

**Technical Note 5**  
**North West Leicestershire: Highway Analysis of Core Scenario and Bardon Relief Road in Coalville**  
**Version 3**  
**11<sup>th</sup> April 2012**

**1. Introduction**

**Basis of the Assessment**

The analysis is based on the SATURN model highway assignments:

- 2031\_nc\_Core\_AM.UFS
- 2031\_nc\_Core\_IP.UFS
- 2031\_nc\_Core\_PM.UFS

These are also referred to as the Option 5 assignments and are used as the basis for three test assignments (referred to as Test 1 (or T1), Test 2 etc.)

**Bardon Grange Model Zones**

The area that encompasses the proposed Bardon Grange development is covered by zone 6231 and 6234 within the transport model. Figure 1.1 presents a depiction of the area covered by these zones. The boundaries of each zone are depicted in red with the number of each presented in the centre of the zone. In this figure, and all subsequent figures, zone 6231 is highlighted with a red star while zone 6234 is highlighted by a blue star.

**Figure 1.1: Location of Model Zones 6231 and 6234**

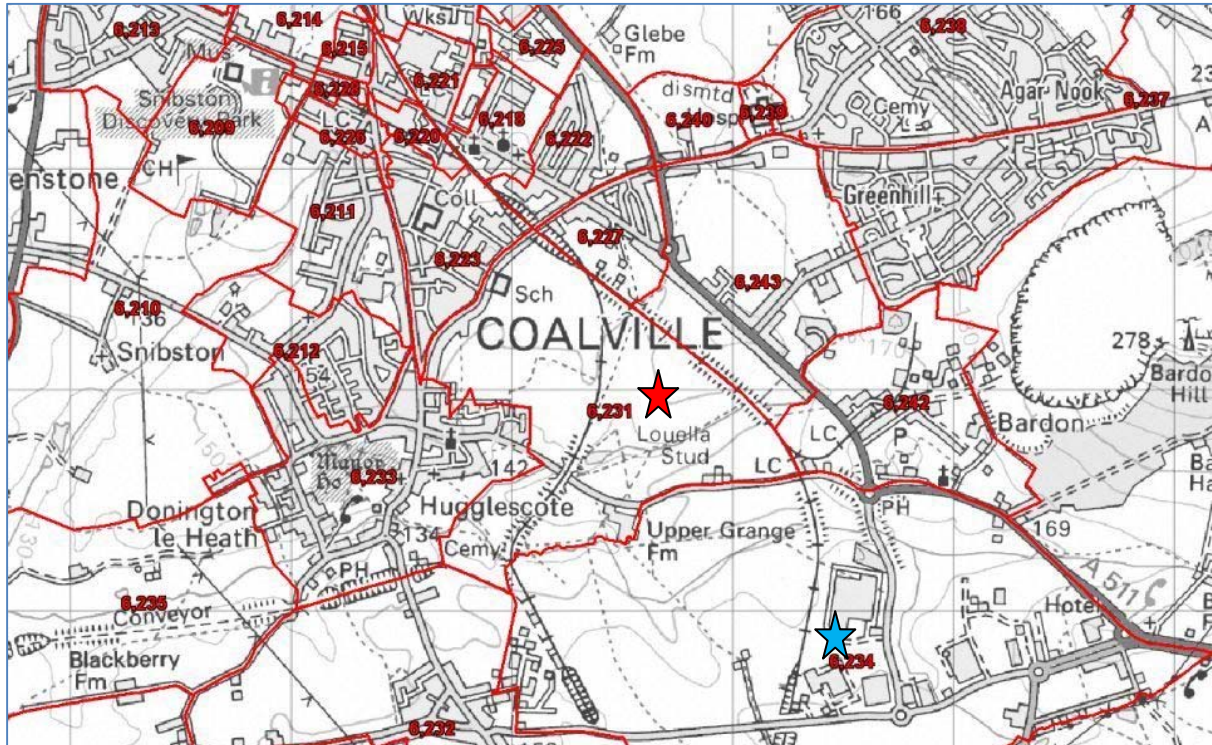


Figure 1.1 shows that both of the zones that cover the proposed Bardon Grange development are geographically large zones compared to the smaller more urban model zones. In particular zone 6234, which covers the southern part of Bardon Grange, includes a number of existing uses such as an industrial estate. The important points to note from this are:

- The model zones are not disaggregated, or 'split-up', hence it is not possible to introduce greater detail to the transport model.
- The new traffic associated with the Bardon Grange development is added to any traffic associated with existing uses in cases where those existing uses are retained following the Bardon Grange development. Hence a model zone will contain a mix of existing and new development traffic.
- Within the transport model traffic to/from a model zone feeds on to the network at a single location only. With geographically large zones, such as zone 6231 and 6234, the point selected for loading the model traffic on the network can affect the impact on the adjacent transport network.

As a result of these considerations sensitivity tests were undertaken to investigate how (a) the Bardon Relief Road would impact on the highway network and (b) how the location of the point where traffic from the proposed Bardon Grange development would influence the impact on the transport system.

### Model Tests

There are two pairs of tests:

- Pair One: The Core Scenario (CS) against the Bardon Relief Road (Test1)
- Pair Two: A repeat of Pair One where the zone feed for zone 6321 (part of Bardon Grange development) is amended to feed at the eastern end of Stephenson's Way. This amendment has been undertaken for the Core Scenario (referred to as Test 2) and the Bardon Relief Road (Test3)

Assignments have been undertaken for the AM, inter-peak and PM peak for 2031. This technical note concentrates on presenting the data for the AM and PM peak periods as these have higher traffic flows compared to the inter peak.

## 2. Pair One: The Core Scenario against the Bardon Relief Road (Test1)

### AM Peak

#### 2031 Forecast Traffic Flows

The analysis of the impact of the proposed Bardon Relief Road (BRR) traffic flows is initially made by comparing the SATURN peak hour demand flows.

Figure 2.1 presents traffic flows for the Core Scenario in the AM Peak while Figure 2.2 presents the same information for the case with the BRR (Test 1). (**Note:** the plots represent a combination of the with BRR/without BRR networks and hence in the Core Scenario plot the BRR is plotted as a network link, although no traffic uses it.

Figure 2.3 presents a bandwidth difference plot of the information in Figures 2.1 and 2.2. Blue indicates that the flow would decrease with BRR while green indicates that it would increase. In addition the wider the bandwidth on link each then the greater the change in flow.

Figure 2.3 highlights the changes between the CS and T1. Table 2.1 provides a brief summary of the main changes in flow.

**Table 2.1: 2031 AM Peak Change in Flow: T1 compared to CS**

Route	Location	Dir.	2008 Base	2031			
				Core Scenario	Test 1	Change	% Change
Bardon Relief Road	West of Grange Rd	Eb	Na	na	467	na	na
		Wb	na	na	1146	na	na
Bardon Relief Road/Grange Rd	East of Grange Rd	Eb	269	450	388	na	na
		Wb	222	386	1150	na	na
A511 Bardon Road	West of W'works St	Eb	785	1007	833	-174	-17%
		Wb	802	1360	396	-964	-71%
A511 Bardon Road	East of W'works St	Eb	1033	1199	1025	-174	-15%
		Wb	1037	1599	696	-903	-56%

**Note:** Flows are 2031 demand flows.

The main points are:

1. The Bardon Relief Road has a forecast flow in the range 1146 to 1150 PCUs in the westbound direction but is much lower in the eastbound direction with forecast flows in the range 388 to 467 PCUs.
2. The A511 Bardon Road has a forecast reduction in flow. The forecast change in flow is much greater in the westbound direction compared to the eastbound direction. It is not apparent why the forecast reduction is greater in the westbound direction compared to the eastbound, however it is possible that this is due to traffic using the BRR to avoid congestion on the approach into Coalville in the AM peak.
3. Waterworks Street has a forecast increase in flow. This increase would reflect the improved attractiveness of this route, which would feed into the A511 Bardon Road. It is likely that traffic management would need to be considered to manage any increase in traffic on this route.
4. There would be a reduction in flow on Broom Leys Road and Forest Road. This would mirror the increase in flow on Waterworks Street.
5. Elsewhere the impact of the BRR is relatively minor with few changes in excess of 50 PCU's per hour.

### **2031 Forecast 'Congestion'**

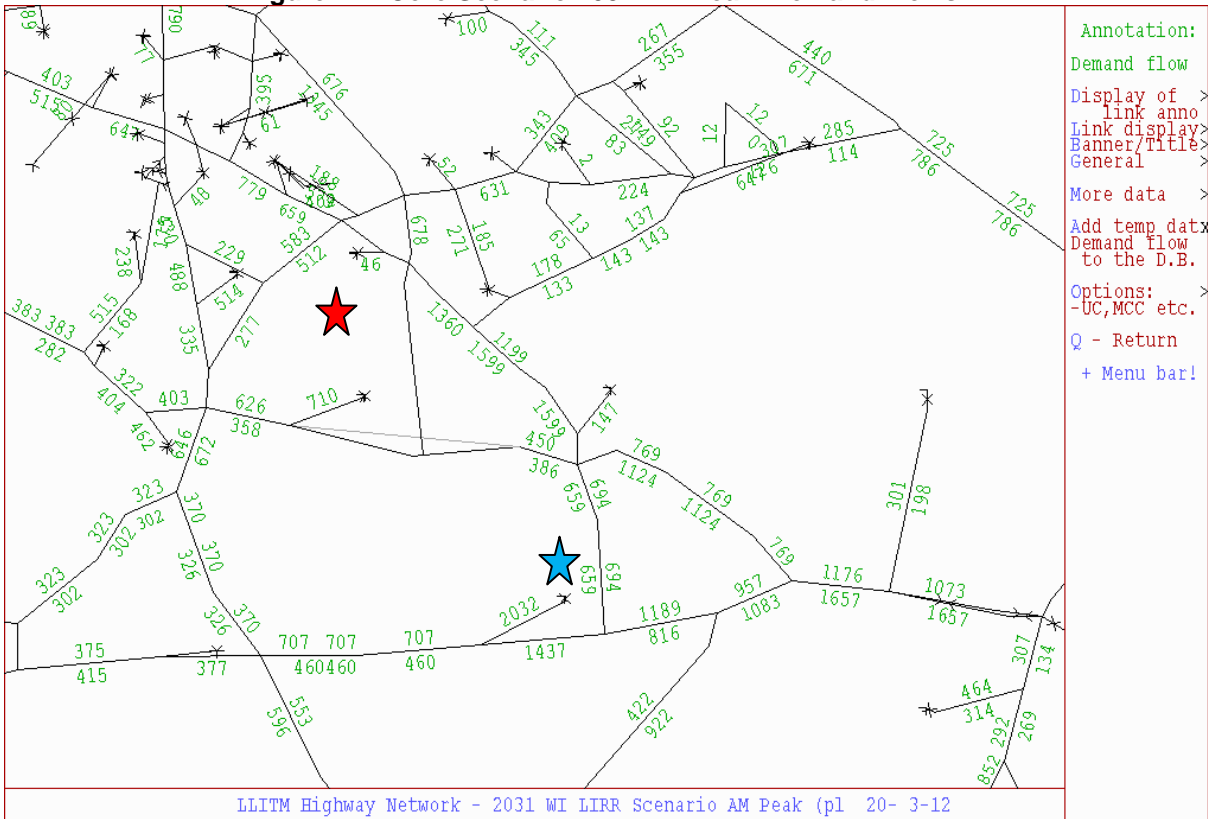
Figures 2.4 and 2.5 presents plots of those links where the 2031 forecast proportion of traffic flow compared to available capacity is in excess of 85%; these can be loosely referred to as 'congestion hotspots'. The threshold of 85% is taken as an threshold indicative of those links which are approaching capacity, however, it is not a threshold value that is based on any definitive guidance.

