



**Turbo Roundabout,
Clapham Road-
Tavistock Street,
Bedford**

Stage 1 Road Safety Audit

May 2013

P843264

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REVISION SCHEDULE

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	May 2013	Issue of draft report to Client	Chris Brown Audit Team member	Mrs E Sands Audit Team leader	Mrs E Sands Associate Director

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1. INTRODUCTION

1.1 Brief

This report results from a Stage 1 Road Safety Audit carried out on the proposal to convert an existing four arm roundabout in Bedford to a 'Turbo' Roundabout. The roundabout forms a junction with Tavistock Street, Clapham Road, Union Street and Roffe Avenue.

The audit was requested by Mr Allan Burls of Bedford Borough Council, Borough Hall, Cauldwell Street, Bedford, MK43 9AP.

The Audit Team membership was as follows: -

Mrs E Sands	MSc (Road Safety Engineering) FCIHT, FSoRSA
Audit Team Leader	URS Infrastructure & Environment UK Limited, Bedford

Chris Brown	HNC (Civ. Eng), MCIHT, MSoRSA
Audit Team Member	URS Infrastructure & Environment UK Limited, Bedford

The audit comprised of a review of the drawings provided, which are listed in Appendix **A** and a site visit that was undertaken by both members of the audit team together on Tuesday 30 April 2013 between 11:00 and 11:45hrs. The weather during the site visit was fine and the roads surfaces were dry.

The terms of reference of the audit are as described in HD19/03. The team has examined and reported only the road safety implications of the scheme as presented and has not examined or verified the compliance of the designs to any other criteria. Therefore only the items raised as **PROBLEM** are relevant to the scheme as presented in Appendix **B** and audited in accordance with HD19/03.

1.2 Scheme Description

The roundabout originally operated with two lane flared entries on all approaches with wide circulatory carriageway, which although not marked was effectively two lanes. The Union Street entry is marked such that the left hand lane is for left turning traffic only. All other arms are left/ahead and ahead/right. Congestion is a problem in this area at peak times but when traffic is light vehicle speeds can be quite high due to poor entry deflection and wide entry arms. Traffic entering from Tavistock Street can be travelling fairly fast. There are dropped kerb crossings on all arms. A staggered signalised crossing of Clapham Road is located opposite Clarendon Street with the extended island preventing right turns into Clarendon Street and Slade Walk. Livingstone Lower School is located at the end of Slade Walk, therefore it is assumed there will be a high degree of pedestrian activity at this crossing.

The proposal is to convert this junction to a Turbo Roundabout, which is a concept developed in the Netherlands. The circulatory carriageway is altered such that raised markings are deployed to achieve a specific form of 'spiralisation' designed to eliminate circulatory collisions and entry exit conflicts. This is achieved by directing traffic into the correct lane before entry with the spiral lines guiding the vehicle around the circulatory carriageway, effectively reducing the number of conflict points from 16 to 10. Turbo Roundabouts in the Netherlands increase capacity by over 40% but are always installed where there are no cyclists on the route as there are separate cycle facilities.

The current situation is that there are some advisory cycle lanes on the Union Street. This follows on from the more formal advance stop lines at the junction at the southern end of Union Street. This facility is poorly implemented and is lacking in some road markings. There are no signs to indicate the presence of the cycle route or any formal signs. The northbound cycle lane on Union Street appears to just disappear just north of the junction with Warwick Avenue where the sharp flare occurs to develop the second lane approach to the roundabout. The only indication of its presence is a "cycle" symbol on the carriageway but no broken longitudinal line.

It is proposed to implement advisory cycle lane on all approaches however there are no details of how these tie in with the existing highway, with Union Street being the only arm with any facilities. The presence of advisory cycle lanes rather than fully segregated routes does not align with the Dutch implementations of Turbo Roundabouts; furthermore the inclusion of Zebra Crossings on each arm may encourage the use of the circulating footways by less experienced / less confident cyclists. The provision of these pedestrian facilities is not in accordance with the original design for this type of roundabout in the information supplied at the time of the road safety audit.

