Trigger Point Justification Note
30th August 2013

1. Introduction

DCC constructed a highway assignment model of Tiverton and the surrounding area and this suggested that in pure capacity terms, up to 1,000 dwellings could be accommodated on the current network. However, other aspects have to be considered such as the safety of vulnerable road users. The particular issue associated with the Tiverton EUE development is the impact of increased traffic levels of pedestrians crossing Blundell's Road outside Blundell's School.

2. Conflict Study

DCC commissioned Parsons Brinckerhoff to carry out a Conflict Study on Blundell's Road outside Blundell's School. After studying video analysis of this section of road carried out on 19th June 2013, a total of 12 near misses / almost near misses were identified in a 12 Hour period. These were any incidents that required some action by the driver to avoid a collision with pedestrians crossing the road.

The number of pedestrians crossing the road was recorded by location and a map showing these zones is located in Appendix 1. The results of this pedestrian survey showed that although the majority of pedestrians crossing Blundell's Road within the vicinity of Blundell's School cross at the pedestrian crossing facility at Zone C (70%), a significant proportion cross within Zone E (20%). The remaining10% cross along the length of the road in Zones A, B and D. This indicates that 30% of pedestrians are crossing in an uncontrolled location on a relatively busy road, the same location as the conflicts were seen to occur.

3. PV² Calculations

To assess the level of conflict between vehicles and pedestrians, PV² calculations were carried out with reference to DMRB Advice Note TA 68/96 '*The Assessment and Design of Pedestrian Crossings*'. The PV² values have been determined for Zones A to E using the pedestrian flow data mentioned above and a traffic count carried out on the same day at the Blundell's Road / Tidcombe Lane junction. For robustness this does not include an additional factor to be applied to the pedestrian flows to take into account the large proportion of children crossing the road although there is some evidence that this could be as high as 4. These results are summarised in Table 1 below.

Hour Starting	$PV^2 \times 10^{-8}$				
	Zone A	Zone B	Zone C	Zone D	Zone E
7	0.01	0.01	0.11	0.02	0.04
8	0.11	0.02	4.44	0.21	0.96
9	0.04	0.00	0.22	0.02	0.14
10	0.05	0.01	1.26	0.03	0.28
11	0.05	0.01	1.25	0.02	0.33
12	0.10	0.00	1.25	0.08	0.18
13	0.06	0.00	1.28	0.09	0.32
14	0.02	0.00	0.19	0.03	0.17
15	0.04	0.01	0.95	0.03	0.18
16	0.08	0.03	0.32	0.04	0.32
17	0.03	0.01	0.24	0.01	0.17
18	0.00	0.00	0.27	0.07	0.13
Average Max 4 Hours	0.09	0.02	2.06	0.11	0.48

Table 1: Current PV^2 Values

TA 68/96 specifies that the assessment criteria for determining whether or not a pedestrian crossing is required is based upon the highest four hourly values of PV^2 and that where the average of these values is greater than 10^8 for an undivided road, then this would meet the criteria.

Based upon the pedestrian and traffic flow data provided, the results indicate that at present, only Zone C meets the criteria of the requirement for a pedestrian crossing facility and this already exists at this location.

To assess the impact of the EUE development traffic on this section of road, future traffic flows were taken from the DCC traffic model and factored to replicate the flows from the traffic count identified above. For a robust approach, it was assumed that the number of pedestrians would remain constant in the future.

After a meeting with developers and Mid Devon District Council on 15th August 2013, the stages of the highway improvements were suggested. These are outlined below along with the network code applied to each stage.

Net0 – Current Network
Net101 – Current Network + Improvements to J27
Net102 – Net100 + Left-In, Left-Out junction onto A361
Net103 – Net102 + Blundell's Road Traffic Calming outside School and improvements to Lowman Way and Blundell's Road roundabouts
Net104 – Net103 + Full Cloverleaf Junction onto A361.

To assess the impact of this, each of the scenario's was modelled and with different development levels to assess the impact of the changing traffic levels on Blundell's Road. The PV^2 values for each of these scenarios are summarised in the table below.

Housing	Employment	A361 Junction	Zone A	Zone B	Zone C	Zone D	Zone E
Existing		Current	0.09	0.02	2.06	0.11	0.48
0	0	Net101	0.10	0.02	2.24	0.12	0.52
0	0	Net102	0.08	0.01	1.85	0.10	0.43
200	4,000	Net102	0.10	0.02	2.25	0.12	0.52
200	4,000	Net103	0.08	0.02	1.82	0.10	0.43
300	4,000	Net101	0.13	0.02	3.03	0.16	0.70
600	10,000	Net103	0.10	0.02	2.44	0.13	0.57
600	10,000	Net104	0.06	0.01	1.53	0.08	0.37
1000	10,000	Net101	0.23	0.04	5.41	0.29	1.27
1000	10,000	Net103	0.14	0.03	3.43	0.18	0.79
1500	40,000	Net103	0.20	0.04	4.76	0.25	1.09
1500	40,000	Net104	0.11	0.02	2.59	0.14	0.62

Table 2: Future PV2 Values

This analysis shows that if the first phase of the junction is built before 300 dwellings and 4,000m² of employment then the PV² values remain relatively low and the only location that requires a signalised pedestrian crossing facility is zone C which already has one. The PV² value for zone E reaches 0.7 which is still below 0.8×10^{-8} which is the level recommended for a zebra crossing but should be considered in the traffic calming measures.

