

Cambridgeshire County Council



A605 Elton Junction



Accident Investigation Report

5 June 2006

Report no: 0001-WX22338-WXR-01



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1 Introduction

- 1.1 This report considers the road traffic accidents occurring at the A605/B671 Elton junction and the possible remedial measures that could be implemented to address the accidents.
- 1.2 There is a long history of road traffic accidents at this junction. Background information has been provided dating back to the early 1990's with local residents and the Parish Council expressing concerns over the junction.
- 1.3 Cambridgeshire County Council has been seeking to implement a roundabout at this junction for 11 to 12 years.
- 1.4 The proposed roundabout has been delayed due to concerns by the adjacent landowner who has resisted the construction of a roundabout and maintained that they would take any compulsory purchase order to public inquiry.
- 1.5 This report is an update of the reviews and studies already carried out on the junction and possible remedial measures and to update of the construction costs and accident savings of the various measures.

2 The Site

- 2.1 The site is a left-right staggered crossroads on the A605 west of Peterborough. The northern arm of the junction, the B671, accesses the village of Elton and Wandsworth and leads eventually to the A1(T), A47(T) and A6118. The southern arm accesses a few properties including a farm, fields and a wood. The A605 is subject to the national speed limit.



- 2.2 There is a full left-right ghost island right turn facility present with red infill and double white lines. The approaches are signed with yellow backed warning signs with reduce speed now and speed camera signs. The works carried out here are the result of low cost safety engineering measures implemented before funding was available for the proposed roundabout. The latest signs and markings work was undertaken in early 2000.
- 2.3 Visibility out of the B671 is good in both directions and well in excess of the requirements of TD42/95. This could be one of the problems at this junction as excess visibility has been known to cause problems at junctions.
- 2.4 A speed camera is located immediately southwest of the junction for eastbound traffic on the A605. The camera was installed in January 2002.
- 2.5 Speeds eastbound through the junction have decreased since the installation of the speed camera as shown below from the speed camera routine monitoring figures.

	Average	85%ile	%> 60mph	%> 75mph
June 2001	54.64	60.45	13	2
Dec 2002	47.28	53.82	2.3	2
Jun 2003*	64	74	27	2
Mar 2004	43.92	50.49	0.6	0
Jun 2004	42.92	49.05	0.4	0
Sept 2004	42.26	48.65	0.3	0
Dec 2004	43.04	49.24	0.4	0
Mar 2005	42	47.90	0.2	0
Jan 2006	40.51	46.09	0.1	0

**The June 2003 readings appear to be in error.*

- 2.6 Visibility out of the B671 is good in both directions and is in excess of what is required under the standards. There may be an issue with excessive visibility distracting drivers turning at the junction.
- 2.7 A traffic count undertaken in 2002 gave a 12-hour flow of 14,295 vehicles of which 2358 (16.5%) were heavy goods vehicles.

3 Accident Analysis

3.1 There have been 5 personal injury accidents in the 6-year period 2000 to the end of 2005. The accidents are detailed below.

Date	Time	Severity	Surface	Light	Description
29/07/2000	17:00	Slight	Dry	Day	Vehicle one emerges from minor road into path of vehicle two.
25/04/2001	15:14	Fatal	Dry	Day	Vehicle 1 pulls out of junction into path of vehicle 2.
11/05/2001	14:00	Slight	Dry	Day	Vehicle 1 emerges from side road into path of vehicle 2 on main road.
17/10/2004	07:50	Serious	Wet	Day	Vehicle 1 left road whilst driving attempting to turn left.
28/10/2004	11:30	Slight	Dry	Day	Vehicle 1 pulled out of minor road into the path of vehicle 2 travelling on major road.