2. ITEMS RAISED AT THIS STAGE 2 AUDIT

The following Problems are listed in the order they were identified whilst walking around the proposed works.

The Road Safety Audit team is not aware of any previous road safety audits having been completed for this scheme.

The Road Safety Audit team is not aware of any Departures from Standard having been applied for or granted in relation to this scheme.

2.1 PROBLEM

Locations: A (Dwg. No. RSA1)

Summary: Private Access crosses combined pedestrian/cycle route.

Details: The proposal takes no account of the existing private drive to the property on the corner of Union Street and Clapham Road. This property is a large house converted to flats and has a number of parking places. Therefore it is likely that this access is well used. At present there dropped kerbs onto what is effectively the circulatory carriageway, the access is fairly conspicuous and its presence is highlighted by the change in surfacing from flagstones to tarmac. It is likely that there is some existing interaction between vehicles and pedestrians in this area, however the vehicle drivers will be aware of the presence of pedestrians and the pedestrians should be aware of the presence of the private access. By encouraging cyclists to use the footway in this area additional conflicts are introduced. It is likely that the cyclists will be travelling at higher speeds and therefore drivers entering or exiting the private access may not see the cyclist leading to potential collisions. No details have been provided of the proposed traffic signs for this scheme therefore it is not possible to comment on this aspect of the works.

RECOMMENDATION

It is recommended that the presence of the private access is highlighted with some form of road marking. If it is felt that this is insufficient then it is recommended that this section of the cycle lane is removed and cyclists dismount signs are installed on this quadrant to ensure that cyclists are not travelling in this area at speed and are therefore not in conflict with any motor vehicles using the access.

Design Team Response

At this stage of the process it would be our intention to put in place a give way marking on the vehicle access at the back of the footpath to highlight to vehicles they should be stopping at this point to ensure the footpath is clear prior to pulling across to access the carriageway. This could be further enforced by some form of warning sign highlighting the presence of cyclists.

Project Sponsor Comment

Agree with Design Team Response, no cyclist dismount signs required as this would be in direct opposition of the schemes aims of improving the movement of cyclists through this junction.

2.2 PROBLEM

Locations: General (Dwg. No. RSA1)

Summary: Thermoplastic humps may cause problems to powered two wheeled users.
Perception of roundabout may cause problems with all users.

Details: It is unclear as to the profile of the markings proposed. Powered two wheeled users may not be expecting the circulatory carriageway markings to be full profile and this may cause loss of control incidents.

RECOMMENDATION

Consider using rumble strip type profile markings rather than full profile markings until the concept is understood and accepted. Consider using Dutch style lane arrows and signs (approval will be required).

Design Team Response

As the design progresses we will be investigating appropriate hard delineations. The current proposal is for some form of bolt down trapezoidal section arrangement tall enough to prevent overrun. This is an integral part of the operation of the roundabout and by only putting in a half measure this will render the design concept void and allow the use of the roundabout as a regular roundabout. With regards to materials proposals will be discussed with the Motorcycle User Group Forum BBC already engage with to capture their thoughts. Talk are already underway with the DfT to find suitable acceptable road marking and signing proposals for this scheme and discussions are also underway relating to advertising the arrangement in local publications and educating the public in the correct way of using the roundabout.

Project Sponsor Comment

Agree with Design Team's response

2.3 PROBLEM

Location: C (Dwg. No. RSA1)

Summary: Lack of cycle/pedestrian signing.

Details: The proposal is to add advisory cycle lanes on all four approaches. In order for the 'Turbo' Roundabout to operate correctly cyclists will not be permitted to enter the roundabout (doing so would require them to negotiate a raised thermoplastic marking. As a result cyclists are required to leave the carriageway prior to each entry. No details of road traffic signs have been provided. It is assumed that this cycleway will be shared with pedestrians and that cyclists will be required to dismount to cross the Zebra Crossings.

It is not illegal to cycle across a Zebra crossing if there is shared-use to either side, but it is contrary to Rule 64 of the Highway Code which states that cyclists should dismount and walk across Zebra crossings. Breach of the Highway Code could be used as evidence of an offence, e.g. cycling dangerously, or of evidence of negligence in the event of a collision.