From Figures 2.4 and 2.5 the main points are:

- The forecast reduction in the high V/C values on Bardon Road. This is an expected outcome from the proposed BRR scheme.
- The forecast increase in high V/C values on Stephenson's Way west of the BRR reflecting the forecast increase in traffic on this section of the network.

Elsewhere there are no notable changes due to the proposed scheme.

Figure 2.1: Core Scenario 2031 AM Peak: Demand Flows



Note: The BRR is included in the plot above as it is a 'hybrid network' presents both the Core scenario and Test 1 network together.

Figure 2.2: Test 1 2031 AM Peak: Demand Flows

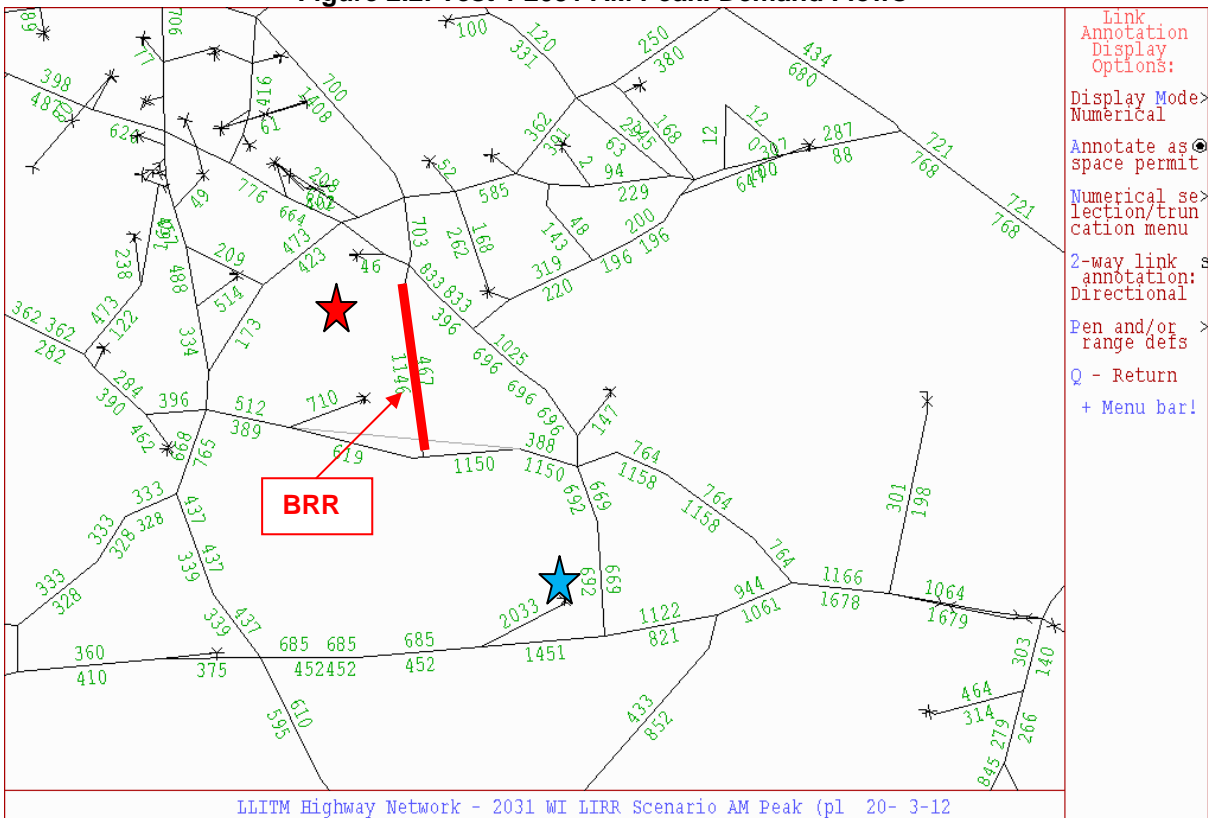


Figure 2.3: 2031 AM Peak: Demand Flow Difference Plot - Core Scenario minus Test 1

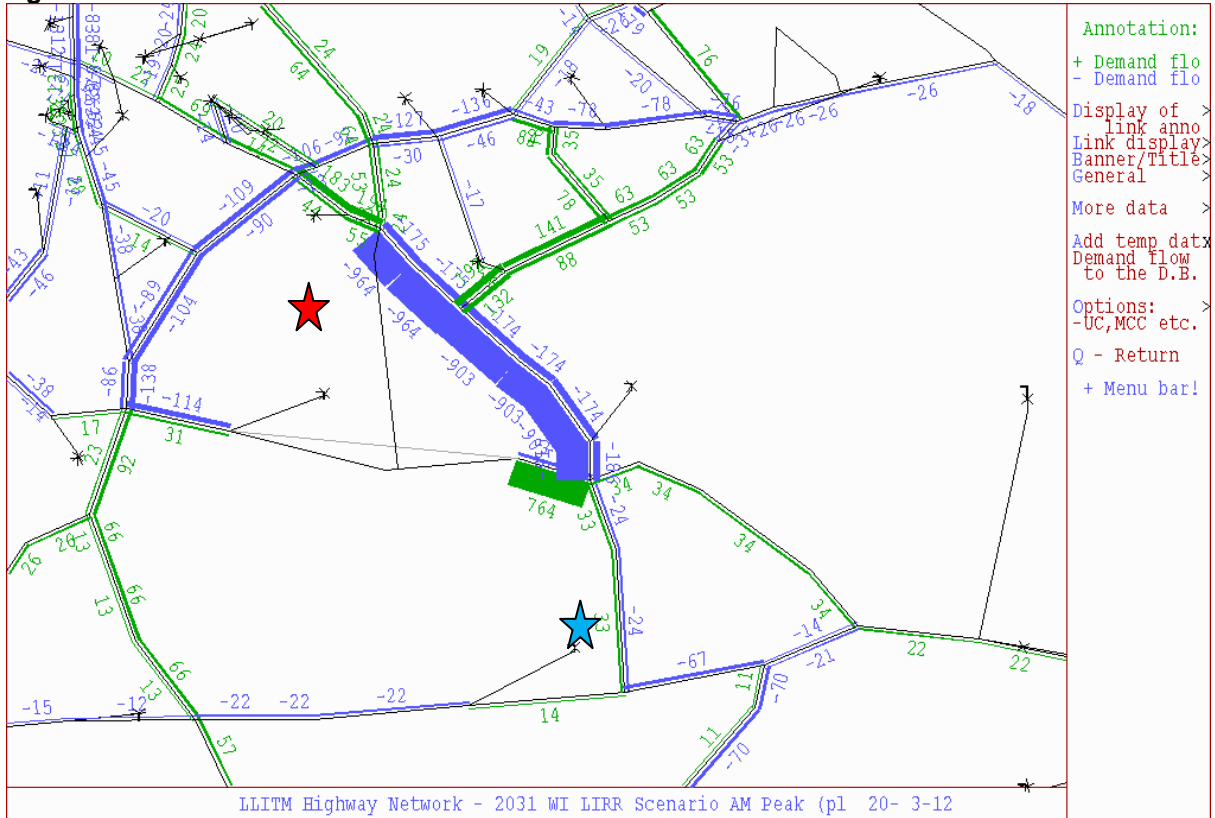


Figure 2.4: Core Scenario 2031 AM Peak: Demand Flows

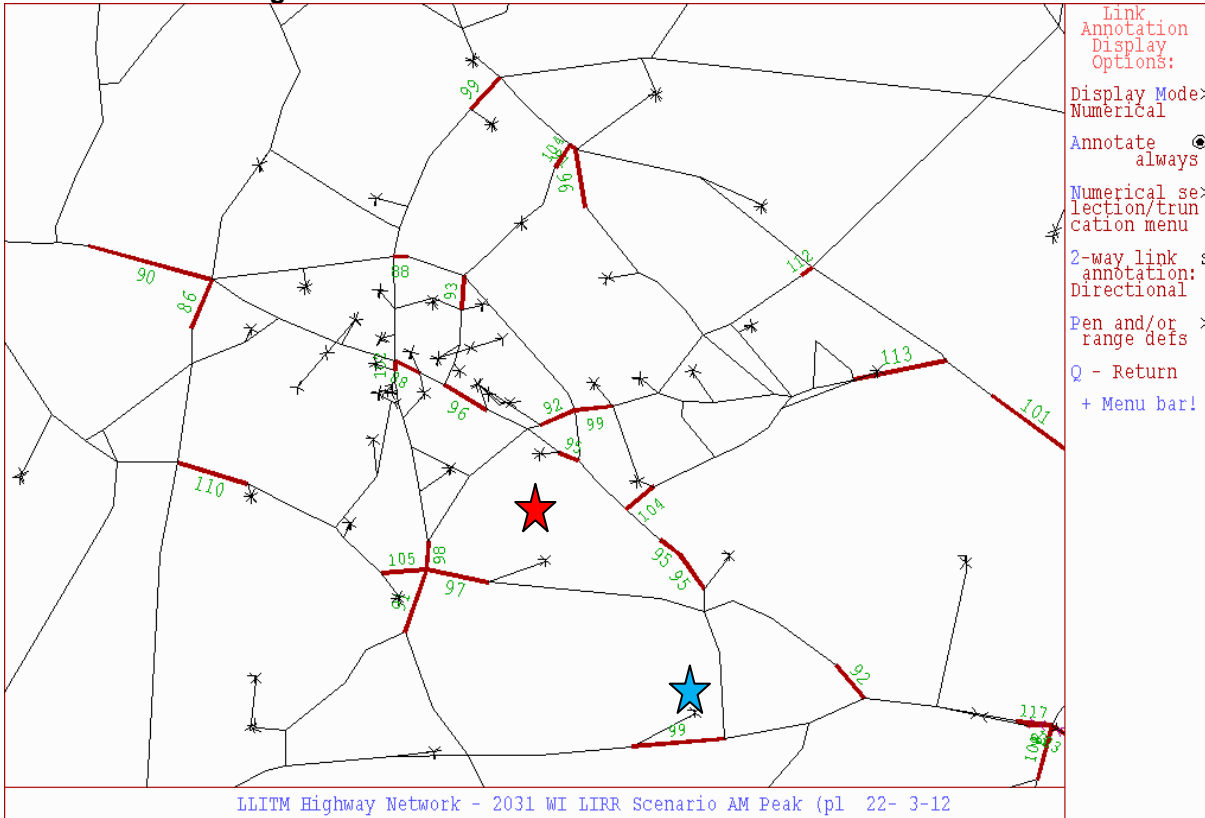
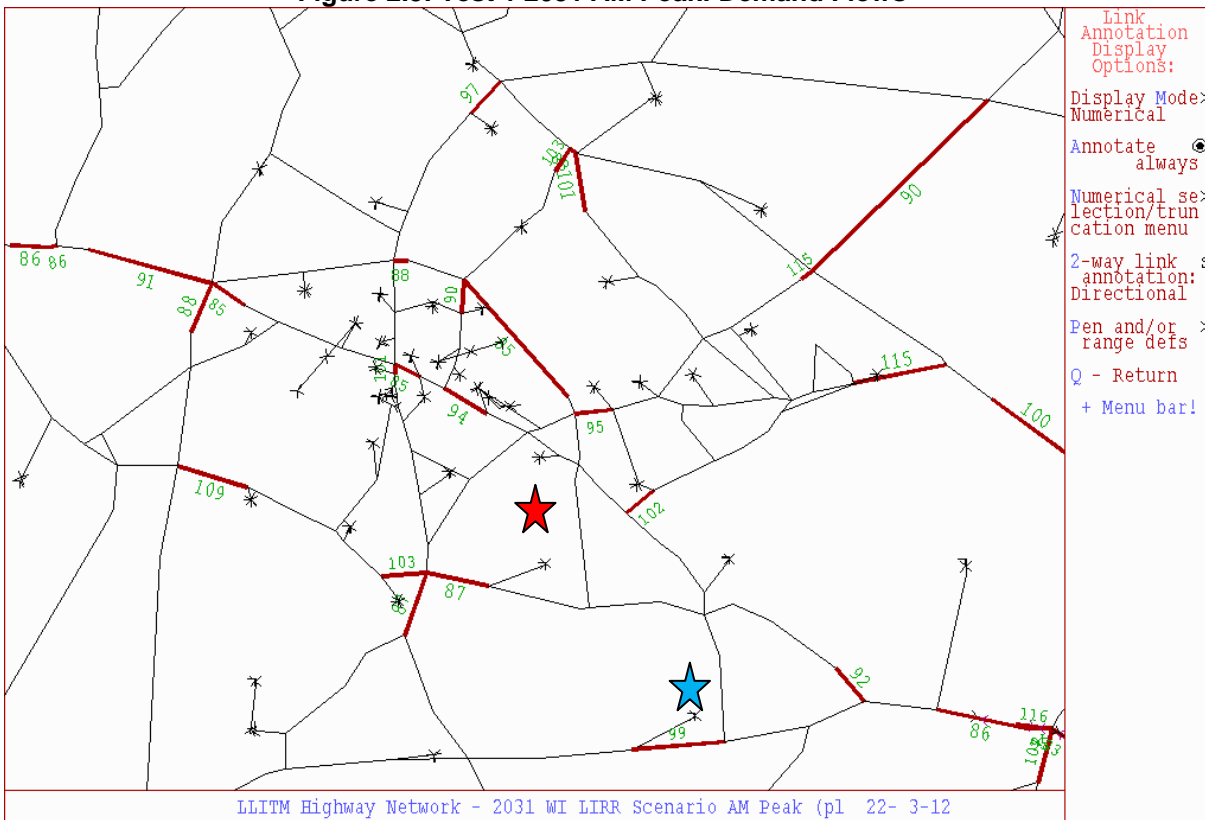


