeds the theoretical maximum, i.e. -11% (100% degree of saturation), which is approximately comparable to an RFC of 1.0 at a priority junction.
- 7.3.3 The results in **Table 9** on the following page reflect the 2019 Base Year and 2037 Reference Case flows. For the sake of simplicity all the summary tables present only the 'worst case' values forecast at each junction. Values exceeding the capacity thresholds discussed above are shown in red. Full capacity assessment outputs can be found in **Appendix F**.

Table 9 - Junction Assessments at 2019 Base and 2037 Reference Case

| Ref | Junction | 2019 Base Flows | | | | 2037 Reference Case Flows (Base + Committed) | | | |
|-----|---|-------------------------------------|---|-------------------------------------|---|---|---|-------------------------------------|---|
| | | AM Peak | | PM Peak | | AM Peak | | PM Peak | |
| | | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| | Bassetlaw DC | | | | | | | | |
| J1 | A60/A619 | 0.94 | 10.2 | 0.86 | 5.5 | 1.14 | 53.0 | 1.07 | 31.0 |
| J2 | A57/Sandy Lane | 0.90 | 8.2 | 0.98 | 17.3 | 1.07 | 59.0 | 1.23 | 159.7 |
| J3 | A57/Claylands Ave/Shireoaks Common | 0.62 | 1.8 | 0.53 | 1.2 | 0.94 | 13.0 | 0.85 | 5.8 |
| J4 | A57/B6034/Netherton Road | 0.93 | 11.6 | 1.04 | 17.3 | 1.03 | 39.4 | 1.13 | 28.7 |
| J5 | A57/B6040 | 0.87 | 6.3 | 0.91 | 9.3 | 0.97 | 18.3 | 1.02 | 32.1 |
| J6 | A1(T)/A57/A614 | 0.97 | 14.0 | 0.93 | 10.3 | 1.13 | 50.4 | 1.41 | 217.6 |
| J7 | Blyth Road/Snape Lane | 0.07 | 0.1 | 0.15 | 0.2 | 0.08 | 0.1 | 0.16 | 0.2 |
| J8 | Blyth Rd/Scrooby Rd/Bawtry Rd/Main St | 0.71 | 2.6 | 0.74 | 2.8 | 0.83 | 4.7 | 1.05 | 26.3 |
| J14 | Dover Bottom/A1(T) Northern Junction | 0.09 | 0.1 | 0.06 | 0.1 | 0.09 | 0.1 | 0.06 | 0.1 |
| J15 | Dover Bottom/A1(T) Southern Junction | 0.11 | 0.1 | 0.13 | 0.2 | 0.18 | 0.2 | 0.20 | 0.2 |
| J16 | Kilton Rd/High Hoe Rd | 0.71 | 2.4 | 0.95 | 11.4 | 0.76 | 3.0 | 0.98 | 16.2 |
| | Doncaster MBC | | | | | | | | |
| J9 | A631 Sunderland Street/A60 Market Place | 0.76 | 3.0 | 0.78 | 3.3 | 1.06 | 22.6 | 0.97 | 10.4 |
| J10 | A631 Bawtry Rd/B6463 Blyth Rd/B6463 Stripe Rd | 0.69 | 3.1 | 0.90 | 9.7 | 0.79 | 5.1 | 2.10 | 51.2 |
| J11 | A631 Bawtry Road/Bawtry Road | 0.57 | 1.3 | 0.39 | 0.6 | 0.64 | 1.8 | 0.43 | 0.7 |
| J12 | A631 Tickhill Road/A638 High Street | 0.50 | 1.1 | 0.50 | 1.0 | 0.83 | 3.8 | 1.01 | 8.8 |
| J13 | A631 Gainsborough Road/A638 High Street | 3.5% | 18.4 | 2.2% | 20.6 | -28.2% | 80.8 | -58.6% | 148.8 |

- 7.3.4 The results demonstrate that seven of the total 16 junctions are already over capacity in the 2019 Base Year in one or more peak periods. With the addition of committed development traffic flows 12 junctions are forecast to operate over capacity by the end of the Local Plan period in one or more peak periods.
- 7.3.5 The results in **Table 10** on the following page reflect the 'worst case' 2037 Design Flows which include all the potential Local Plan allocations and the Garden Village flows assume no trip internalisation, or modal shift to reflect improved sustainable travel.

Table 10 - Junction Assessments with 2037 Design Flows (No GV Internalisation)

| Ref | Junction | 2037 Design Flows (Morton GV) (Base + Committed + Allocations) | | | | 2037 Design Flows (Gamston GV) (Base + Committed + Allocations) | | | |
|-----|---------------------------------------|--|---|-------------------------------------|---|---|---|-------------------------------------|---|
| | | AM Peak | | PM Peak | | AM Peak | | PM Peak | |
| | | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| | Bassetlaw DC | | | | | | | | |
| J1 | A60/A619 | 1.67 | 284.0 | 1.44 | 163.3 | 1.67 | 284.0 | 1.44 | 163.3 |
| J2 | A57/Sandy Lane | 1.37 | 343.7 | 1.51 | 513.9 | 1.37 | 343.7 | 1.51 | 513.9 |
| J3 | A57/Claylands Ave/Shireoaks Common | 1.40 | 505.6 | 1.20 | 222.1 | 1.40 | 505.6 | 1.20 | 222.1 |
| J4 | A57/B6034/Netherton Road | 1.84 | 657.4 | 1.87 | 956.3 | 1.84 | 653.4 | 1.87 | 955.0 |
| J5 | A57/B6040 | 1.81 | 897.4 | 2.03 | 1188.7 | 1.81 | 893.3 | 2.03 | 1187.4 |
| J6 | A1(T)/A57/A614 | 1.99 | 1389.0 | 2.89 | 1572.2 | 3.14 | 1336.8 | 2.78 | 1501.6 |
| J7 | Blyth Road/Snape Lane | 0.13 | 0.2 | 0.22 | 0.3 | 0.13 | 0.2 | 0.22 | 0.3 |
| J8 | Blyth Rd/Scrooby Rd/Bawtry Rd/Main St | 1.14 | 49.2 | 1.23 | 64.9 | 1.14 | 49.7 | 1.23 | 64.9 |

- 7.3.6 As can be seen from the results all the junctions tested for this scenario are forecast to be over capacity, except for the Blyth Road/Snape Lane (J7) junction in Harworth.
- 7.3.7 Only the eight junctions listed in **Table 10** were tested for this 'worst case' scenario. The results demonstrated that without vehicle trip reductions to reflect trip internalisation at the Garden Villages (i.e. some trips remain internal to the site and therefore do not impact on the wider highway network) the impacts on the wider highway network would be so severe that mitigation would require significant infrastructure investment (e.g. widening the A57 to dual carriageway etc).
- 7.3.8 One of the key benefits of Garden Village developments is the promotion of a 'self-contained' settlement with a complementary mix of land uses and the 'critical mass' required to deliver meaningful improvements to sustainable travel connections and services. Against this background the 'worst case' assessment is unrealistic and is presented for information purposes only. All further assessments presented in the report apply the Design Flows which include all the potential Local Plan allocations and the Garden Village flows assume vehicle trip reductions to reflect trip internalisation and some modal shift from car to rail (at the Morton Garden Village site only). Results are summarised in **Table 11** on the following page.

Table 11 - Junction Assessments with 2037 Design Flows (With GV Internalisation)