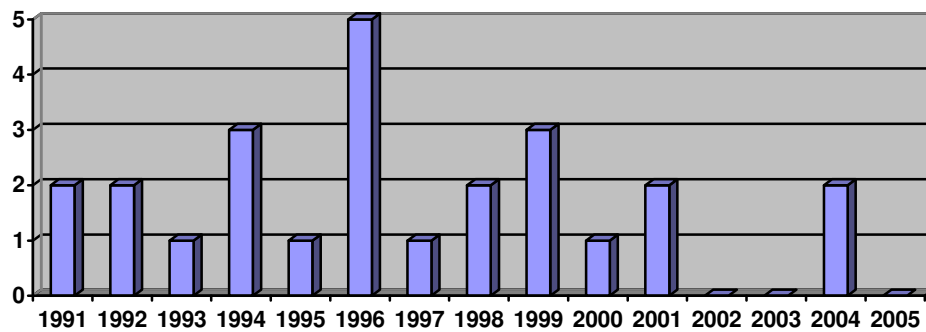
3.2 Four of the five above accidents involved a vehicle turning right out of the B671 being struck by a vehicle travelling eastbound on the A605. This is clearly the dominant accident type at this junction.

3.3 The fifth accident involved a vehicle turning left from the A605 into the B671 and losing control.

3.4 2 of the 5 accidents involved KSI casualties. There are no patterns present in the times of the accidents or any of the circumstances other than 4 of the 5 accidents have identical manoeuvres.

3.5 One of the major concerns by local residents is overtaking within the junction. There are no reported injury accidents involving overtaking in the current study period.

3.6 The historical accident record shows that the accidents have been reducing over time. This is likely to be due to the many minor improvements carried out and the installation of the speed camera.



Number of accidents at the A605 Elton Junction by year

- 3.7 As can be seen from the above chart, the accident rate since the introduction of the camera in 2002 has been low compared with previous years. In the 11 years prior to the camera there was on average 2.09 accidents per year. After the installation of the camera this has dropped to 0.5 accidents per year.
- 3.8 It is worth noting that the two accidents in 2004 occurred within 11 days of each other. It is a strange coincidence that the only two accidents to occur in a 4-year period (2002 to 2005) happened so close together.
- 3.8 The current accident cluster site criteria in Cambridgeshire is 5 accidents in 3 years.
- 3.9 The site did not appear on the 2005 Cambridgeshire County Council accident cluster site list which listed the top 135 accident cluster sites in the county (excluding Cambridge City).
- 3.10 The A605 Elton junction is therefore not an identified accident cluster site.

4 Remedial Measure Options

- 4.1 This section of the report considers the raft of options available to road safety engineers to tackle the problems experienced at this junction.
- 4.2 The majority of the options below have been considered in the past by the County Council or requested by the parish council, local residents and Sir William Proby of the Elton Hall Estate consultant, Colin Buchanan and Partners
- 4.3 The existing accident rate of 0.83 accidents per annum has been used for the site (5 accidents in 6 years) in calculating accident reductions that would be made by each scheme.
- 4.4 The actual estimated accident savings for each measure has been undertaken by an accident investigation and prevention specialist.
- 4.5 The monetary value of an accident has been calculated using Highways Economic Note 1 (HEN:1) published by the Department for Transport. The costings have been taken from HEN:1 2004 which was published on 2 December 2005. Table 4a (Average cost per injury accident including an allowance for damage only accidents) gives the cost of £86,810 at June 2004 prices. This figure has been factored to June 2006 prices (HEN:1 paragraph 13) which is £91,578 (based on GDP per capita growth of 2.96% for 2005 and 2.46% for 2006).
- 4.6 Any measures introducing physical features into the highway are likely to require the junction to be street lit. This will cost in the region of £35,000 and has been included in the costs below.
- 4.7 Below are the various options that have been considered along with their likely accident saving, works cost and first year rate of return.

Signs and Markings

- 4.8 Signs and markings are one of the widest used accident remedial measures. They are usually cost effective and can achieve respectable accident savings.
- 4.9 The Elton junction is however already well signed with warning signs with yellow backing boards, reduce speed now plates and speed camera warning signs. The junction is considered already well signed, so whilst additional signing may help, it is unlikely to have the same impact than if the junction wasn't already so well signed.
- 4.10 The signing could be improved with additional warning signs and the use of 3/2/1 countdown boards on the main road approaches.

Pro's

Inexpensive

Minimal engineering works

Con's

Already well signed so would not have a large impact on accidents.

Does not directly address the accident problem

4.11 A standard signs and markings scheme costs in the region of £2,500. As a high speed road the new requirements for passively safe street furniture is likely to increase this substantially due to the use of Lattix posts or similar approved.