Figure 2.5: Test 1 2031 AM Peak: Demand Flows



## PM Peak

### 2031 Forecast Traffic Flows

Figure 2.6 presents the SATURN demand flow for the 2031 PM peak Core Scenario and Figure 2.7 presents the demand flows for Test 1. Figure 2.8 presents a difference plot.

Table 2.2 provides a brief summary of the main changes in flow.

**Table 2.2: 2031 PM Peak Change in Flow: T1 compared to CS**

Route	Location	Dir.	2008 Base	2031			
				Core Scenario	Test 1	Change	% Change
Bardon Relief Road	West of Grange Rd	Eb	Na	0	520	na	na
		Wb	na	0	803	na	na
Bardon Relief Road/Grange Rd	East of Grange Rd	Eb	194	245	430	185	76%
		Wb	460	638	1193	555	87%
A511 Bardon Road	West of W'works St	Eb	983	1534	975	-559	-36%
		Wb	605	874	168	-706	-81%
A511 Bardon Road	East of W'works St	Eb	1079	1389	1012	-377	-27%
		Wb	853	930	478	-452	-49%

The main points are:

1. The directional change in flow on the A511 Bardon Road is more balanced. In the eastbound direction the reduction with the BRR is between 377 and 559 PCUs while in the westbound direction the change is between 452 and 706 PCUs.
2. The increase in flow on Waterworks Street is higher than in the AM peak.
3. Compared to the AM peak there is a larger change on Beveridge Lane with an increase to the west of the zone feed (Z6234) with Bardon Grange and a decrease to the east of the zone feed.

### 2031 Forecast 'Congestion'

Figures 2.9 and 2.10 present plots of those links where the 2031 forecast proportion of traffic flow compared to available capacity is in excess of 85%. From these Figures the main points are:

- The forecast reduction in the high V/C values on Bardon Road. This is an expected outcome from the proposed BRR scheme.
- There are no forecast increases in V/V values above 85% on Stephenson's Way. This differs from the AM peak where V/C values increase on this link.

Elsewhere there are no obvious changes due to the proposed scheme.

Figure 2.6: Core Scenario 2031 PM Peak: Demand Flows

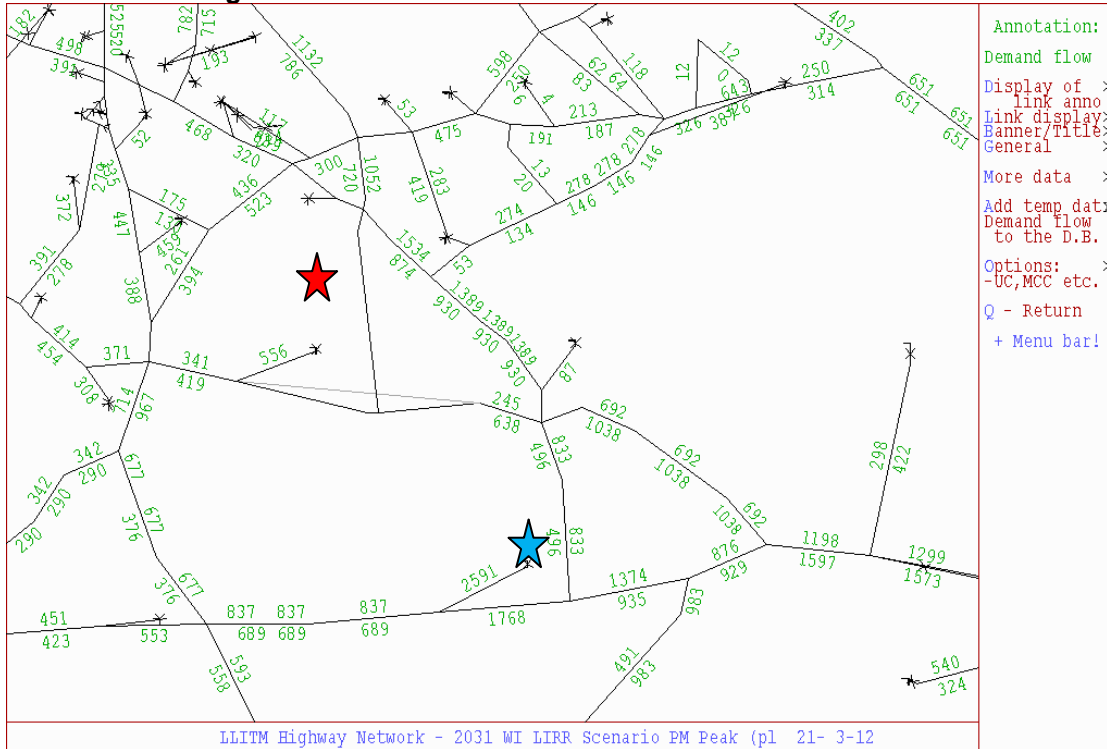


Figure 2.7: Test 1 2031 PM Peak: Demand Flows

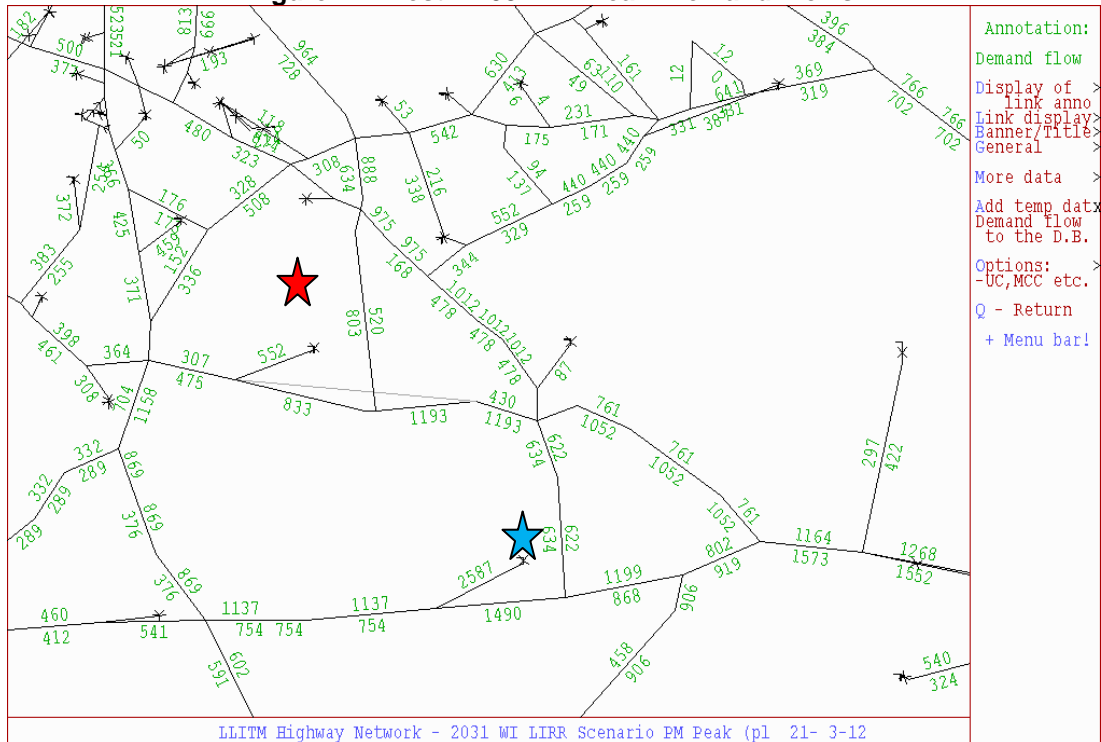




Figure 2.8: 2031 PM Peak: Demand Flow Difference Plot - Core Scenario minus Test 1