RECOMMENDATION

Clarify the intended use of the cycle route and Zebra Crossings in line with current UK legal framework to ensure that cyclists are clear of their rights, priorities and interaction with other road and NMU users. Ensure that suitable cycle signs are installed indicating where shared use exists and where cyclists should dismount. Provide uncontrolled crossing warning signs where necessary.

Design Team Response

As this is only Stage 1, and a very early stage of the design process detailed sign designs are not yet formulated. It is proposed to make the footpaths around the roundabout shared use and these will be clearly signed.

Project Sponsor Comment

Auditors have misunderstood the proposed working of the roundabout and assume that cyclists will be required to not use the roundabout, whereas it is the opposite, the design is to make the roundabout safer for cyclists (and other road users) to use. Happy with Design Team response except for the omission of this point.

2.4 PROBLEM

Location: D (Dwg. No. RSA1)

Summary: Lack of lane destination signing

Details: Whilst the 'Turbo' Roundabout concept is well established in the Netherlands it has not been implemented in the UK. It is understood that the implementation is in the approval process with the Department for Transport.

It is not possible to ascertain from the information provided what advance signing there will be on each approach. The Dutch have special arrow signs and road markings (as shown below) to indicate that certain movements are not possible from certain lanes. These markings would also require approval if that has not been applied for as part of the overall approval process. Verge mounted signs may also be of assistance.

Whatever information is provided it is unlikely that the average UK road user will appreciate that lane discipline is more of an issue in this instance. Therefore it is likely that until this form of 'Turbo' Roundabout becomes more common place on the UK roads some drivers may ignore, or simply not understand the lane markings and follow the advice contained within the Highway Code; or simply take the path of least resistance. There is at least one roundabout in Bedford where vehicles execute a right turn from within the left hand lane and outside lane of the circulatory carriageway due to the prevalent congestion problems. It is imperative that all road users are made fully aware that the left hand lane is for left-turning traffic only, not straight on. It is not clear how the Dutch made the transition from normal to Turbo Roundabouts and if there were any issues.

RECOMMENDATION

Ensure that all drivers are fully aware of the change in the rules of the road at this roundabout. As a minimum a new road layout warning sign should be installed. Consultation with the DfT and reference to the early Dutch trials should be carried out to ensure that all possible measures are taken to make drivers aware of the unique nature of this roundabout. Perhaps some use of the word "Trial" or "Experimental" could be included in the warning sign to alert drivers to this. Monitoring of this junction at Stage 4 would also be advisable to determine



Provide information to the public through the local press and via posters in public locations as to the theory behind the operation of the roundabout to assist with the understanding of the way the roundabout will operate.

Design Team Response

As discussed above plans are already being put in place for publicising the workings of the roundabout in order to better inform the public and talks are underway with the DfT. It is worth noting that this roundabout does not change the rules of the road merely asks drivers to access the correct lane for their destination before entering the roundabout and to stay in that lane minimising conflict points on the circulatory area from people making last minute changes that other drivers would not be expecting.

Project Sponsor Comment

Happy with Design Team response.

3. AUDIT TEAM STATEMENT**Turbo Roundabout, Clapham Road-Tavistock Street, Bedford
Stage 1 Road Safety Audit**

I certify that this audit has been carried out in accordance with HD 19/03.