4.12 A scheme such as warning signs and the use of 3/2/1 countdown markers is likely to be in the region of £8,000 including an allowance for passively safe sign posts.

4.13 The junction is already well signed and is likely to be already receiving reduced accident rates due to this. Therefore an accident saving of 14% has been given to enhanced signs and markings for the junction.

4.14 The first year rate of return is as follows:-

Scheme Cost	-	£8,000
Accident Savings	-	0.83 x 14% = 0.12 accidents per annum
Cost saving	-	0.12 * 91,578 = £10,989.36
FYRR	-	10989/8000*100 = 137%

Anti-Skid Surfacing

4.15 Anti-skid surfacing can serve two purposes. Firstly it aids in reducing stopping distances and reducing skidding. It also can be used to highlight the approach to a hazard or junction by providing a contrasting surface.

4.16 Anti-skid surfacing can be scrubbed off by turning traffics tyres so is not recommended for use within the area of a junction experiencing turning traffic. The approaches would not suffer from this.

4.17 It should be noted that anti-skid surfacing is unlikely to reduce conflicts but it may reduce the severity and whether an impact occurs.

Pro's

Low amount of construction works

Con's

Unlikely to address conflicts direct

Maintenance issues

- 4.18 100 metres of antiskid surfacing on the eastbound approach to the junction is likely to cost in the region of £6,500.
- 4.19 Accident savings are likely to be lower than signing and lining. 10% accident saving has therefore been assumed.
- 4.20 The first year rate of return is as follows:-
- | | | |
|------------------|---|---------------------------------------|
| Scheme Cost | - | £6,500 |
| Accident Savings | - | 0.83 x 10% = 0.08 accidents per annum |
| Cost saving | - | 0.08 * 91,578 = £7326 |
| FYRR | - | 7326/6500*100 = 112% |

Interactive Signing

- 4.21 Interactive signing uses an illuminated sign to flash up a message to drivers when a set approach speed is exceeded. The message can be one of the standard warning signs, text or a combination of both. It is also possible to trigger the signs with an induction loop for example on the side road.
- 4.22 Recorded average speeds at this junction do not appear to be excessive therefore the average vehicle wouldn't set the sign off. An interactive warning sign would only be of benefit to the high-end speeders. However, it is these high-end speeders that are traditionally involved in more accidents.
- 4.23 Options for interactive signs include junction warning signs, vehicles crossing (triggered by an induction loop on the side road) or a speed camera warning sign.

Pro's

- Cost effective
- Minimal engineering works
- Targets the high-end speeders

Con's

- Police unlikely to support an interactive speed camera sign
- Would not make any difference to the majority of vehicles.
- Does not assist turning traffic

- 4.24 An interactive sign will cost in the region of £8000.
- 4.25 Accident savings of 25% have been assumed. High
- 4.26 The first year rate of return is as follows:-

Scheme Cost	-	£8,000
Accident Savings	-	$0.83 \times 25\% = 0.21$ accidents per annum
Cost saving	-	$0.21 * 91,578 = £19,231$
FYRR	-	$19231/8000 * 100 = 240\%$

Single Lane Dualling

- 4.27 Single lane dualling involves installing a central reserve through the hatching of the ghost island right turn facility. This provides physical segregation of the main road and offers additional protection for vehicles waiting to turn right.
- 4.28 These works would highlight the junction, increase driver awareness and can have the effect of giving drivers the perception of a narrowing carriageway and thus reduce speed.
- 4.29 The single lane dualling also prevents overtaking through the junction, however there are no accidents on record resulting from overtaking through this junction.
- 4.30 Due to the widening of the road it is likely that the give way line for the B671 may be relocated further north. This may reduce visibility to the right for vehicles emerging from Elton.
- 4.31 It is possible that problems could be introduced here if a vehicle was to breakdown within the junction as vehicles behind may have difficulty overtaking if it blocks too much of the carriageway.
- 4.32 Single lane dualling would require street lighting as it introduces construction in the centre of the highway.

Pro's

- Highlights the presence of the junction to approaching drivers
- Prevents overtaking
- May reduce speeds

Con's

- Does not directly address the accident problem
- Expensive
- Requires land take
- May reduce visibility to the right for vehicles emerging from Elton
- Requires major engineering works

- 4.33 To install single lane dualling through the junction would cost in the region of £250,000.
- 4.34 Accident savings of 25% have been assumed.