| Ref | Junction | 2037 Design Flows (Morton GV) (Base + Committed + Allocations) | | | | 2037 Design Flows (Gamston GV) (Base + Committed + Allocations) | | | |
|-----|---|--|--|-------------------------------------|--|---|--|-------------------------------------|--|
| | | AM Peak | | PM Peak | | AM Peak | | PM Peak | |
| | | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| | Bassetlaw DC | | | | | | | | |
| J1 | A60/A619 | 1.48 | 201.3 | 1.40 | 150.4 | 1.56 | 214.9 | 1.41 | 154.3 |
| J2 | A57/Sandy Lane | 1.34 | 298.4 | 1.41 | 370.8 | 1.35 | 315.2 | 1.46 | 435.3 |
| J3 | A57/Claylands Ave/Shireoaks Common | 1.10 | 111.3 | 0.86 | 5.9 | 1.11 | 117.7 | 0.87 | 6.2 |
| J4 | A57/B6034/Netherton Road | 1.69 | 388.3 | 1.75 | 767.1 | 1.74 | 434.9 | 1.81 | 857.8 |
| J5 | A57/B6040 | 1.61 | 629.4 | 1.88 | 958.2 | 1.65 | 699.9 | 1.95 | 1067.2 |
| J6 | A1(T)/A57/A614 | 1.74 | 393.7 | 2.30 | 1035.8 | 2.57 | 925.4 | 2.50 | 1231.8 |
| J7 | Blyth Road/Snape Lane | 0.13 | 0.2 | 0.22 | 0.3 | 0.13 | 0.2 | 0.22 | 0.3 |
| J8 | Blyth Rd/Scrooby Rd/Bawtry Rd/Main St | 1.14 | 49.2 | 1.23 | 64.9 | 1.17 | 57.0 | 1.23 | 65.5 |
| J14 | Dover Bottom/A1(T) Northern Junction | 0.09 | 0.1 | 0.06 | 0.1 | 0.55 | 1.5 | 1.17 | 36.8 |
| J15 | Dover Bottom/A1(T) Southern Junction | 0.21 | 0.3 | 0.30 | 0.4 | 1.02 | 30.1 | 0.42 | 1.4 |
| J16 | Kilton Rd/High Hoe Rd | 1.11 | 51.3 | 1.19 | 80.3 | 1.12 | 55.0 | 1.19 | 84.0 |
| | Doncaster MBC | | | | | | | | |
| J9 | A631 Sunderland Street/A60 Market Place | 1.15 | 38.8 | 1.17 | 37.9 | 1.15 | 38.8 | 1.17 | 38.2 |
| J10 | A631 Bawtry Rd/B6463 Blyth Rd/B6463 Stripe Rd | 1.63 | 44.8 | 2.84 | 64.4 | 1.63 | 44.8 | 2.87 | 65.0 |
| J11 | A631 Bawtry Road/Bawtry Road | 0.74 | 2.7 | 0.76 | 2.9 | 0.74 | 2.7 | 0.76 | 2.9 |
| J12 | A631 Tickhill Road/A638 High Street | 1.46 | 32.3 | 1.30 | 40.1 | 1.46 | 32.6 | 1.30 | 40.3 |
| J13 | A631 Gainsborough Road/A638 High Street | -43.2% | 122.0 | -75.6% | 180.0 | -43.2% | 122.0 | -75.6% | 181.0 |

- 7.3.10 As can be seen from the results above all the junctions tested for this scenario except for J7, and J11 are still forecast to be over capacity in at least one peak period, however the degree by which capacity is exceed and the resultant queues are slightly less severe than the results in **Table 10**.
- 7.3.11 Potential mitigation at each of the junctions identified to exceed capacity in the above table is explored in the next section of the report.

8 Mitigation

8.1 INTRODUCTION

8.1.1 This chapter discusses the highway improvements likely to be required at the junctions covered by this study to mitigate the traffic implications of possible Local Plan development.

8.2 SUSTAINABLE TRAVEL INFRASTRUCTURE/MEASURES

8.2.1 Current best practice recommends that the transport implications of developments should be assessed having regard to:

- **Measures to encourage environmental sustainability** – i.e. reducing the need to travel, especially by car, providing sustainable transport information and choices and measures to assist in influencing travel behaviour.
- **Managing the existing network** – i.e. making best use of existing transport infrastructure, low cost improvements such as signal control systems and intelligent transport systems.
- **Mitigating residual impacts** – through demand management; improvements to public transport networks, walking and cycling infrastructure; and through minor physical improvements to existing roads.

8.2.2 In accordance with the NPPF all developments which generate significant amounts of movement will be required to provide a Travel Plan. As part of the travel planning process developers will be required to nominate a Travel Plan Coordinator and make financial contributions for the annual monitoring of travel plan performance against agreed targets for an agreed time period following occupation of the development. In addition, bond payments may also be sought to cover the provision of supplementary sustainable travel infrastructure and/or measures if agreed targets are not met.

8.2.3 The detailed content of each Travel Plan will be site specific and will need to be agreed with the highway and planning authorities at the planning application stage but in general terms will set out the process for monitoring future travel behavior and the site-specific strategies and measures that will be introduced to influence modal choice with a view to reducing dependency upon the private car. The broad aims of Travel Plan reports being to:

- Encourage the use of alternative modes of transport to the private car and to better manage private car usage in order to reduce environmental impacts for all journeys associated with the proposed development;
- Include 'smarter choices' (e.g. car sharing, car clubs, teleworking, teleconferencing, home shopping, electric vehicle infrastructure etc) to help change the way people travel;
- Deliver long-term commitments to changing travel habits by minimising the percentage of single occupancy car journeys associated with the proposal and maximising the proportion of trips made by public transport, by car share, on foot and by cycle;
- Identify and achieve the support of stakeholders for the Travel Plan and encourage a sustainable transport culture, which will develop and grow with time;
- To educate residents and employees regarding the health benefits of walking and cycling;
- To seek to reduce traffic generated by development to a lower level of car trips than would occur without the implementation of a Travel Plan; and
- Promote healthy lifestyles and vibrant communities.

8.2.4 Developers will be required to fund measures and/or infrastructure improvements required to mitigate the direct transport impacts of developments. This will include funding for items such as; Smarter Choices measures and initiatives, Travel Plans, on and off-site cycling and walking infrastructure, bus network/infrastructure enhancements and possibly bespoke bus services, where these can be demonstrated to be financially self-supporting in the long term.

8.3 MITIGATION OF RESIDUAL TRAFFIC IMPACTS

8.3.1 Developers will be required to deliver off-site highway infrastructure improvements to mitigate residual traffic impacts. Details of which will need to be determined at the planning application stage through the submission of Transport Assessments produced in accordance with the NPPF. Developers will be required to assess the transport implications of their sites and the cumulative implications of sites in the local area. Appropriate transport mitigation will need to be identified and agreed with the highway authorities to address residual traffic impacts and delivery of mitigation secured through the planning approval process.

8.3.2 In addition to addressing the direct transport impacts of developments it is recommended that developers also provide financial contributions towards the delivery of the improvements required to address the cumulative effects of all Local Plan development, as discussed in this section and as summarised in **Appendix G**.

8.4 MITIGATION STRATEGY FOR JUNCTIONS

8.4.1 This study identifies the nature and scale of highway improvements required at key junctions to mitigate the cumulative traffic effects of possible Local Plan development. It is beyond the scope of this study to identify all locations where improvements will be required and further assessment will be required as developments come forward through the planning process.

8.4.2 The junctions summarised in **Appendix G** are discussed in the following paragraphs and, where possible, a mitigation strategy has been identified for each location. The type and scale of improvement works required/deliverable at each location are discussed and preliminary costs identified. Scheme costs are identified in preliminary form only and these are intended to give an **approximate** 'order of cost'. All **cost estimates exclude land acquisition and utilities costs** as these are unknown at this stage. In accordance with WebTAG guidance an Optimism Bias of 44% has also been applied to reflect the preliminary nature of the mitigation schemes. Further details on the cost breakdowns can be found in **Appendix H**. Potential mitigation is discussed for each of the following junctions:

- J1 - A60 Mansfield Road/A619
- J2 - A57/Sandy Lane
- J3 - A57/Claylands Ave/Shireoaks Common
- J4 - A57/B6034/Netherton Road
- J5 - A57/B6040
- J6 - A1/A57/A614 Blyth Road (Apleyhead)
- J8 - Blyth Rd/Scrooby Rd/Bawtry Rd/Main St
- J9 - A631 Sunderland St/A60 Market Place
- J10 - A631/B6463 Blyth Rd/B6463 Stripe Rd
- J12 - A631 Tickhill Road/A638 High Street
- J13 - A631 Gainsborough Rd/A638 High St
- J14 - Dover Bottom/B6387 (North)
- J15 - Dover Bottom/B6387 (South)
- J16 - Kilton Rd/High Hoe Rd

J1 - A60/A619 ROUNDABOUT, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

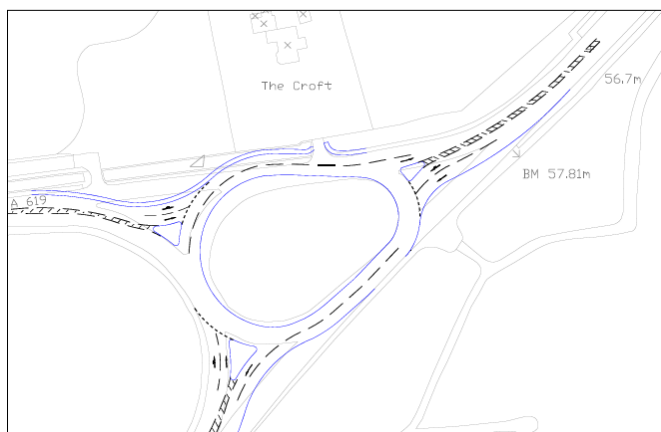
Junction Type/Details

Priority 3-arm roundabout with single lane approaches.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 1.14 | 53.0 | 1.07 | 31.0 |

Mitigation Proposals



Mitigation Description

Potential improvements were previously identified as part of the 2019 Transport Study Update however, one of these options required work involving third party land to the north of the junction. Given that this would not be favorable, a mitigation scheme which retains the elongated 'egg shape' of the existing junction has been proposed which would operate within capacity with 2037 Design Flows (With GV Internalisation). See **Figure 5**.