If 1,000 Dwellings were allowed to come forward before phase 1 (LILO) of the junction was implemented, or the full development was operated off just the first phase of the junction, an additional signalised crossing would be required in Zone E to accommodate the 20% that cross at this location. This then leads to the consideration of the residual 10% that cross at uncontrolled locations.

4. Ability to Cross the Road for Residual 10%

In the Existing Situation a significant proportion of pedestrians cross at uncontrolled locations, the gap between vehicles on the road was analysed for the AM peak (08:00 – 09:00) as this was the hour with the most vehicles and pedestrians. This gave a mean gap of 3.5 seconds but there were a number of gaps greater than 10 seconds, with a maximum of 27 seconds.

Assuming a gap of 5 seconds is required for a pedestrian to safely cross the road, the probability of a gap being large enough for pedestrians to cross is currently 20%, (i.e. 20% of the time the recorded gap was bigger than 5 seconds).

The EUE development would add additional vehicles along this road which would result in smaller gaps between vehicles; as a consequence there would be less opportunity for pedestrians to cross outside of the designated crossing. To assess the impact of this, the length and number of gaps between vehicles was factored by the percentage increase in traffic. The results of this are summarised in Table 3 below.

Housing	Employment	A361 Junction	Probability of Crossing
Existing Situation		Current	20%
0	0	Net101	19%
0	0	Net102	21%
200	4,000	Net102	18%
200	4,000	Net103	20%
300	4,000	Net101	14%
600	10,000	Net103	16%
600	10,000	Net104	23%
1000	10,000	Net101	8%
1000	10,000	Net103	11%
1500	40,000	Net103	8%
1500	40,000	Net104	14%

Table 3: Probability of Crossing Road Outside of Crossing

This analysis shows that for the majority of the scenarios the probability of crossing the road is above 14% which DCC believes is acceptable and only decreases if 1000 dwellings are allowed on the current network or the full development comes forward before the full junction is constructed. This is likely to result in pedestrians taking more risks in crossing the road which increases the chance of collisions.

The only way of preventing this from happening is to add guardrails along the whole section of road funnelling the pedestrians to the designated crossing(s). Guardrails are not an attractive option and according to Manual for Streets 2, '*It disadvantages pedestrian movement by making people walk further, away from their desire lines, and creates an unpleasant feeling or restraint. It also narrows the usable footway which can lead to congestion. It is unsightly and detracts from local character and visual amenity, and there is evidence that it can increase traffic speeds and present an increased risk to cyclists, who can be crushed against it by vehicles*'.

5. Conclusion

The DCC highway SATURN model outlined that in capacity terms, up to 1,000 dwellings could be accommodated on the current network. However, this technical note has outlined the impacts the development traffic would have on the pedestrians crossing Blundell's Road outside Blundell's School.

This analysis shows that if 1,000 dwellings were allowed without phase 1 (LILO) of the A361 junction then an additional signalised pedestrian crossing would be required at zone E to allow pedestrians to cross the road safely at this location. This would also require guardrails along the whole length of road outside the school on both sides to funnel the pedestrians to the signalised crossing points. This mitigation measure is considered unacceptable because it has various safety implications and would not fit in with the image of the school.

Taking all this information into account, DCC proposed the following trigger points:

- Before construction – Blundell's Road traffic calming
- 100 Dwellings – Improvements to Lowman Way Roundabout and Blundell's Road Roundabout
- 300 Dwellings, 4,000m² Employment – Left-in, left-out junction onto A361
- 600 Dwellings, 10,000m² Employment – Full movements junction onto A361
- 2000 Dwellings – Secondary access onto Heathcoat Way (beyond EUE Development)

After the meeting on 15th August, the impact of construction traffic was considered and to mitigate this, it was proposed to bring forward the highway improvements and the following trigger points were proposed:

- Before construction – south slips for construction traffic
- Before occupation – Left-In, Left-Out junction and connection to Blundell's Road
- 200 Dwellings, 4,000m² Employment – Blundell's Road traffic calming phase 1 (outside Blundell's School) and improvements to Blundell's Road roundabout and Lowman Way roundabout
- 600 Dwellings, 10,000m² Employment – Full A361 Junction and phase 2 of Blundell's Road traffic calming
- 2,000 Dwellings, 40,000m² Employment – Secondary access onto Heathcoat Way

6. Appendix 1: Zonal Map