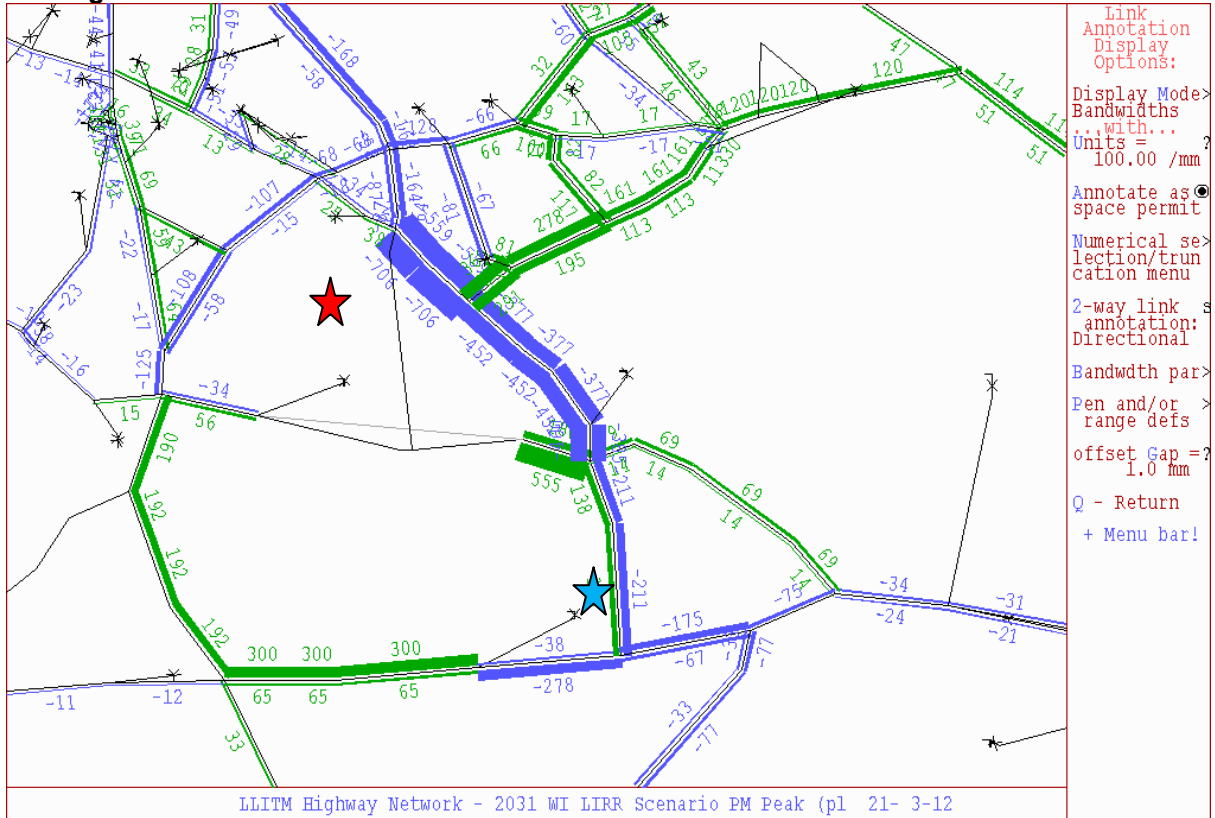


Figure 2.9: Core Scenario 2031 PM Peak: Demand Flows

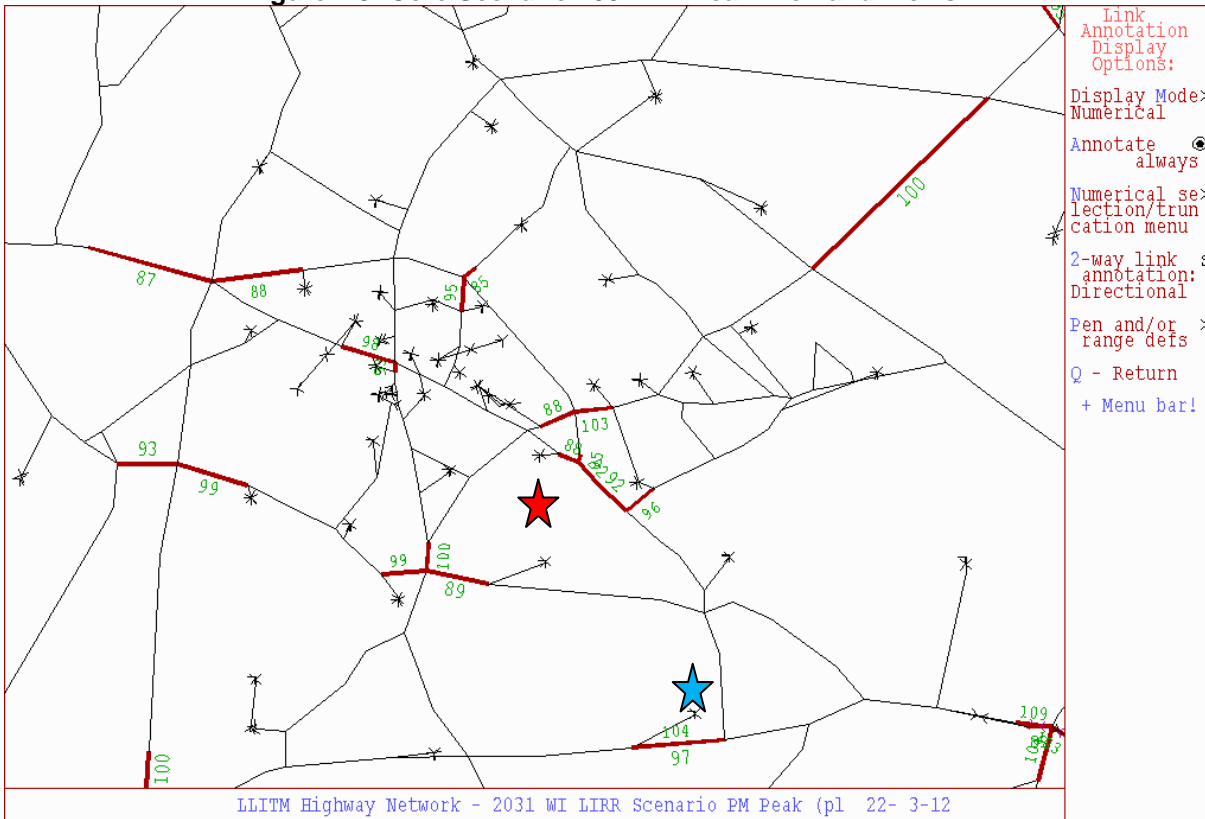
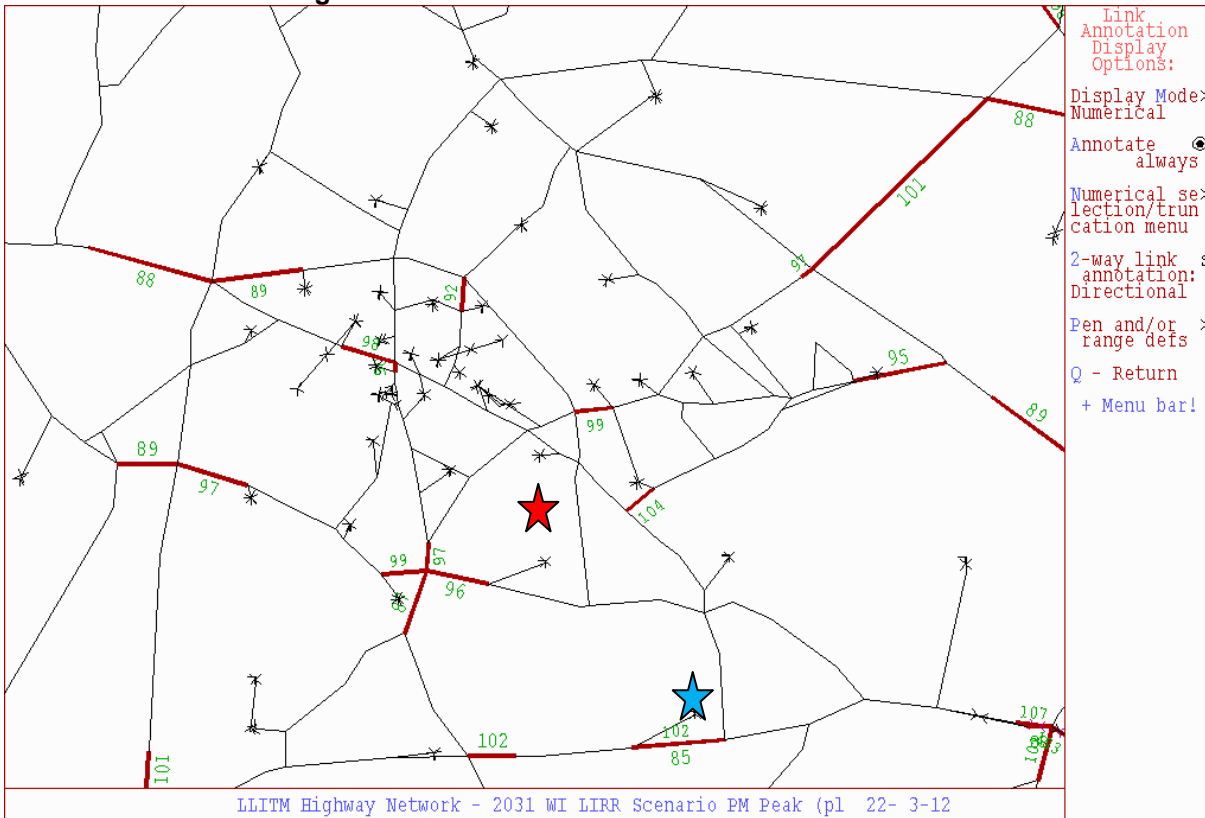


Figure 2.10: Test 1 2031 PM Peak: Demand Flows



### 3. Alternative Zone Feeds

Tests 2 and 3 examine the impact of a change to the zone feed for zone z6231 through the provision of an additional zone feed that feeds into the Stephenson's Way roundabout. The change is common to Test 2 and Test 3, and is the only change between the tests presented as the Core Scenario/Test1. This change is illustrated in Figure 3.1. An important aspect of this change is to ensure that traffic does not use the route provided by the new link as through route.

Figure 3.1: Zone 6231 Zone feeds.