4.35 The first year rate of return is as follows:-

Scheme Cost	-	£250,000
Accident Savings	-	$0.83 \times 25\% = 0.21$ accidents per annum
Cost saving	-	$0.21 * 91,578 = £19,231$
FYRR	-	$19231/250000 * 100 = 8\%$

Wide Single Lane Dualling

4.36 Wide single lane dualling involves installing a wide central reserve through the right turn facility. This allows vehicles turning right out of the side road to cross the main road lanes one at a time. Rather than waiting for a gap in the two streams of traffic, turning traffic can cross each on individually resulting in less frustration.

4.37 It is possible that problems could be introduced here if a vehicle was to breakdown within the junction as vehicles behind may have difficulty overtaking if it blocks too much of the carriageway.

4.38 Wide single lane dualling would require street lighting.

Pro's

Addresses part of the accident problem

Highlights junction presence

May reduce speeds

Con's

Requires major engineering works

Requires larger amount of land take and would be expensive

May affect visibility from side roads

4.39 To install wide single lane dualling through the junction would cost in the region of £300,000.

4.40 Accident savings of 50% have been assumed.

4.41 The first year rate of return is as follows:-

Scheme Cost	-	£300,000
Accident Savings	-	$0.83 \times 50\% = 0.42$ accidents per annum
Cost saving	-	$0.42 * 91,578 = £38462.76$
FYRR	-	$38462/300000 * 100 = 13\%$

Parallel Left Turn Slip

- 4.42 The parallel left turn slip has a deceleration lane for vehicles turning left. Into the side road. This allows a vehicle to perform the majority of the braking for the turn out of the main through lane reducing possible conflict with vehicles behind.
- 4.43 It can be of benefit at locations where left turning traffic causes shunt accident type problems or where vehicles exiting a side road wrongly assume that the approaching vehicle is turning left.
- 4.44 Left turn slips have also been known to cause problems. There can also cause confusion when a vehicle waiting in the side road wrongly assumes that an approaching vehicle is going to turn left but it is continuing straight ahead.
- 4.45 The other common historical problem with parallel left turn slips is that a vehicle using the left turn slip can mask a vehicle that is overtaking it. A driver waiting to turn right out of the junction may not see an eastbound vehicle on the A605 as it is hidden behind the vehicle in the parallel left turn slip.

Pro's

Would require minimal land take.

Reduces conflicts on eastbound A605 due to braking vehicles

Con's

Does not directly address the accident problem

Could introduce 'masking' which would make accident problem worse.

Creates an additional conflict point at the end of the slip lane.

- 4.46 To install a parallel left turn slip at the junction would cost in the region of £175,000.
- 4.47 Accident savings of 10% have been assumed. This value may be high as there are concerns that the parallel left turn slip could introduce problems at this location.
- 4.48 The first year rate of return is as follows:-

Scheme Cost	-	£175,000
Accident Savings	-	$0.83 \times 10\% = 0.08$ accidents per annum
Cost saving	-	$0.08 * 91,578 = £7,326$
FYRR	-	$7326/175000 * 100 = 4\%$

Central Islands

- 4.49 Small central islands located within the ghost island right turn facility can be used to highlight the presence of the junction to approaching drivers and to prevent overtaking through the right turn lanes.
- 4.50 Islands also create the perception of narrowing the carriageway which can reduce through speeds through the junction.
- 4.51 Islands would require street lighting which would also further highlight the junction.

Pro's

- Would not require major engineering works
- Would highlight the junction to approaching drivers
- Would reduce speeds through the junction

Con's

- Does not directly address the accident problem
- The islands could be missed and hit by vehicles.

- 4.52 To install small central islands at the junction would cost in the region of £55,000.
- 4.53 Accident savings of 15% have been assumed.
- 4.54 The first year rate of return is as follows:-

Scheme Cost	-	£55,000
Accident Savings	-	$0.83 \times 15\% = 0.12$ accidents per annum
Cost saving	-	$0.12 \times 91,578 = £10989$
FYRR	-	$10989/55000 \times 100 = 20\%$

Long Traffic Islands

- 4.55 This measure is similar to single lane dualing but is a cheaper alternative and requires less alteration to the junction.
- 4.56 The main benefits include highlighting of the junction to approaching drivers and the prevention of overtaking manoeuvres through the right turn facility.
- 4.57 It is possible that problems could be introduced here if a vehicle was to breakdown within the junction as vehicles behind may have difficulty overtaking if it blocks too much of the carriageway.