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 0.79 | 3.8 | 0.79 | 3.6 |
| Gamston | 0.82 | 4.3 | 0.80 | 3.9 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £1,475,602 |
| Optimism Bias: | £649,265 |
| Total | £2,124,867 |

J2 - A57/A60 SANDY LANE/HIGHGROUNDS ROAD ROUNDABOUT, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

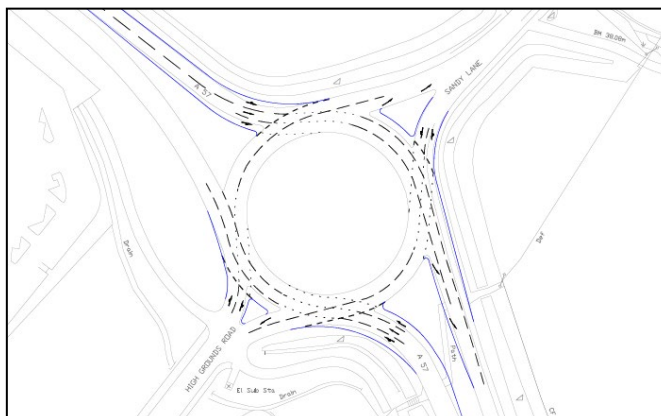
Junction Type/Details

Priority 4-arm roundabout with duel lane approaches.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 1.07 | 59.0 | 1.23 | 159.7 |

Mitigation Proposals



Mitigation Description

Improvements to the junction have been proposed which involves widening along both arms of the A57 to incorporate an additional lane, with minor widening taking place on the two minor arms (See **Figure 6**).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 0.75 | 2.9 | 0.82 | 4.2 |
| Gamston | 0.76 | 3.1 | 0.85 | 5.1 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £2,213,403 |
| Optimism Bias: | £973,897 |
| Total | £3,187,301 |

J3 - A57/CLAYLANDS AVENUE ROUNDABOUT, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

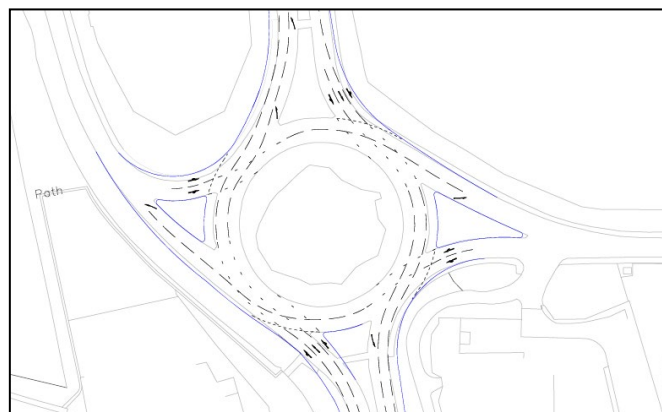
Junction Type/Details

Priority 4-arm roundabout with dual lane approaches.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.94 | 13.0 | 0.85 | 5.8 |

Mitigation Proposals



Mitigation Description

Widening on both A57 arms to incorporate an additional lane, with minor carriageway widening on the two minor arms (See **Figure 7**).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Garden Village | | | | |
| Morton | 0.83 | 5.1 | 0.63 | 1.8 |
| Gamston | 0.84 | 5.2 | 0.64 | 1.9 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £1,660,052 |
| Optimism Bias: | £730,423 |
| Total | £2,390,475 |

J4 - A57/B6034/NETHERTON ROAD, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

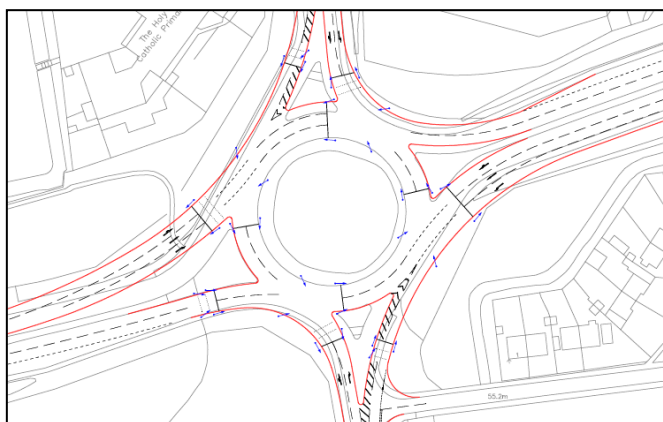
Junction Type/Details

Priority 4-arm roundabout with dual lane approaches.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 1.03 | 39.4 | 1.13 | 28.7 |

Mitigation Proposals



Mitigation Description

Widening of the A57 arms to provide additional lanes. Widening on the minor arms to cater for the signal installation. Widening of the circulatory carriageway to provide two/three lanes to cater for traffic flows (see **Figure 8**).

Operational Performance (2037 Design Flows)

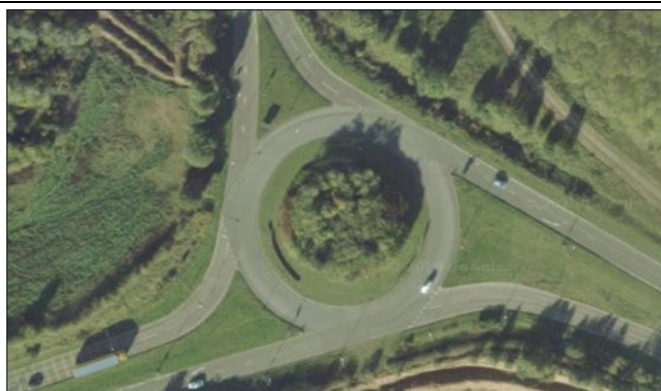
| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Garden Village | | | | |
| Morton | 6.3% | 24.8 | 4.0% | 27.8 |
| Gamston | 4.4% | 29.1 | -0.2% | 32.1 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £1,660,052 |
| Optimism Bias: | £730,423 |
| Total | £2,390,475 |

J5 - A57/B6040, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

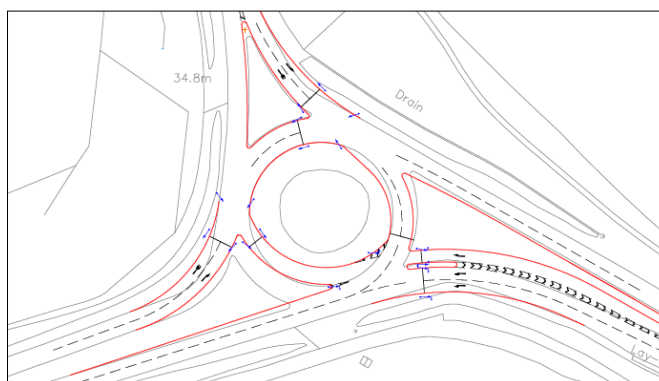
Junction Type/Details

Priority 3-arm roundabout with dual lane approaches.

Operational Performance
(2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.97 | 18.3 | 1.02 | 32.1 |

Mitigation Proposals



Mitigation Description

Widening of the A57 southern arm to provide three lane entry, alterations to the roundabout ICD to accommodate the higher flows passing through on the A57 (see **Figure 9**). **It should be noted that even with these improvements the junction is still forecast to operate over its theoretical capacity** with 2037 Design Flows (With GV Internalisation) but would operate significantly better than the existing layout.

Operational Performance
(2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | -4.5% | 31.1 | 2.1% | 30.7 |
| Gamston | -7.8% | 38.6 | -2.2% | 39.4 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £1,475,602 |
| Optimism Bias: | £649,265 |
| Total | £2,124,867 |

J6 - A614 BLYTH ROAD/A57/A1(T), WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

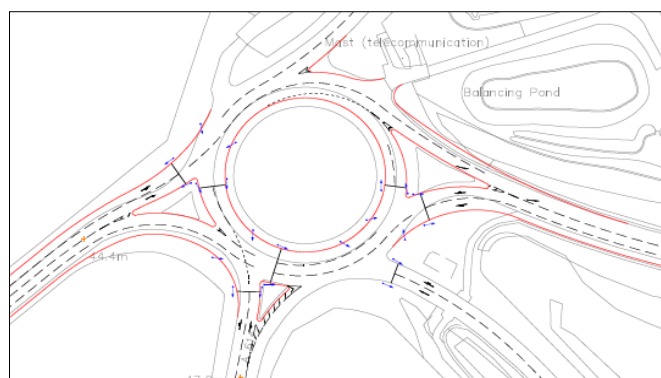
Junction Type/Details

Priority 7-arm roundabout with a single wide circulatory carriageway.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 1.13 | 50.4 | 1.41 | 217.6 |