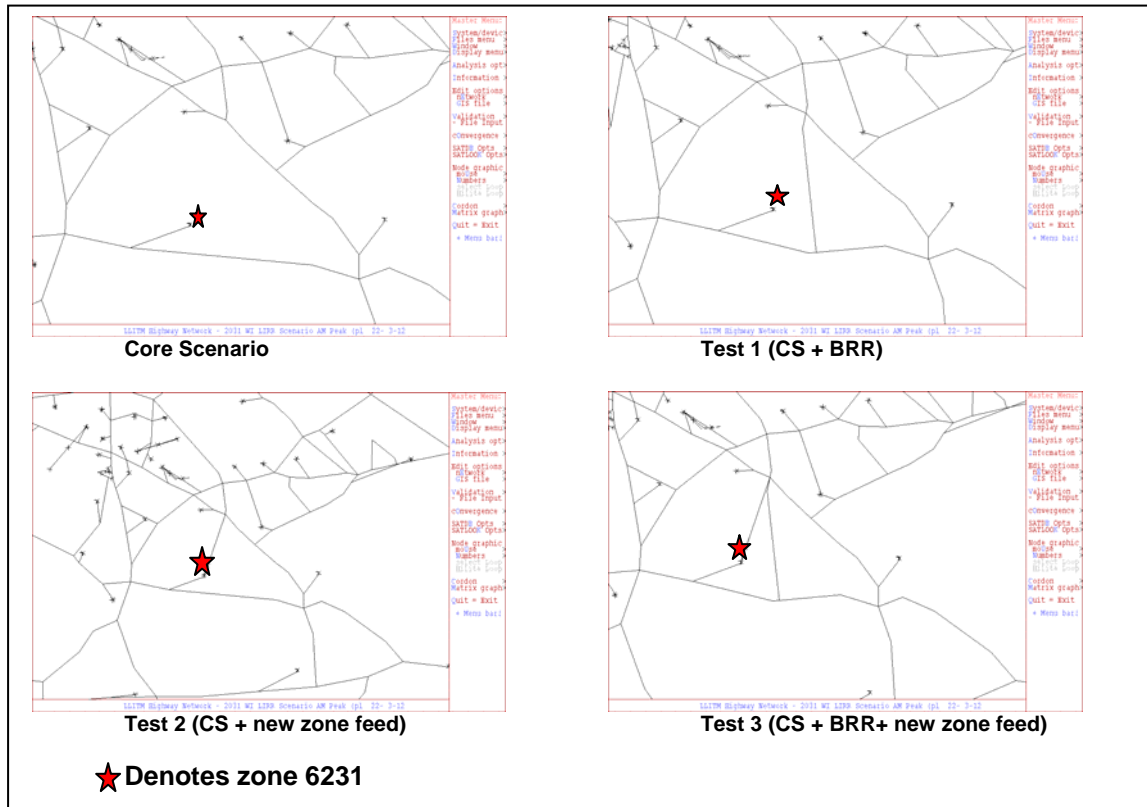


Figure 3.1 shows the zone feeds for zone 6231 under each test. It can be noted that:

- In Test 2 the new zone feed creates a four arm junction with the A511 Bardon Road. This junction has been coded exactly the same as the proposed 4-arm junction as in the BRR test.
- In Test 3 the new zone feed creates a five-arm roundabout with the A511/BRR. This has been coded by simply adding a fifth arm to the roundabout with an appropriate approach arm capacity.

#### Test 3: Impact of Alternative Zone Feeds (No BRR)

It is worth comparing the impact of the alternative zone feed on the route chosen by traffic from zone 6231.

Figures 3.2 and 3.3 compare Test 2 against the Core scenario (i.e. the BRR is absent from both cases, with the only difference being the change in zone feed) for the 2031 AM peak and PM peak respectively.

Figure 3.2: AM 2031: Test 2 compared to CS

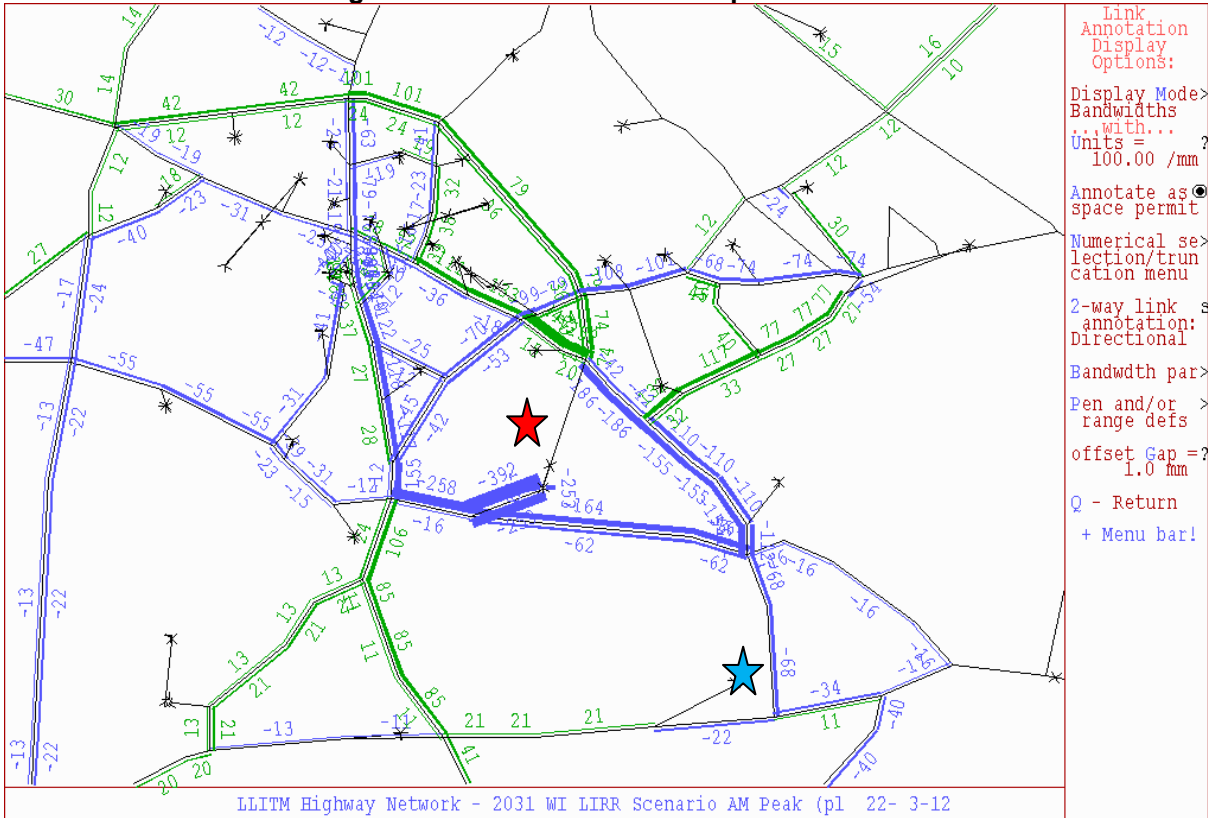
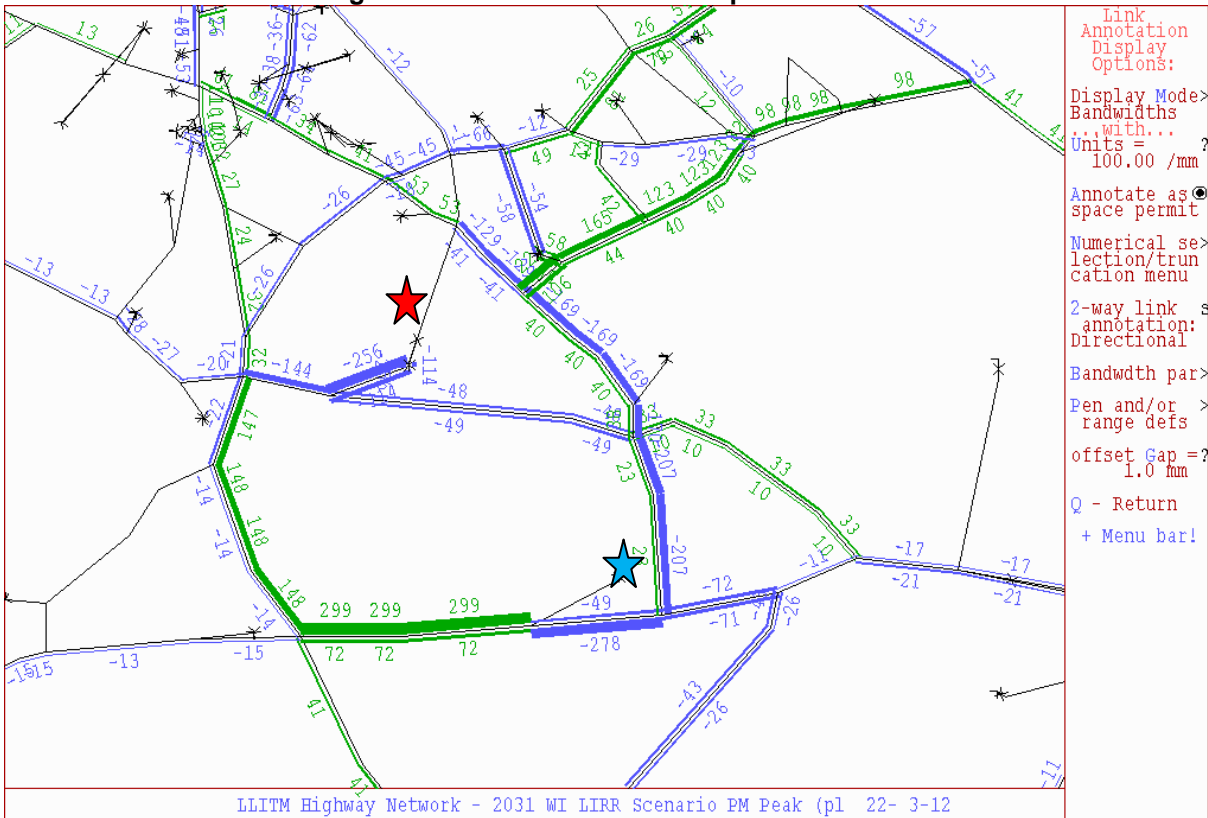


Figure 3.3: PM 2031: Test 2 compared to CS



Figures 3.2 and 3.3 both show that less traffic will use Grange Road to access Zone 6231 (the blue bandwidth on the zone connector) and that this traffic will instead access via the junction with the B511 Bardon Road. It can be noted that:

- Traffic levels are lower on Bardon Road east of Stephenson's Way despite more traffic accessing directly onto the highway network at this location. This indicates that the additional traffic on Bardon Road discourages other traffic from using this route.
- In the PM peak traffic accessing the other Bardon Grange zone (zone 6234, which is marked with a blue star in Figure 7) from Beveridge Lane accesses from the west rather than the east.

**Test 3: Impact of Alternative Zone Feeds (with BRR)**

Figures 3.4 and 3.5 compare Test 3 against Test 1 (i.e. the BRR is present in both cases, with the only difference being the change in zone feed) for the 2031 AM peak and PM peak respectively.