Pro's

Less engineering works than some options

Would reduce speeds through the junction

Con's

Does not address accident problem

Could cause issues if a vehicle breaks down within the junction.

Does not offer full protection to vehicles waiting to turn right.

4.58 To install long islands the junction would cost in the region of £95,000.

4.59 Accident savings of 20% have been assumed.

4.60 The first year rate of return is as follows:-

Scheme Cost	-	£95,000
Accident Savings	-	$0.83 \times 20\% = 0.17$ accidents per annum
Cost saving	-	$0.17 * 91,578 = £15568$
FYRR	-	$15568/95000 * 100 = 16\%$

Traffic Calming – Rumble Strips

4.61 Due to the speed of the road the majority of traditional traffic calming measures are not appropriate. Measures such as road humps and speed cushions can only be used in a 30mph limit. Priority narrowings and the like are liable to cause serious accidents at this location.

4.62 One traffic calming feature that may be of benefit are rumble devices. These features make a sound as drivers run over them alerting them to a danger ahead.

4.63 The main disadvantage is that as well as creating noise for drivers, rumble strips also create noise outside the vehicle. Advice is that these features should not be located 200 to 300 metres from residential properties. There are a number of residential properties that would fall within this distance.

Pro's

Con's

Cost effective

Noisy for local residents

Minimal engineering works needed

Low accident savings

Would reduce speeds through the junction

4.64 To install rumble strips on the approach to the junction would cost in the region of £3,000.

4.65 Accident savings of 25% have been assumed.

4.66 The first year rate of return is as follows:-

Scheme Cost	-	£3,000
Accident Savings	-	0.83 x 25% = 0.21 accidents per annum
Cost saving	-	0.21 * 91,578 = £19231
FYRR	-	19231/3000*100 = 640%

Restricted Movements

4.67 It is possible to ban turning manoeuvres at the junction. This would require a traffic regulation order.

4.68 4 of the 5 current accidents involve a vehicle turning right out of the Elton junction. Therefore banning this turn would resolve the accident problem at this location.

4.69 The major dis-benefit is that the right turn out of the junction is the quickest route to areas west of Elton such as the urban centres of Oundle and Corby. It is highly unlikely that drivers will be prepared to either drive 10km to the Haddon services roundabout by the A1 or to use the low standard back roads north of Elton. This will result in drivers undertaking U-turns along the A605 or using side roads to turn around in. This could create serious accident problems at other locations along the route.

Pro's

Con's

Addresses accident problems

Long diversion route

Minimal engineering works

Will increase U turning on A605

Cost effective

Some drivers may illegally turn

4.70 To ban the right turn out of the junction would cost in the region of £3,000.

4.71 Accident savings of 50% have been assumed. Further detailed analysis may be required to ascertain the effect on road safety away from the junction where there may be an increase in turning accidents including serious U-turn issues.

4.72 The first year rate of return is as follows:-

Scheme Cost	-	£2,500
Accident Savings	-	0.83 x 50% = 0.42 accidents per annum
Cost saving	-	0.42 * 91,578 = £38462
FYRR	-	38462/2500*100 = 1538%

Traffic Signals

4.73 Traffic signals could be employed at this junction and would assist turning traffic.

4.74 Although traffic signals would solve the turning accidents, they would cause shunt accidents. Signals on high-speed roads will almost always suffer from shunt type accidents. Advanced signing and anti-skid surfacing can reduce the number of shunt accidents occurring but there are no measures that can be used to ensure that no shunt accidents ever occur.

4.75 It is unlikely that traffic signals will make any improvements to the accident rate and will simply change the dominant accident pattern here from right turns out of the side road to shunt accidents and right turns into the side road.

4.76 Traffic signals would require street lighting, advanced signing and anti-skid surfacing on the approaches.

Pro's

Addresses accident problems

Assists turning manoeuvres

Con's

Will cause shunt accidents and could still have 'right turn in' type collisions.