Mitigation Proposals



Mitigation Description

Provision of full signal control with widening on both A57 arms to provide additional lanes. Minor widening on side roads (See **Figure 10**). **It should be noted that even with these improvements the junction is still forecast to operate over its theoretical capacity** with 2037 Design Flows (With GV Internalisation).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Garden Village | | | | |
| Morton | -25.5% | 242.3 | -16.5% | 118.0 |
| Gamston | -38.3% | 408.1 | -35.8% | 315.7 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £1,660,052 |
| Optimism Bias: | £730,423 |
| Total | £2,390,475 |

J8 - BLYTH ROAD/SCROOBY RD AND MAIN STREET/BAWTRY RD, HARWORTH

Existing Junction Layout



(Map data © 2019 Google)

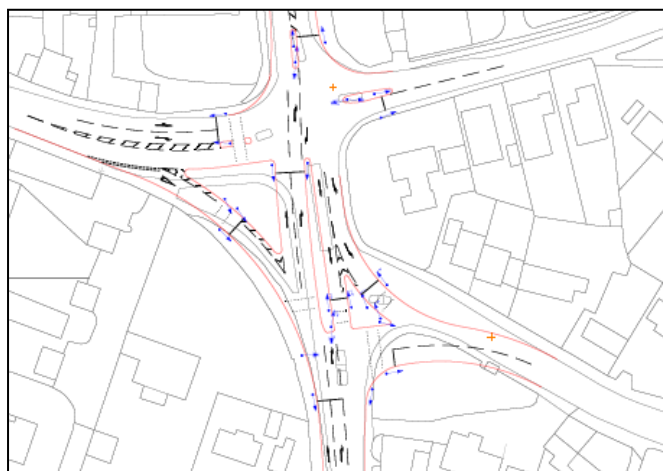
Junction Type/Details

Priority double mini-roundabout junction.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.83 | 4.7 | 1.05 | 26.3 |

Mitigation Proposals



Mitigation Description

Full signal control of the junction to replace the mini-roundabouts. (see **Figure 11**).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 1.5% | 35.9 | 0.9% | 34.9 |
| Gamston | 1.5% | 36.0 | 0.9% | 34.9 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £737,801 |
| Optimism Bias: | £324,632 |
| Total | £1,062,434 |

J9 - A631 SUNDERLAND ST/A60 MARKET PLACE, TICKHILL

Existing Junction Layout



(Map data © 2019 Google)

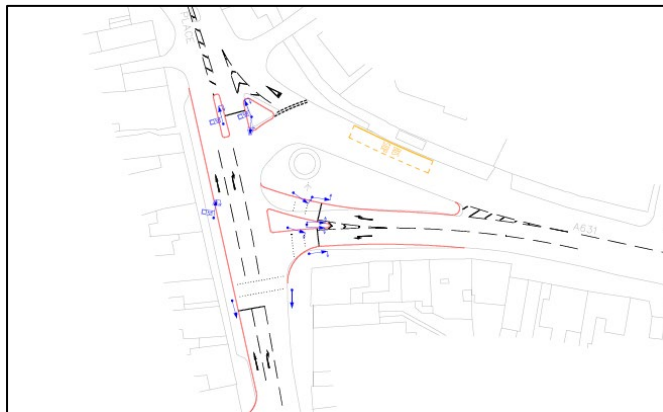
Junction Type/Details

Priority 3-arm complex with The Buttercross Monument situated within the centre.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 1.06 | 22.6 | 0.97 | 10.4 |

Mitigation Proposals



Mitigation Description

Signalisation of the existing junction layout.

Given the awkward layout of the junction, a series of mitigation options were examined. These are summarised as follows:

MITIGATION OPTION 1

This option involves replacing the junction with a three-arm roundabout (see **Figure 12**). This option would require the relocation of The Buttercross Monument, something which may not be supported by the local community.

MITIGATION OPTION 2

This option again involves replacing the junction with a three-arm roundabout however, the roundabout would form an unconventional stadium shape to avoid having to relocate The Buttercross Monument (see **Figure 13**).



MITIGATION OPTION 3

This option introduces a double-mini roundabout on Sunderland Street, with a series of one-way left and right-turn movements onto Market Place (see **Figure 14**). It should be noted that whilst this option would require limited alterations to the existing junction layout, minor queues are still forecast for vehicles turning north from Sunderland Street.

MITIGATION OPTION 4

This option would provide signal control at the junction (see **Figure 15**) and the proposed layout would operate within capacity with 2037 Design Flows (With GV Internalisation).

This option is the preferred solution on the grounds that it delivers additional traffic capacity with minimal alterations to the junction layout, no implications for The Buttercross Monument and provides additional pedestrian crossings.

Operational Performance
(2037 Design Flows)

| Garden Village | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 34.5% | 10.0 | 4.9% | 14.8 |
| Gamston | 34.5% | 10.0 | 4.5% | 14.9 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £737,801 |
| Optimism Bias: | £324,632 |
| Total | £1,062,434 |

J10 - A631/B6463 BLYTH RD/B6463 STRIPE RD, BAWTRY

Existing Junction Layout



(Map data © 2019 Google)

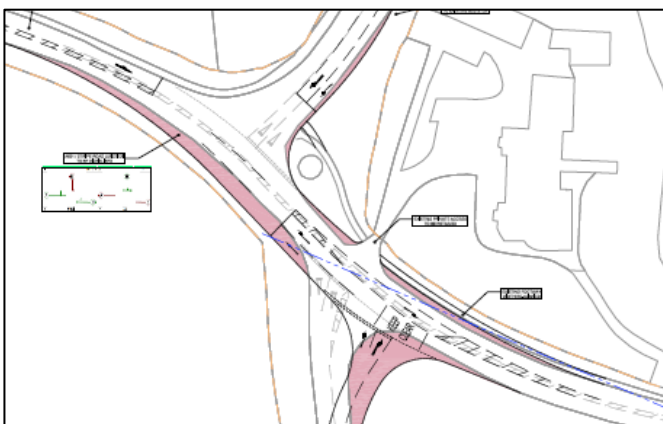
Junction Type/Details

Priority staggered-crossroad arrangement.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.79 | 5.1 | 2.10 | 51.2 |

Mitigation Proposals



Mitigation Description

Improvements proposed as part of a recent planning application which involves the partial signalisation of the Stripe Road/A631 arm of the junction and realignment of the Blyth Road/A631 approach but retaining its priority status (see **Figure 16**).

It is recommended that further investigations are undertaken to determine whether the proposed junction layout can be delivered within the adopted highway boundary without the requirement for third party land.

Operational Performance (2037 Design Flows)

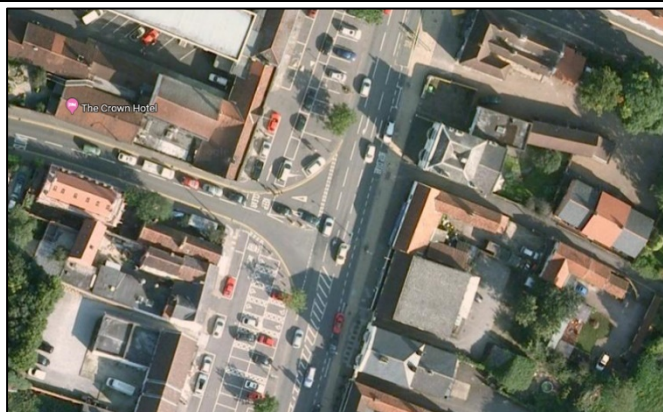
| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 51.0% | 10.3 | 36.8% | 11.6 |
| Gamston | 51.0% | 10.3 | 36.8% | 11.6 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £737,801 |
| Optimism Bias: | £324,632 |
| Total | £1,062,434 |

J12 - A631 TICKHILL ROAD/A638 HIGH STREET, BAWTRY

Existing Junction Layout



(Map data © 2019 Google)

Junction Type/Details

Priority 'ghost island' right turn arrangement.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.83 | 3.8 | 1.01 | 8.8 |

Mitigation Proposals



Mitigation Description

The junction is very constrained by adjacent on-street parking areas which severely limit options for improvement. Several options have been considered and rejected. One possible solution would be to replace the junction with a 3-arm priority roundabout (see **Figure 17**). However, implementation of this solution would require a wider reconfiguration of the adjacent parking and public realm. This improvement operates within capacity with 2037 Design Flows (With GV Internalisation). It is recommended that further investigations are undertaken to determine whether the proposed junction layout can be delivered within the adopted highway boundary without the requirement for third party land.