**Figure 3.4: AM 2031: Test 3 compared to Test 1**

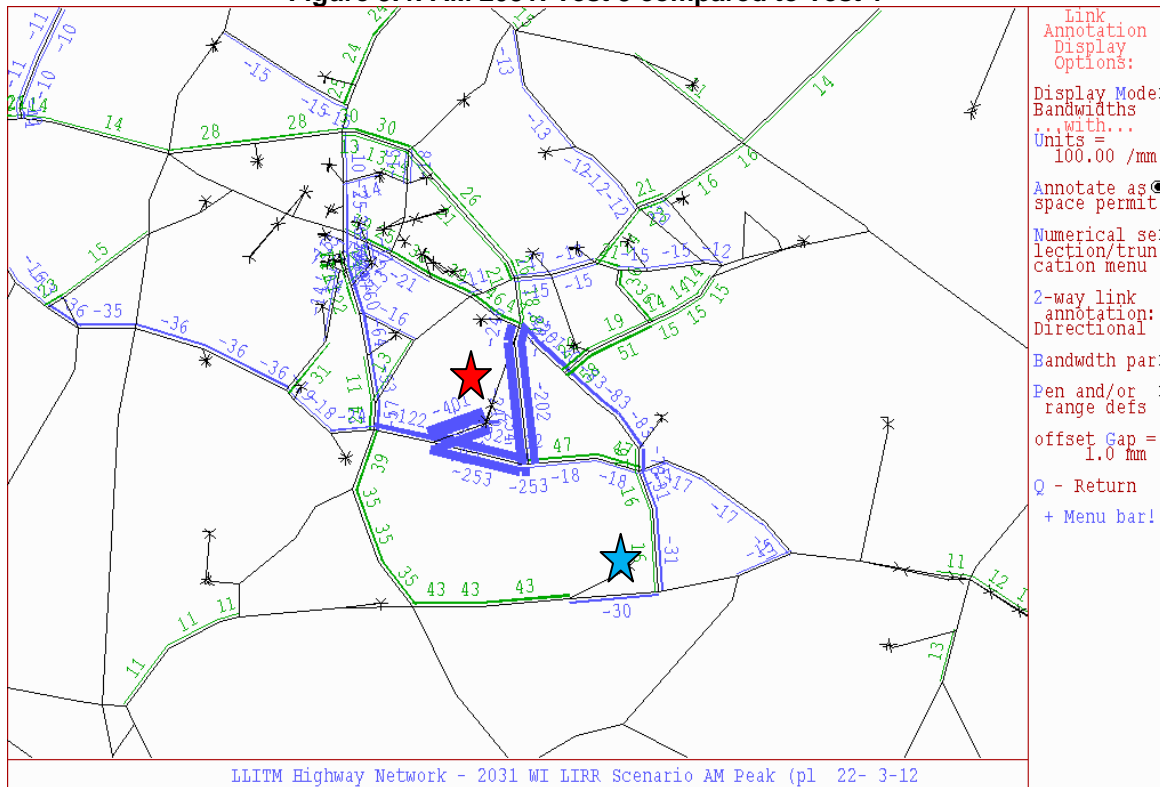
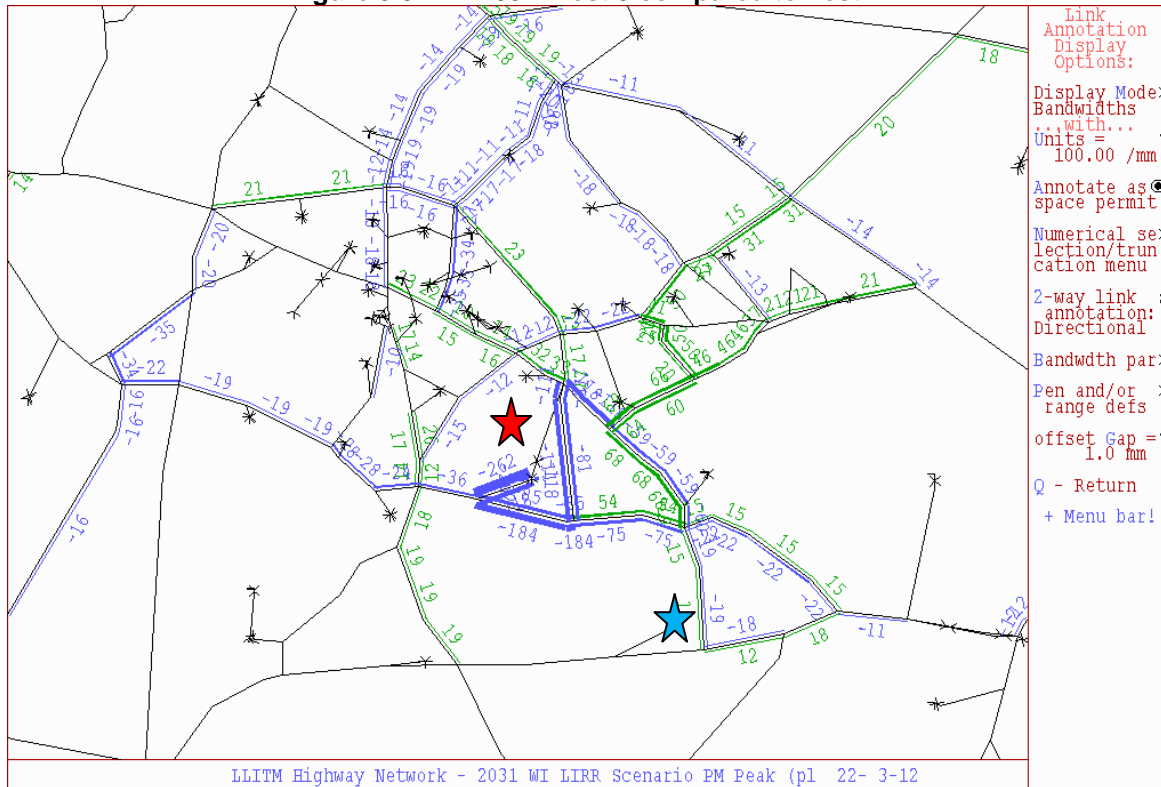


Figure 3.5: PM 2031: Test 3 compared to Test 1



Figures 3.4 and 3.5 show that:

1. The main impact of the change in zone feed is that forecast traffic flows would be lower on (a) Grange Road east of zone 6231 and (b) on the BRR between Grange Road and Bardon Road.
2. Elsewhere in the network the impact is relatively small with few differences in excess of 50 PCU's.

#### 4. Distribution of Traffic from Zones 6231 and Zones 6234

The distribution of traffic from zone 6231 is the same between the Core Scenario and all tests, and simply reflects the fact that the matrices are the same in each case.

Figures 4.1 and 4.2 present the distribution of traffic from zone 6231 in the AM peak under Core Scenario. Figure 4.1 presents a plot of the immediate network around the zone while Figure 2 provides a wider plot of where this traffic ends up in the wider model network.

Figures 4.3 and 4 4 present the same information for zone 6234, while figures 4.5 to 4.8 present the same information for the PM peak.

In general terms the distribution for highway trips from zone 6231 are focused towards Leicester and the city centre. This reflects the predominant use of this site for housing in the future and reflects more typical patterns for household to work commuting trips. The pattern for zone 6234 is more diverse with a greater proportion of trips using the

Figure 4.1: 2031 AM Core Scenario: Distribution of Traffic from Zone 6231 (Coalville area)

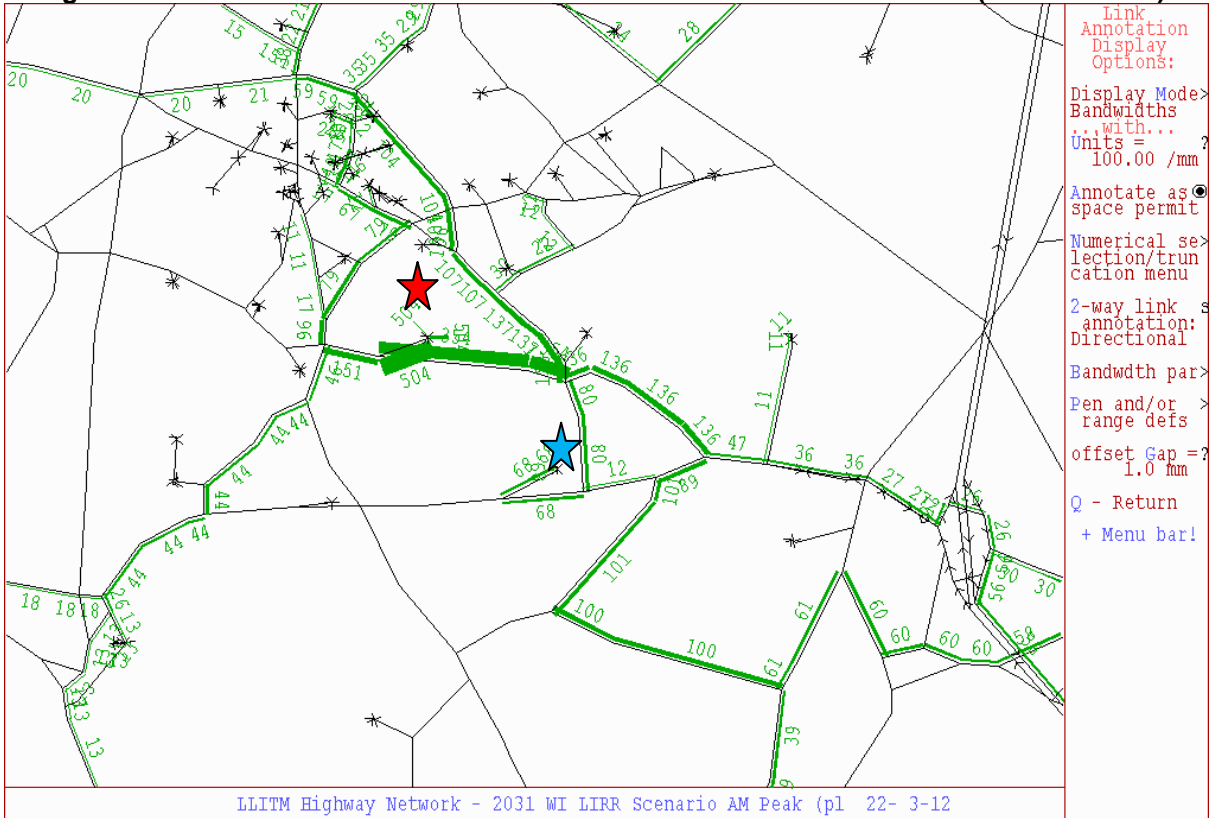


Figure 4.2: 2031 AM Core Scenario: Distribution of Traffic from Zone 6231 (Wider area)

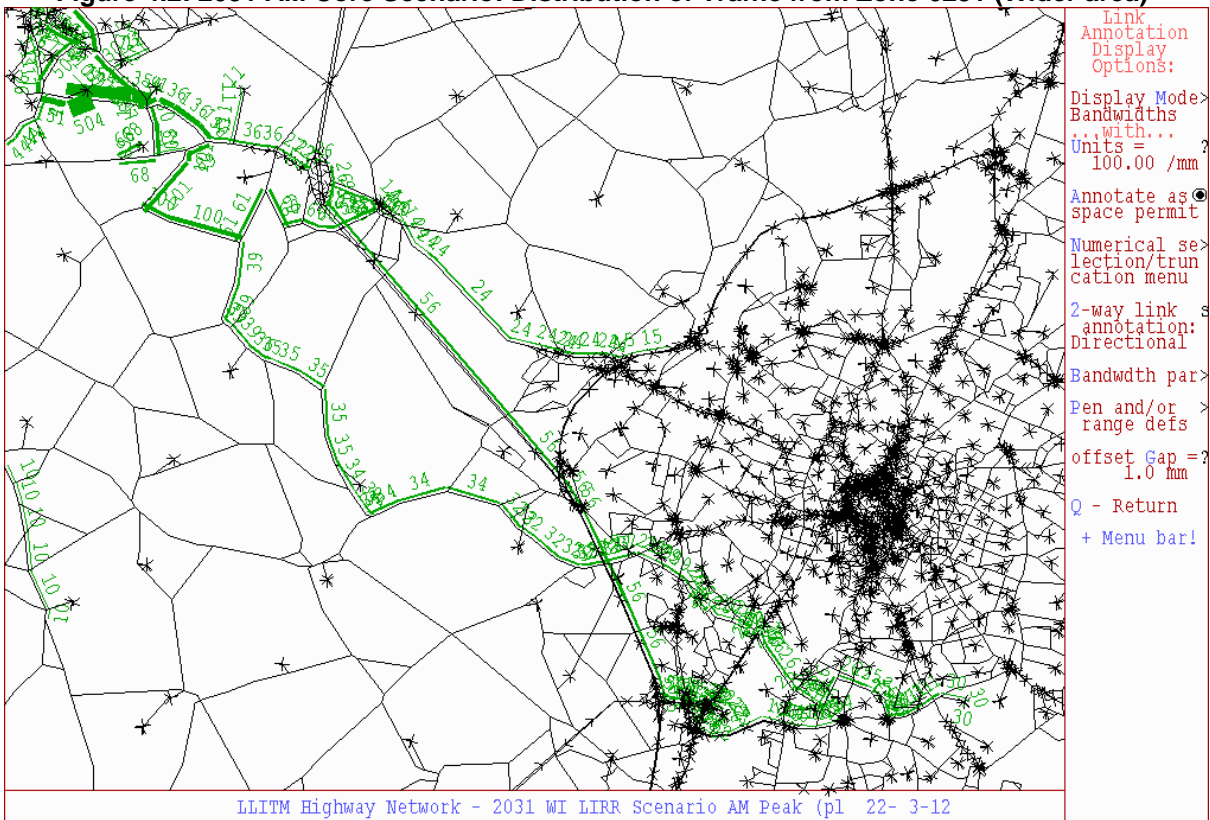


Figure 4.3: 2031 AM Core Scenario: Distribution of Traffic from Zone 6234 (Coalville area)