AUDIT TEAM LEADER

Mrs E Sands

Signed

Audit Team Leader

E Sands

URS Infrastructure & Environment UK Limited

Date

URS House

07 May 2013

Horne Lane

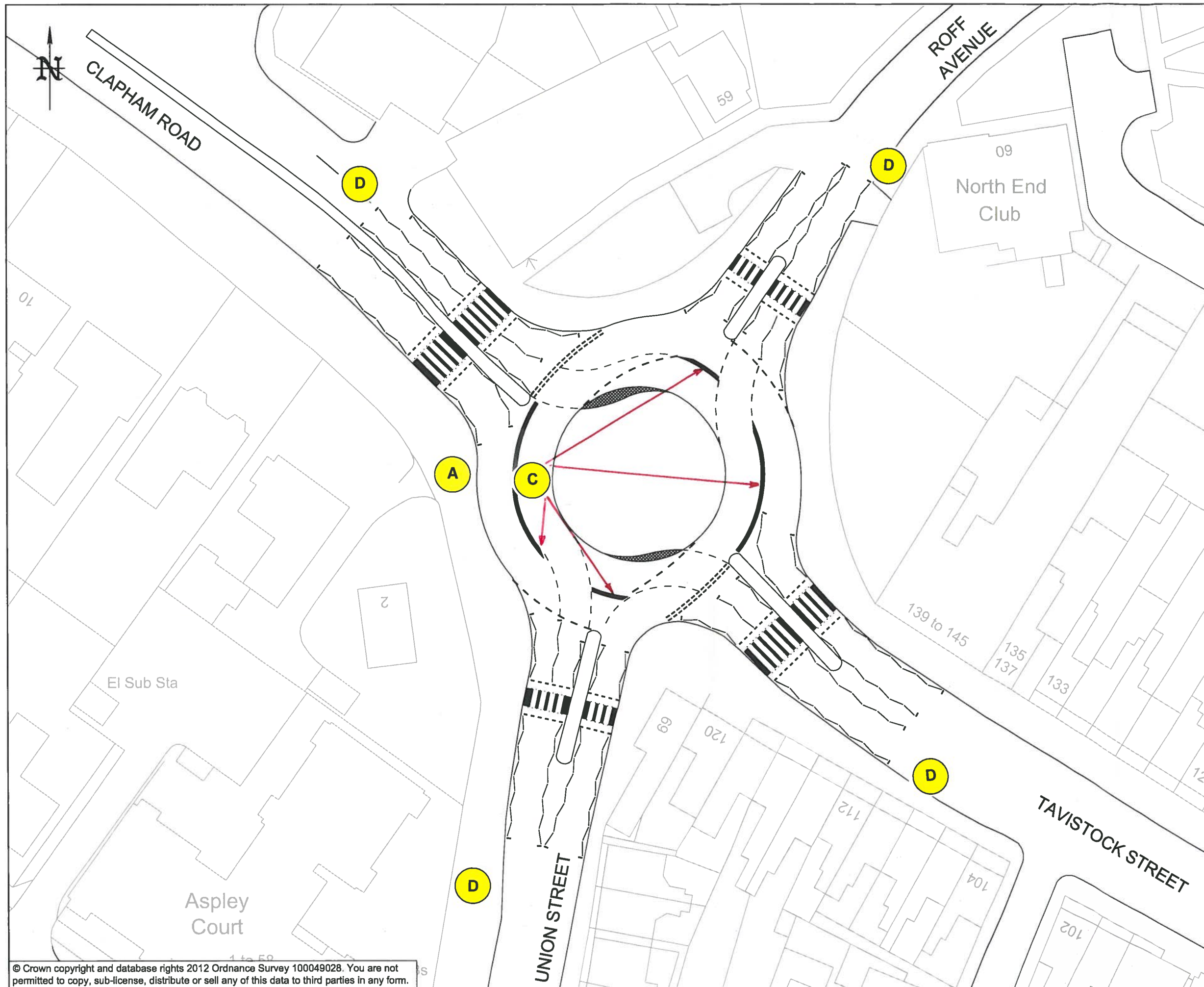
Bedford

MK40 1TS

APPENDIX A LIST OF DRAWINGS

Number	Title
00	Indicative Layout. Scale 1: 500 @ A3 drawing size.
Google view	
Collision Data	
Turning traffic data	

APPENDIX B PROBLEM LOCATION PLANS



PRINTS FROM THIS DRAWING ARE
UNCONTROLLED UNLESS OTHERWISE STATED

A3

NOV '12	First Issue	0	ABC
DATE	AMENDMENTS	REV	BY



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CLIENT
**Environment and
Sustainable Communities**

SCHEME
**Turbo Roundabout
Clapham Road - Tavistock Street**

DRAWING TITLE
Indicative Layout

DRG No. **RSA1**

DRG STATUS
Information

SCALE @ A3 1:500	DATE NOV '12	DRAWN ABC	CHECKED ACB
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