Operational Performance (2037 Design Flows)

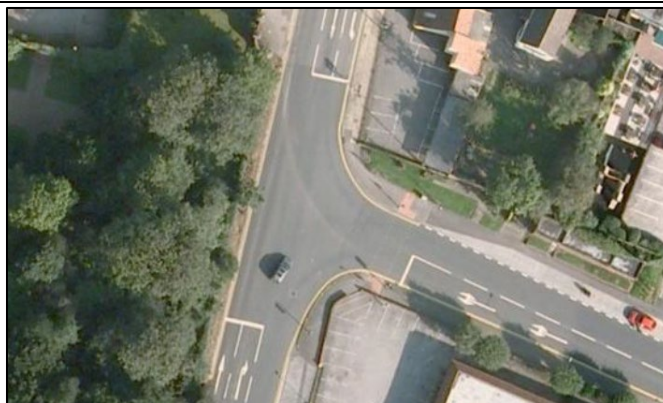
| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 0.69 | 2.4 | 0.71 | 2.4 |
| Gamston | 0.69 | 2.4 | 0.71 | 2.4 |

Anticipated Mitigation Costs

Construction Work Cost: £442,681
 Optimism Bias: £194,779
Total **£637,460**

J13 - A631 GAINSBOROUGH ROAD/A638 HIGH STREET, BAWTRY

Existing Junction Layout



(Map data © 2019 Google)

Junction Type/Details

Signalised 3-arm junction.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| -28.2% | 80.8 | -58.6% | 148.8 |

Mitigation Description

The junction is very constrained by adjacent buildings, which severely limits the options available for improvement. A minor mitigation measure has been suggested to implement an indicative right turn arrow for those vehicles proceeding to Gainsborough Road from High Street.

It should be noted that even with these improvements the junction is still forecast to operate over its theoretical capacity with 2037 Design Flows (With GV Internalisation) but would operate better than the existing layout.

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | -13.0% | 51.9 | -22.2% | 120.5 |
| Gamston | -13.0% | 51.6 | -22.2% | 120.4 |

Anticipated Mitigation Costs

| | |
|-------------------------|----------------|
| Construction Work Cost: | £44,268 |
| Optimism Bias: | £19,478 |
| Total | £63,746 |

J14 - DOVER BOTTOM/A1(T) NORTHERN JUNCTION, GAMSTON

Existing Junction Layout



(Map data © 2019 Google)

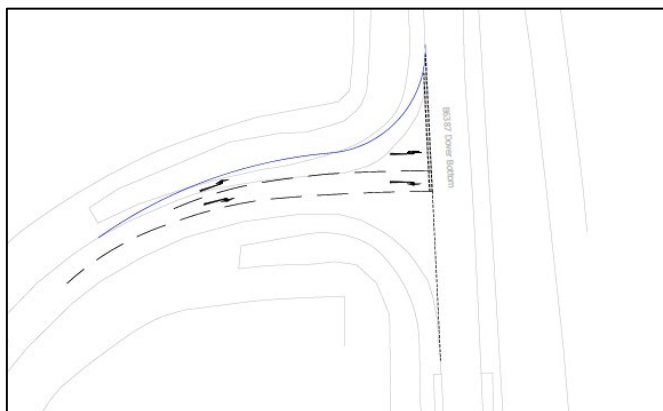
Junction Type/Details

Priority T-Junction arrangement.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.09 | 0.1 | 0.06 | 0.1 |

Mitigation Proposals



Mitigation Description

Mitigation only required for Gamston GV. Mitigation measures would provide localised carriageway widening to provide a two lane approach from the A1(T) (see **Figure 18**).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Garden Village | | | | |
| Morton | 0.09 | 0.1 | 0.06 | 0.1 |
| Gamston | 0.49 | 1.2 | 0.84 | 4.6 |

Anticipated Mitigation Costs

| | |
|-------------------------|-----------------|
| Construction Work Cost: | £295,120 |
| Optimism Bias: | £129,853 |
| Total | £424,973 |

J15 - DOVER BOTTOM/A1(T) SOUTHERN JUNCTION, GAMSTON

Existing Junction Layout



(Map data © 2019 Google)

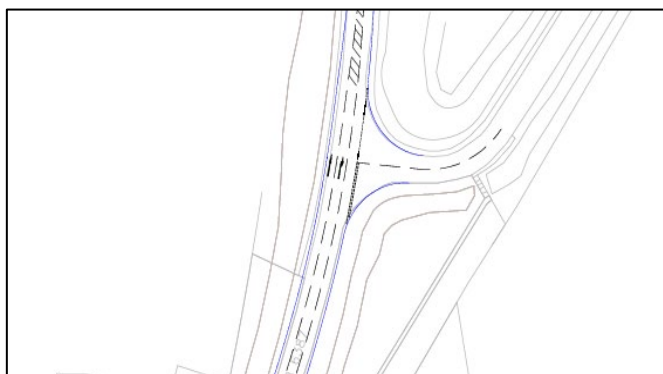
Junction Type/Details

Priority T-Junction arrangement.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.18 | 0.2 | 0.20 | 0.2 |

Mitigation Proposals



Mitigation Description

Mitigation only required for Gamston GV. Mitigation would provide a priority right turn 'ghost island' arrangement at the junction (see **Figure 19**).

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Garden Village | | | | |
| Morton | 0.22 | 0.3 | 0.31 | 0.5 |
| Gamston | 0.73 | 2.9 | 0.46 | 0.8 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £737,801 |
| Optimism Bias: | £324,632 |
| Total | £1,062,434 |

J16 - KILTON RD/HIGH HOE RD, WORKSOP

Existing Junction Layout



(Map data © 2019 Google)

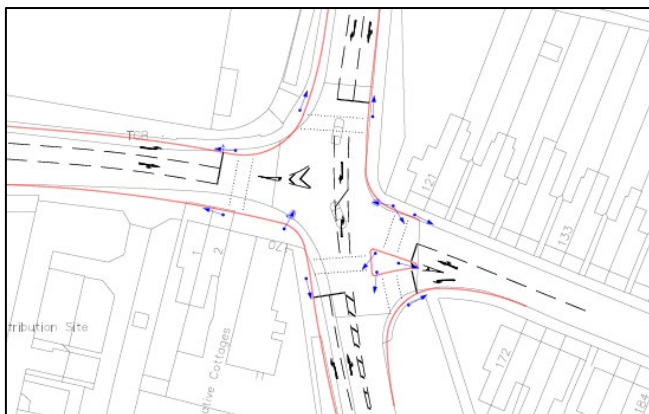
Junction Type/Details

Priority mini roundabout with adjacent priority T-junction.

Operational Performance (2037 Reference Case)

| AM Peak | | PM Peak | |
|-------------------------------|--|-------------------------------|--|
| Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| 0.76 | 3.0 | 0.98 | 16.2 |

Mitigation Proposals



Mitigation Description

A signal-controlled improvement scheme has been identified which would provide betterment to the operational capacity (see **Figure 20**). It is recommended that further investigations are undertaken to check whether the improvements can be delivered without the need for third party land.

Operational Performance (2037 Design Flows)

| | AM Peak | | PM Peak | |
|----------------|-------------------------------|--|-------------------------------|--|
| Garden Village | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| Morton | 47.9% | 8.4 | 3.1% | 24.1 |
| Gamston | 46.4% | 8.6 | 0.6% | 25.4 |

Anticipated Mitigation Costs

| | |
|-------------------------|-------------------|
| Construction Work Cost: | £737,801 |
| Optimism Bias: | £324,632 |
| Total | £1,062,434 |

8.4.3 The above mitigation measures will assist in ensuring that existing transport infrastructure does not constrain plans for Local Plan development. **Table 12** summarises the junction assessment results with the mitigation schemes in place.

Table 12 - Mitigated Junction Assessments with 2037 Design Flows (With GV Internalisation)