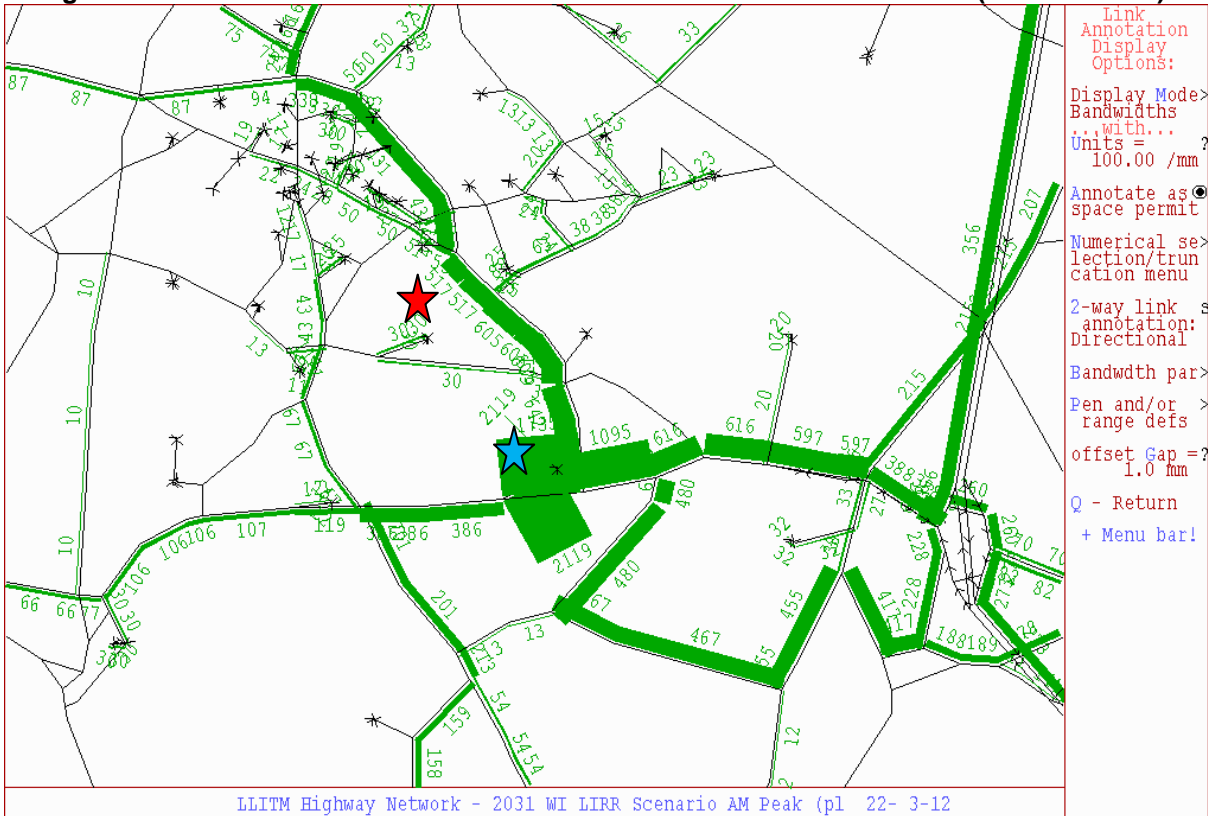


Figure 4.4: 2031 AM Core Scenario: Distribution of Traffic from Zone 6234 (Wider area)

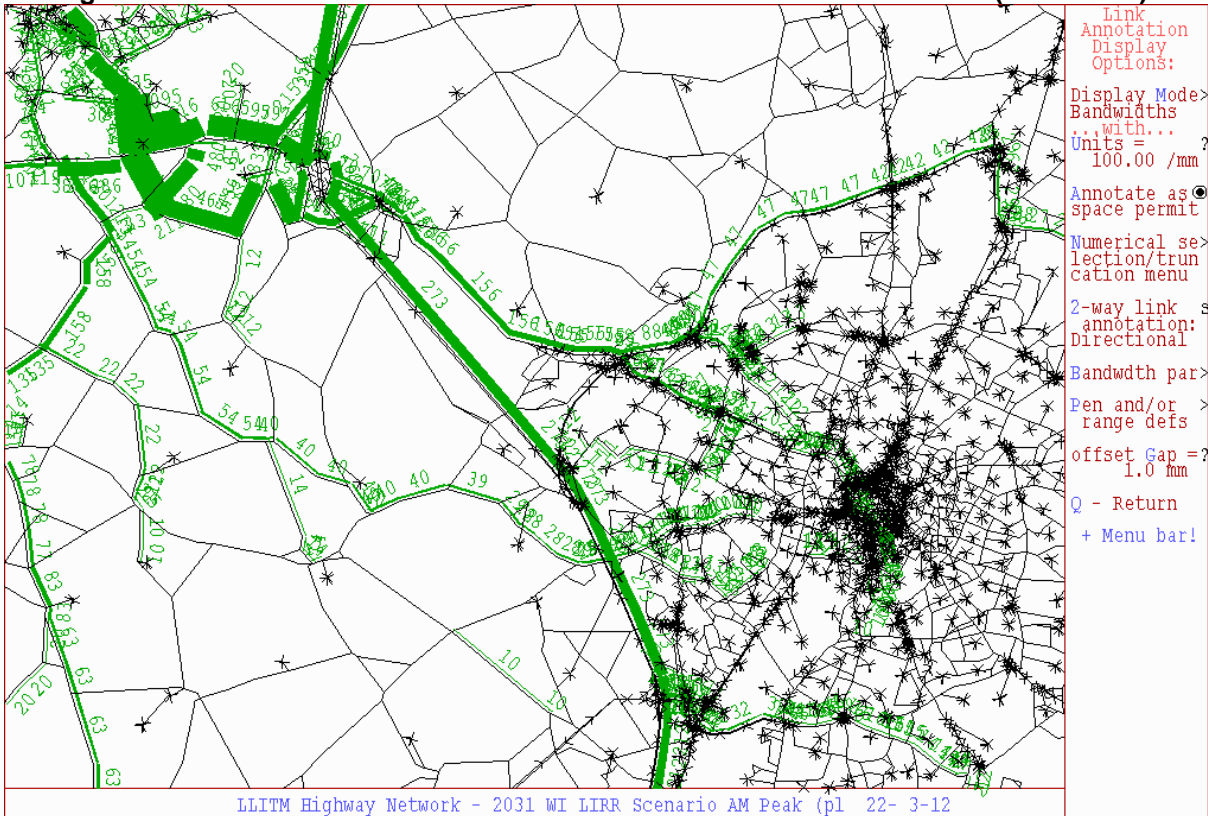




Figure 4.5: 2031 PM Core Scenario: Distribution of Traffic from Zone 6231 (Coalville area)

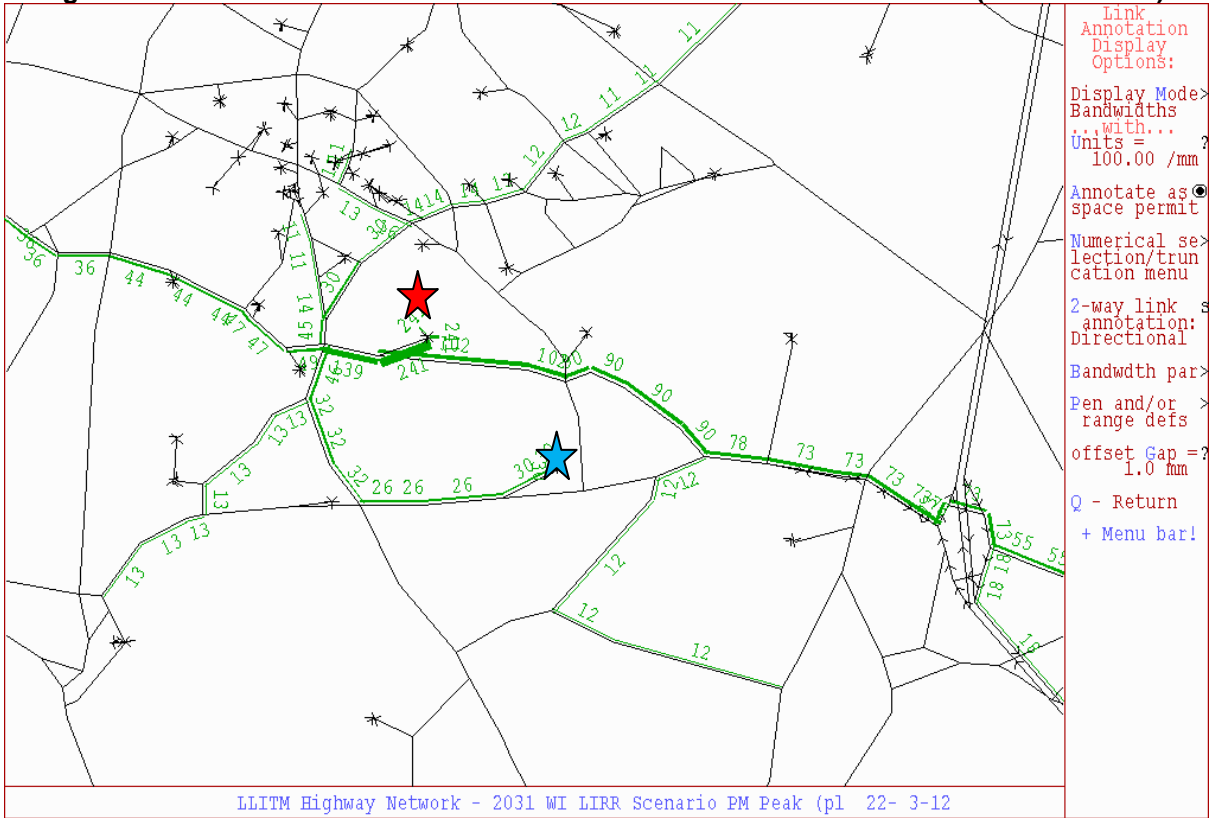


Figure 4.6: 2031 PM Core Scenario: Distribution of Traffic from Zone 6231 (Wider area)