Interrupts flow of A605 and will introduce delays

Expensive

Maintenance implications

4.77 To signalise the junction would cost in the region of £300,000.

4.78 No accident savings have been attributed to the traffic signals scheme as the number of accidents created are likely to be on a par with the current accident levels. The only savings are likely to be on a reduced severity basis.

Roundabout

- 4.79 Roundabouts are one of the safest forms of junction, and are also one of the most expensive.
- 4.80 A roundabout would require a large amount of land. Whilst addressing the turning accident problem at the junction, a roundabout would introduce new accident problems such as shunt accidents and failure to give way especially on a high-speed route such as this.
- 4.81 A roundabout would require street lighting.
- 4.82 A roundabout would make accident savings, but these would not be as high due to the transfer of one form of accident to another.

Pro's

Addresses accident problems
Aids all turning manoeuvres

Con's

May result in other accident types
Large land take required
Major engineering works and will cause disruption during construction
Extremely expensive

- 4.83 Large cost schemes such as roundabouts and bypasses are not usually justified on first year rate of return type calculations due to their disproportionately higher costs. Schemes of this size are usually judged with scoring systems taking into account the cumulative benefits of the scheme such as assisting turning traffic, aiding vulnerable road users to cross the highway and reducing severance of the community.
- 4.84 To install a roundabout, the costs would be in the region of £750,000.
- 4.85 Accident savings of 20% have been assumed.
- 4.86 The first year rate of return is as follows:-

Scheme Cost	-	£750,000
Accident Savings	-	$0.83 \times 20\% = 0.166$ accidents per annum
Cost saving	-	$0.166 * 91,578 = £15201$
FYRR	-	$15201/750000 * 100 = 2\%$

5 Remedial Measure Comparison

5.1 The table below compares the possible remedial measures detailed in section 4 of this report.

Scheme	Cost	Number of Accidents Saved per Annum	Accident Cost Saving Per Annum	FYRR
Signs and Markings	£8,000	0.12	£10,989	137%
Antiskid Surfacing on Approach	£6,500	0.08	£7,326	112%
Interactive Signing	£8,000	0.21	£19,231	240%
Single Lane Dualling	£250,000	0.21	£19,231	8%
Wide Single Lane Dualling	£300,000	0.42	£38,462	13%
Parallel left turn slip	£175,000	0.08	£7,326	4%
Central Islands	£55,000	0.12	£10,989	20%
Long Traffic Islands	£95,000	0.17	£15,568	16%
Rumble Strips	£3,000	0.21	£19,231	640%
Banned Turns	£2,500	0.42	£38,462	1538%
Signalisation	£300,000	0.00	N/A	N/A
Roundabout	£750,000	0.17	£15,201	2%*

*As noted in 4.83, simple FYRR calculations are not applicable to large schemes such as roundabouts.

6 Conclusions

- 6.1 The most cost effective remedial measure would be to ban the right turns at the junction. Whilst this will directly address the accident problems, it has a number of drawbacks. Firstly, the diversion routes are excessive and banning the turns will lead to increased turning movements including U turns on the A605. Secondly, there are likely to be a number of drivers who disobey the restrictions and turn right at the junction increasing the risk of accidents.
- 6.2 The wide single lane dualling will directly address the accident problems by allowing right turning drivers to do the manoeuvre in two movements. This will allow drivers to concentrate on one direction at a time and reduce driver frustration. However, this is an expensive scheme and would require major engineering works.
- 6.3 Other schemes such as signalisation and a roundabout will introduce other types of accidents. The first roundabout east of Elton has 6 accidents in the same study period (1 fatal, 2 serious, 3 slight). The first roundabout to the west is in Northamptonshire and has had no accidents in the last 3 years. The next roundabout at Oundle has experienced 3 serious and 2 slight accidents in the last 3 years.
- 6.4 The installation of the safety camera has appeared to have reduced the number of collisions occurring at this junction and major works are not justified on accident grounds.
- 6.5 Minor improvements such as interactive signs, antiskid, signs and markings and rumble strips could make modest accident savings but the cost has to be justified against the other sites within the county that have a worse accident record than this site.