| | Junction | 2037 Design Flows (Morton GV) (Base + Committed + Allocations) | | | | 2037 Design Flows (Gamston GV) (Base + Committed + Allocations) | | | |
|-----|---|--|---|-------------------------------------|---|---|---|-------------------------------------|---|
| | | AM Peak | | PM Peak | | AM Peak | | PM Peak | |
| | | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) | Max. RFC/ Reserve Capacity | Max. Queue/ Delay per Hour (PCU) |
| | Bassetlaw DC | | | | | | | | |
| J1 | A60/A619 | 0.79 | 3.8 | 0.79 | 3.6 | 0.82 | 4.3 | 0.80 | 3.9 |
| J2 | A57/Sandy Lane | 0.75 | 2.9 | 0.82 | 4.2 | 0.76 | 3.1 | 0.85 | 5.1 |
| J3 | A57/Claylands Ave/Shireoaks Common | 0.83 | 5.1 | 0.63 | 1.8 | 0.84 | 5.2 | 0.64 | 1.9 |
| J4 | A57/B6034/Netherton Road | 6.3% | 24.8 | 4.0% | 27.8 | 4.4% | 29.1 | -0.2% | 32.1 |
| J5 | A57/B6040 | -4.5% | 31.1 | 2.1% | 30.7 | -7.8% | 38.6 | -2.2% | 39.4 |
| J6 | A1(T)/A57/A614 | -25.5% | 242.3 | -16.5% | 118.0 | -38.3% | 408.1 | -35.8% | 315.7 |
| J8 | Blyth Road/Scrooby Rd/Bawtry Rd/Main St | 1.5% | 35.9 | 0.9% | 34.9 | 1.5% | 36.0 | 0.9% | 34.9 |
| J14 | Dover Bottom/A1(T) Northern Junction | 0.09 | 0.1 | 0.06 | 0.1 | 0.49 | 1.2 | 0.84 | 4.6 |
| J15 | Dover Bottom/A1(T) Southern Junction | 0.22 | 0.3 | 0.31 | 0.5 | 0.73 | 2.9 | 0.46 | 0.8 |
| J16 | Kilton Rd/High Hoe Rd | 47.9% | 8.4 | 3.1% | 24.1 | 46.4% | 8.6 | 0.6% | 25.4 |
| | Doncaster MBC | | | | | | | | |
| J9 | A631 Sunderland Street/A60 Market Place | 34.5% | 10.0 | 4.9% | 14.8 | 34.5% | 10.0 | 4.5% | 14.9 |
| J10 | A631 Bawtry Rd/B6463 Blyth Rd/B6463 Stripe Rd | 51.0% | 10.3 | 36.8% | 11.6 | 51.0% | 10.3 | 36.8% | 11.6 |
| J12 | A631 Tickhill Road/A638 High Street | 0.69 | 2.4 | 0.71 | 2.4 | 0.69 | 2.4 | 0.71 | 2.4 |
| J13 | A631 Gainsborough Road/A638 High Street | -13.0% | 51.9 | -22.2% | 120.5 | -13.0% | 51.6 | -22.2% | 120.4 |

9 Link Capacity

9.1 INTRODUCTION

9.1.1 The junction capacity assessments that apply the 'worst case' Garden Village Design Flows demonstrate that without any allowance for trip internalisation and modal shift the resultant traffic impacts on the highway network would be significant (see results in **Table 10** on page 8). Mitigation has been identified to accommodate the 2037 Design Flows that include Garden Village trip internalisation and modal shift at most junctions assessed (see results in **Table 12** on page 46). However, at J6 (A1(T)/A57/A614 - Apleyhead) and J5 (A57/B6040 - Mantonwood) roundabouts the identified mitigation still does not fully address the 2037 Design Flows.

9.1.2 Link flows on the eastern end of the A57 have therefore been examined to determine whether it is realistic to expect to be able to mitigate the 2037 Design Flows at these junctions, or whether, in practice link capacity on the A57 would constrain flows through the junctions.

9.2 A57 LINK CAPACITY

9.2.1 Guidance on link capacity is provided in Volume 5 of the Design Manual for Roads and Bridges (DMRB) in TA 79/99 'Traffic Capacity of Urban Roads' and TA 46/97 'Traffic Flow Ranges for use in the Assessment of New Rural Roads'.

9.2.2 The A57 between its junctions with the A1 and the B6034 Netherton Road is a two-lane single carriageway road with a carriageway width of approximately 7.3m. This section of the A57 is predominantly rural in character however, for the purposes of this assessment forecast link flows on the A57 have been compared against both rural and urban link flow standards.

9.2.3 Comparing the characteristics of the A57 to Table 1 of TA79/99 shows it is classed as an Urban All-Purpose (UAP1) road "*High standard single/dual carriageway road carrying predominantly through traffic with limited access, 40 to 60mph speed limit, with limited access*". Table 2 of TA79/99 shows that 7.3m wide UAP1 category roads have a one-way hourly capacity in each direction equivalent to 1,590 VPH (busiest direction of flow assuming a 60/40 directional split) which is equivalent to a two-way hourly capacity of 2,650 VPH.

9.2.4 Annex D to TA 46/97 provides a calculation for link capacity where:

$$\text{Capacity} = [A - B * \text{Pk\%H}]$$

Where for single carriageways A = 1,380, B = 15 and Pk%H is the percentage of Heavy Vehicles in the peak hour.

9.2.5 Applying the most optimistic case in this formula of zero Pk%H would give the maximum Rural Link capacities summarised in the table below.

Table 13 – A57 Link Capacities (2-Way VPH)

| A57 Link | TA 79/99 Urban Link Capacity | | TA 46/97 Rural Link Capacity | |
|--------------------------|------------------------------|-------|------------------------------|-------|
| | AM | PM | AM | PM |
| J4 (B6034) to J5 (B6040) | 2,650 | 2,650 | 2,760 | 2,760 |
| J5 (B6040) to J6 (A1) | 2,650 | 2,650 | 2,760 | 2,760 |

9.2.6 The Forecast 2037 Link Flows for these A57 links are summarised in the table below.

Table 14 – A57 Link Flows (2-Way VPH)

| A57 Link | 2037 Design Flows | | | | | | | |
|--------------------------|-----------------------|-------|---------|-------|-------------------------|-------|---------|-------|
| | No GV Internalisation | | | | With GV Internalisation | | | |
| | Morton | | Gamston | | Morton | | Gamston | |
| | AM | PM | AM | PM | AM | PM | AM | PM |
| J4 (B6034) to J5 (B6040) | 3,657 | 3,714 | 3,654 | 3,711 | 3,021 | 3,224 | 3,288 | 3,454 |
| J5 (B6040) to J6 (A1) | 3,962 | 3,941 | 3,958 | 3,937 | 3,249 | 3,391 | 3,548 | 3,650 |

Note: Link flow values exceeding the highest link capacity thresholds in Table 13 are shown in red

9.2.7 Comparing the link flows in **Table 14** against the link capacities in **Table 13** it can be seen that the forecast flows significantly exceed the theoretical capacity in all scenarios in both peak periods. For these sections of the A57 to perform satisfactorily additional link capacity would therefore be required which would mean widening the A57 to dual carriageway between the A1 (J6) and the B6034 Netherton Road (J5) over a length of circa 6km estimated to cost in the region of £15m to £20m.

9.2.8 Widening the carriageway of this section of the A57 would be prohibitively expensive and likely to have significant detrimental environmental impacts due to the A57 being bordered by forest over most of this length.

9.3 SENSITIVITY TEST

9.3.1 Observation of the Local Plan employment allocation details in **Table 6** shows there is a large employment allocation immediately adjacent to the eastern section of the A57 'Land off the A57 Apleyhead'. This site is identified as reference D22-E on **Figure 4** with a total site area of 118Ha. For the purposes of this assessment a development comprising 78,596 sqm of B2 Industrial and 314,384 sqm of B8 Warehouse/Distribution land uses has been assumed on this allocation site. This gives two-way peak period vehicle trip generation from this site alone of 958 VPH in the AM peak and 746 VPH in the PM peak.

9.3.2 Flow Bundle plots from the VISUM model used to assign development vehicle trips onto the highway network are presented below. These show that the majority of trips from the 'Land off the A57 Apleyhead' site are assigned directly onto the A57 (trips represented in green with the thickness of the line proportional to flow volume) with a strong weighting to/from Worksop.

Image 4 – AM Peak Flow Bundle for Site Ref D22-E

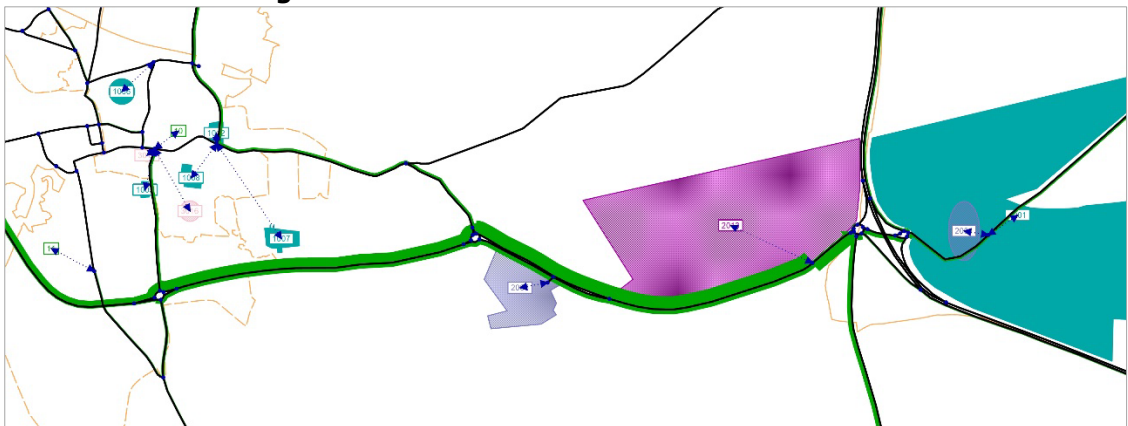
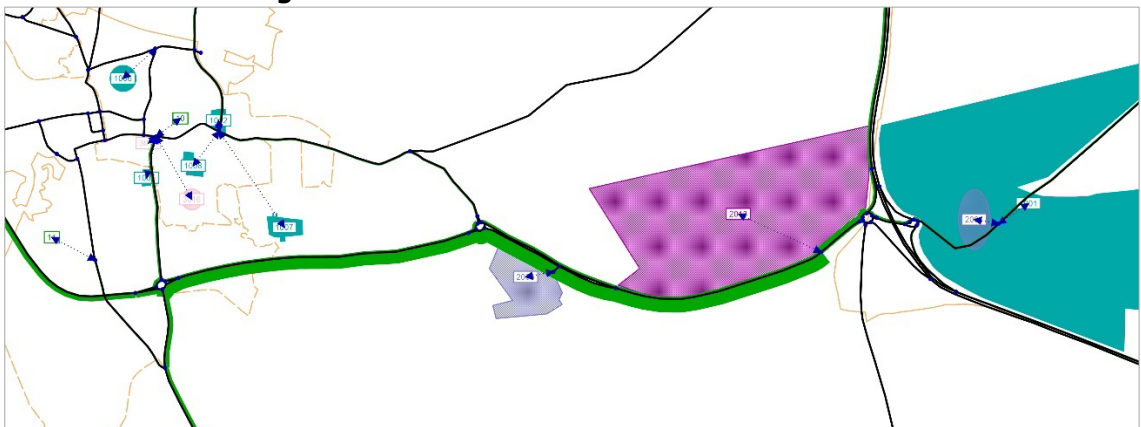