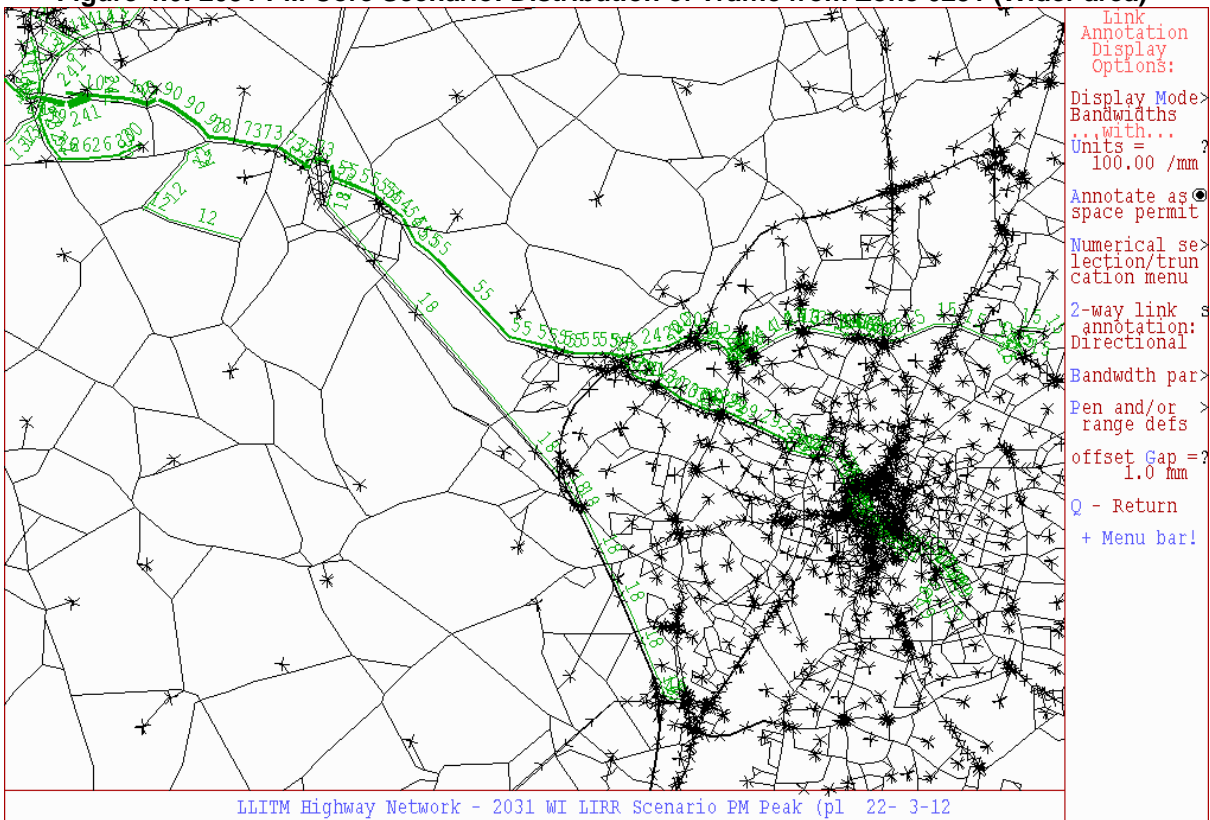


Figure 4.7: 2031 PM Core Scenario: Distribution of Traffic from Zone 6234 (Coalville area)

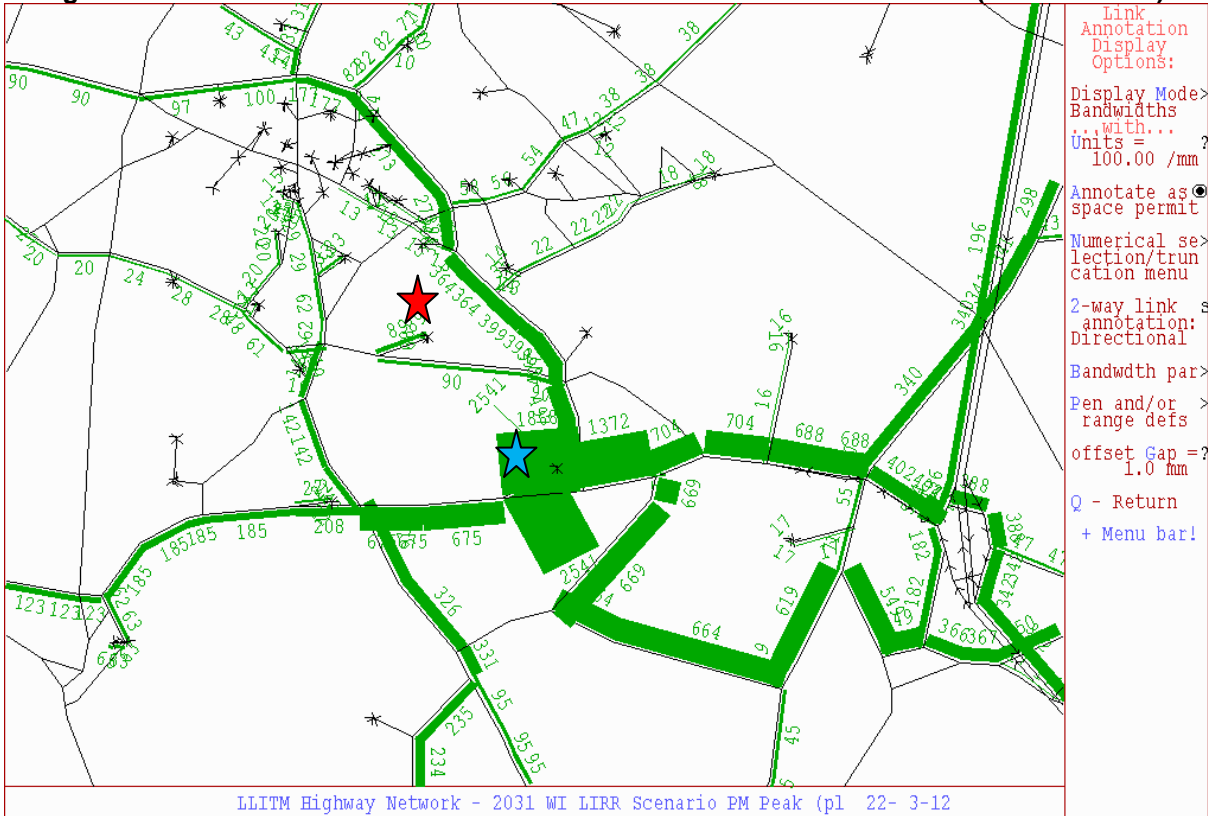
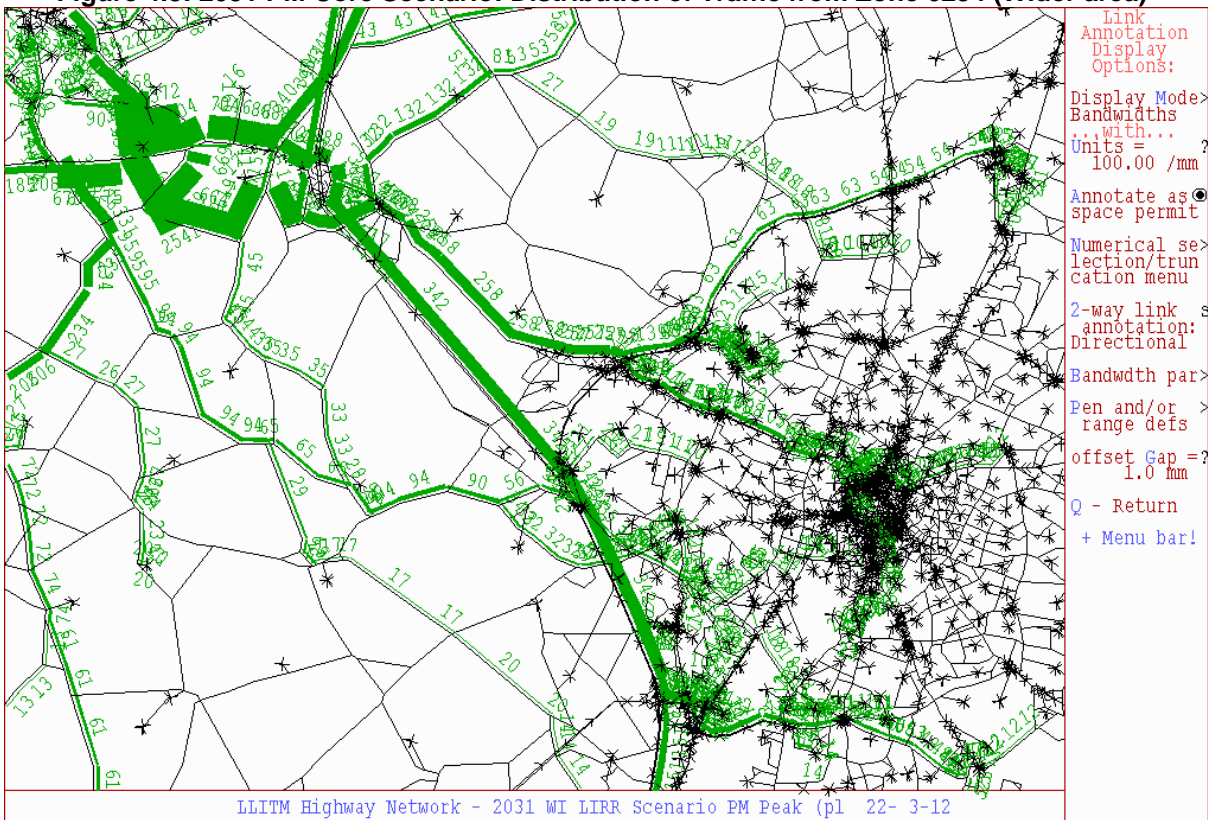


Figure 4.8: 2031 PM Core Scenario: Distribution of Traffic from Zone 6234 (Wider area)



## 5. Conclusions

The summary points from the above analysis are presented below.

### ***Impact of the Bardon Relief Road***

The most notable impacts are that the proposed Bardon Relief Road are forecast to be:

- Reduce forecast traffic flows on the A511 Bardon Road between Stephenson Way and Grange Road.
- Increase forecast traffic flows on Waterworks Street
- Elsewhere changes in traffic flow are more localised with few changes in excess of 50 PCU's

In terms of forecast 'congestion' (as measured by volume/capacity ratios on individual links), the proposed Bardon Relief Road will lead to reductions in V/C ratios on Bardon Road, but there are few notable changes elsewhere.

### ***Impact of Alternative Zone Feed for Zone 6231***

The main impact of the change in zone feed is that forecast traffic flows would be lower on (a) Grange Road east of zone 6231 and (b) on the BRR between Grange Road and Bardon Road.

Elsewhere in the network the impact is relatively small with few differences in excess of 50 PCU's.

(end)