Image 5 – PM Peak Flow Bundle for Site Ref D22-E



9.3.3 The Flow Bundle plots suggest that the 'Land off the A57 Apleyhead' potential allocation site is contributing significantly to the forecast traffic flows on the eastern end of the A57. A sensitivity

test has therefore been undertaken to remove the flows associated with this possible allocation site from the network. 2037 Design Flows without this site are summarised in **Table 15** below.

Table 15 – A57 Sensitivity Test Link Flows (2-Way VPH)

| A57 Link | 2037 Design Flows (Sensitivity Test) | | | | | | | |
|--------------------------|--------------------------------------|-------|---------|-------|-------------------------|-------|---------|-------|
| | No GV Internalisation | | | | With GV Internalisation | | | |
| | Morton | | Gamston | | Morton | | Gamston | |
| | AM | PM | AM | PM | AM | PM | AM | PM |
| J4 (B6034) to J5 (B6040) | 3,200 | 3,275 | 3,197 | 3,272 | 2,564 | 2,785 | 2,831 | 3,015 |
| J5 (B6040) to J6 (A1) | 3,397 | 3,436 | 3,393 | 3,432 | 2,684 | 2,886 | 2,983 | 3,145 |

Note: Link flow values exceeding the highest link capacity thresholds in Table 13 are shown in red

9.3.4 Comparison of the flows in the table above against the theoretical link capacities in **Table 13** show that if this employment site were excluded the 2037 Design Flows (with internalisation) scenario would be within link capacity in the AM peak and very close to capacity in the PM peak with the Morton GV site. With the Gamston/Bevercotes GV site the links would still be over capacity in both peaks (this is due to the benefits of a modal shift to rail which is assumed for the Morton GV site, but not the Gamston/Bevercotes GV site).

9.3.5 Although the inclusion of the Apleyhead employment site will lead to a further increase in pressure on the capacity of the A57, it is recommended that further testing and modelling of the affected junctions are undertaken at the time of applying for planning permission.

9.3.6 Based on the results of the sensitivity test it is therefore recommended that the Council work with relevant partners to agree an 'Improvement Plan' for the A57 corridor which considers the planned growth as well as other likely sites that may come forward through the lifetime of the Local Plan. The Improvement Plan should identify a credible mechanism for the delivery of any improvements required to the highway.

9.4 TWYFORD BRIDGE LINK CAPACITY

9.4.1 Link capacity has also been considered for the B6387 Dover Bottom at the point where it crosses the A1 at Twyford Bridge. This has been reviewed in response to concerns raised regarding the potential impacts of the Gamston/Bevercotes GV site on the bridge, as the GV site is split either side of the A1 on the Gamston Airfield and Bevercotes Colliery sites.

9.4.2 The bridge has a narrow single carriageway with a width of approximately 7.3m. There are no existing footways over the bridge, although there are hard surfaced verges over the bridge only

on either side of the carriageway, with widths of approximately 1.5m. **Image 6** below (taken from Google Streetview and dated Nov 2015) shows the view over the bridge.

Image 6 – View South over Twyford Bridge



(© 2019 Google)

- 9.4.3 Design flows for the B6387 Dover Bottom over the Twyford Bridge are summarised in the table below. Comparison against the

Table 16 – B6387 Dover Bottom Link Flows (2-Way VPH)

| Link | 2037 Design Flows (Sensitivity Test) | | | | | | | |
|-------------------------------------|--------------------------------------|-----|---------|-------|-------------------------|-----|---------|-------|
| | No GV Internalisation | | | | With GV Internalisation | | | |
| | Morton | | Gamston | | Morton | | Gamston | |
| | AM | PM | AM | PM | AM | PM | AM | PM |
| B6387 Dover Bottom (Twyford Bridge) | 574 | 600 | 1,977 | 1,681 | 574 | 600 | 1,424 | 1,417 |

Note: Link flow values exceeding the highest link capacity thresholds in Table 13 are shown in red

- 9.4.4 Comparison of the flows in the table above against the theoretical link capacities in **Table 13** demonstrate that in all scenarios the forecast design flows are within theoretical link capacity, which is primarily due to the existing (2019 Base) flows over the bridge being low. Based on this assessment no link capacity issues are therefore anticipated on the bridge.

10 Summary

10.1 SUMMARY AND CONCLUSIONS

- 10.1.1 Bassetlaw District Council has commissioned WYG to undertake traffic capacity assessments at key junctions within the district and within neighbouring Doncaster district to help advise preparation of the new Bassetlaw Local Plan.
- 10.1.2 This report summarises the methodology and findings of the junction capacity assessment work and builds on the earlier district-wide transport study presented in the report titled 'Bassetlaw Local Plan Transport Study Update', dated January 2019.
- 10.1.3 This study has been prepared in discussion with Highways England and Nottinghamshire County Council (NCC), who are the highway authorities responsible for roads within the district. Consultation has also been undertaken with Doncaster Metropolitan Borough Council (DMBC) regarding cross-boundary highway issues to the north of Bassetlaw.
- 10.1.4 This study addresses highway capacity issues only and has assessed the likely traffic implications of development sites being considered for possible allocation in the emerging Bassetlaw Local Plan. Potential highway mitigation schemes are presented in a preliminary format and it will be necessary for more detailed analysis and design to be undertaken as individual sites come forward through the planning process.
- 10.1.5 This study has assessed a total of 16 junctions, 11 of which are within Bassetlaw and five are within Doncaster. In addition, an assessment of merge/diverge requirements has been undertaken for two junctions onto the A1, and link capacity has been considered on the A57 east of Worksop and at the A1/B6387 (Twyford Bridge) junction in Elkesley.
- 10.1.6 New AM/PM peak period traffic surveys were commissioned and undertaken by specialist survey sub-contractors at 12 of the 16 junctions. Recent data was supplied by DMBC for the remaining four junctions. All surveys were undertaken during school term time and the dates of the surveys were discussed with NCC and DMBC prior to surveys proceeding. Flow data for the A1 mainline was obtained from the DfT's WebTRIS website.
- 10.1.7 A review of collision data at the junctions hasn't identified any consistent factors pointing to deficiencies or problems with the geometry or condition of the existing highway. No mitigation improvements are therefore considered necessary to specifically address highway safety issues at the junctions covered by this study.

- 10.1.8 Committed transport infrastructure and land-use schemes have been assumed to be in accordance with the details contained within the 'Bassetlaw Local Plan Transport Study Update' report dated January 2019. No changes were made to the earlier assumptions regarding committed land-use developments outside of the district. However, committed land-use developments within the district have been updated based on information supplied by BDC.
- 10.1.9 BDC provided details of potential Local Plan allocation sites to form the basis for the junction assessment work. This included two potential Garden Village (GV) sites located at Morton and Gamston Airport/Bevercotes Colliery. Each would accommodate circa 4,000 dwellings and supporting development. Only one GV site will be allocated and promoted for development during this Local Plan period.
- 10.1.10 A future year of 2037 has been applied consistent with the end of the new Local Plan period. The study has assessed the following scenarios:
- 2019 Base Year
 - 2037 Reference Case (2019 Base + Committed Developments)
 - 2037 Design Flows (Reference Case + Allocations including Morton GV)
 - 2037 Design Flows (Reference Case + Allocations including Gamston GV)
 - 2037 Design Flows (Reference Case + Allocations including Morton GV & Internalisation)
 - 2037 Design Flows (Reference Case + Allocations including Gamston GV & Internalisation)
- 10.1.11 Trip Generation for committed development and potential allocation sites has been undertaken using the same methodology as applied for the Bassetlaw Local Plan Transport Study Update, dated January 2019.
- 10.1.12 The trip generation methodology for the potential Garden Village (GV) sites is described in the accompanying Garden Village Trip Generation Methodology Report, dated October 2019 (Ref: A113816-03). Two scenarios have been tested; one with no car trip reductions applied for 'trip internalisation' or modal shift (i.e. the 'Worst Case') and one with car trip reductions to reflect 'trip internalisation' and in the case of the Morton GV site some modal shift away from private car to rail use.
- 10.1.13 Trip distribution and assignment has been undertaken using the same (hybrid spreadsheet/VISUM) methodology as applied for the Bassetlaw Local Plan Transport Study Update, dated January 2019.

- 10.1.14 Capacity assessments have been undertaken for the AM and PM peak hours, for the 2019 Base Year and at 2037 both with and without Local Plan allocation development flows using 'industry standard' junction modelling software. Where appropriate, potential improvements have also been assessed to identify potential mitigation.
- 10.1.15 The operation of the existing merge/diverge facilities onto the A1 at the Apleyhead and Twyford Bridge junctions have been assessed. The results demonstrate that with the 'worst case' (No GV Internalisation) scenario all the existing merge/diverge facilities are forecast to operate satisfactorily except for the southbound diverge and northbound merge at Twyford Bridge in the scenario where the Garden Village is assumed to be provided at Gamston Airport. In this scenario it is likely that these merge/diverge facilities would require upgrading.
- 10.1.16 When tested with the 2037 Design Flows (With GV Internalisation) all existing merge/diverge facilities are forecast to operate satisfactorily. In this scenario no improvements would be required to the existing merge/diverge facilities.
- 10.1.17 The operation of the 16 junctions considered by this study have been tested with 2019 Base Year and 2037 Reference Case flows. The results demonstrate that seven of the total 16 junctions are already over capacity in the 2019 Base Year in one or more peak periods. With the addition of committed development traffic flows 12 junctions are forecast to operate over capacity by the end of the Local Plan period in one or more peak periods.
- 10.1.18 When the junctions are tested with the 'worst case' 2037 Design Flows (No GV Internalisation) all the junctions tested for this scenario³ are forecast to be over capacity, except for the Blyth Road/Snape Lane (J7) junction in Harworth.
- 10.1.19 The results demonstrated that without vehicle trip reductions to reflect trip internalisation at the Garden Villages (i.e. some trips remain internal to the site and therefore do not impact on the wider highway network) the impacts on the wider highway network would be severe.
- 10.1.20 One of the key benefits of Garden Village developments is the promotion of a 'self-contained' settlement with a complementary mix of land uses and the 'critical mass' required to deliver meaningful improvements to sustainable travel connections and services. Against this background the 'worst case' assessment is unrealistic and is presented for information purposes only. All further assessments therefore applied Design Flows which assume Garden Village vehicle

³ Only Junctions 1 to 8 were tested for this 'worst case' scenario

trip reductions to reflect trip internalisation and some modal shift from car to rail (at the Morton Garden Village site only).

- 10.1.21 When the junctions are tested with the 2037 Design Flows (With GV Internalisation) all the junctions tested except for J7, and J11 are still forecast to be over capacity in at least one peak period, however the degree by which capacity is exceeded and the resultant queues are slightly less severe than for the 'worst case' assessment.
- 10.1.22 Potential highway improvements have been considered to mitigate traffic impacts at each of the junctions identified to exceed capacity in the 2037 Design Flows (With GV Internalisation) scenario.
- 10.1.23 The type and scale of improvement works required/deliverable at each location have been identified and preliminary costs identified. Scheme costs are identified in preliminary form only and these are intended to give an **approximate** 'order of cost'. All **cost estimates exclude land acquisition and utilities costs** as these are unknown at this stage. In accordance with WebTAG guidance an Optimism Bias of 44% has also been applied to reflect the preliminary nature of the mitigation schemes.
- 10.1.24 Potential mitigation has been identified for each of the following junctions:
- J1 - A60 Mansfield Road/A619
 - J2 - A57/Sandy Lane
 - J3 - A57/Claylands Ave/Shireoaks Common
 - J4 - A57/B6034/Netherton Road
 - J5 - A57/B6040
 - J6 - A1/A57/A614 Blyth Road (Apleyhead)
 - J8 - Blyth Rd/Scrooby Rd/Bawtry Rd/Main St
 - J9 - A631 Sunderland St/A60 Market Place
 - J10 - A631/B6463 Blyth Rd/B6463 Stripe Rd
 - J12 - A631 Tickhill Road/A638 High Street
 - J13 - A631 Gainsborough Rd/A638 High St
 - J14 - Dover Bottom/B6387 (North)
 - J15 - Dover Bottom/B6387 (South)
 - J16 - Kilton Rd/High Hoe Rd

- 10.1.25 At the following junctions it has not been possible to identify improvements that fully mitigate the traffic impacts of the 2037 Design Flows (With GV Internalisation) scenario:
- J5 - A57/B6040, Worksop
 - J6 - A614 Blyth Road/A57/A1(T), Worksop
 - J13 - A631 Gainsborough Road/A638 High Street, Bawtry
- 10.1.26 At J12 (A631 Tickhill Road/A638 High Street, Bawtry) a possible mitigation improvement has been identified that would work in traffic capacity terms. However, it's delivery would require a wider reconfiguration of Bawtry High Street to alter existing on-street car parking arrangements to make space for the improvement to be delivered. This could result in the loss of some on-street parking provision and may be contentious with local traders.
- 10.1.27 At J13 (A631 Gainsborough Road/A638 High Street, Bawtry) the junction is so constrained by adjacent properties that it has not been possible to identify any geometric layout improvements. However, a minor improvement to the signal operation has been identified that would provide some additional traffic capacity.
- 10.1.28 At J16 (Kilton Rd/High Hoe Rd, Worksop) a signal junction improvement scheme has been identified to replace the mini-roundabout that would provide additional traffic capacity. However, the deliverability of this scheme would need further investigation with regards its impact on the front gardens of property numbers 1 and 2 Kilton Road. These gardens are indicated as being part of the adopted public highway on highway asset mapping. However, they appear to be well established and their removal is likely to be contentious.
- 10.1.29 Link flows at the eastern end of the A57 have been examined by comparing the forecast 2037 Design Flows against theoretical link flow capacities. In the 'Worst Case' 2037 Design Flows (No GV Internalisation) scenario the forecast flows significantly exceed the theoretical link capacity in all scenarios in both peak periods. For the A57 to perform satisfactorily additional link capacity would therefore be required which would mean widening the A57 to dual carriageway between the A1 (J6) and the B6034 Netherton Road (J5) over a length of circa 6km.
- 10.1.30 Widening the carriageway of this 6km section of the A57 is likely to cost in the region of £15m to £20m and could have detrimental environmental impacts due to the A57 being bordered by forest over most of this length.

- 10.1.31 A sensitivity test has therefore been undertaken that removes the traffic flows associated with a large potential employment allocation situated immediately north of the A57 at 'Land off the A57 Apleyhead'
- 10.1.32 When this employment site is excluded the 2037 Design Flows (With GV Internalisation) scenario would be within link capacity in the AM peak and very close to capacity in the PM peak with the Morton GV site. With the Gamston GV site the A57 links would still be over capacity in both peaks (this is due to the benefits of a modal shift to rail which is assumed for the Morton GV site, but not the Gamston GV site).
- 10.1.33 With exclusion of the 'Land off the A57 Apleyhead' employment allocation site and allocation of the Morton GV site the sensitivity test results therefore suggest that widening of the A57 to dual carriageway would not be required.
- 10.1.34 The reduction in traffic flows from removal of the employment allocation would also assist with the forecast operation of J6 (A1(T)/A57/A614 - Apleyhead) and J5 (A57/B6040 - Mantonwood), potentially meaning the mitigation schemes identified for these junctions would operate within capacity, although these junctions have not been re-tested with the sensitivity flows at this time.
- 10.1.35 Based on the results of the sensitivity test it is therefore recommended that the Council works with partners on an 'improvement plan' for the A57 to facilitate planned development in this Local Plan and other un-planned development on the A57 corridor that may come forward during the plan period.



Figures



Appendix A - Traffic Flow Data



Appendix B - Collision Data



Appendix C - Comparison with TEMPro



Appendix D – Trip Generation Calculations



Appendix E – Merge/Diverge Assessments



Appendix F – Junction Capacity Assessments



Appendix G - Mitigation Summary



Appendix H – Preliminary Costs