UNION STREET ROUNDABOUT SAFETY IMPROVEMENTS

EXECUTIVE SUMMARY

Funding has been successfully obtained to tackle Union Street roundabout, a junction which has been identified as having the highest concentration of cyclist accidents within the Borough. The proposal is to install a new type of roundabout taking influences from the Dutch ‘turbo’ roundabouts with the goals being to make the junction safer for cyclists and pedestrians whilst attempting to maintain optimum capacity.

Following completion of the detail design and consultation process the entire scheme was subjected to a Stage 2 Safety Audit and this report seeks to highlight those issues which can not be designed out of the scheme prior to Senior Management deciding whether this scheme should be implemented.

Should the scheme proceed Section 4 highlights the risks which will exist, largely by the roundabouts innovative design. These risks largely concern the construction of traffic islands within the roundabout and the potential hazard these will present to vulnerable road users, especially power two wheelers. It will be required for the person responsible for making this decision to accept the designers comments within the Safety Audit Report as the Project Sponsor.

If the scheme does not proceed the junction will continue to be of high risk to both pedestrians and cyclists hindering non-motorised travel to the railway station and Biddenham School, key objectives of the Borough’s Active Travel Strategy.

1.0 Project Introduction

1.1 Introduct ion

In September 2009 Bedford Borough's Walking and Cycling Officer submitted an expression of interest to Sustrans who are managing a £15 million fund made available by the DfT. The purpose of this fund is to improve cycle safety at hazardous junction or short sections of highway. Additional criteria included full analysis of accident data, evidence of problem from stakeholders, details of work with stakeholders to identify most risky sections, evidence that this has been identified in a review of all accidents, an assessment of whole cycle network, connectivity of proposal to cycle network.

This junction was selected as an analysis of cycle accidents between 2004 and 2010 found that the roundabout had 2 serious cycle accidents and 3 slight cycle accidents. This represents the highest concentration of serious cycle accidents in Bedford Borough over that period.

This junction is also one of the busiest in the Borough. On average 25,000 vehicles, 2,500 pedestrians (including 200 children) and 500 cyclists use the junction in a typical 12 hour period. It is recognised as being a difficult junction to navigate for the large number of pedestrians, as there are very limited crossing facilities. The roundabout lies on the major cycle inner orbital route (the "Avenue Route") leading from Roff Avenue to Union Street, which links to the routes north to Brickhill and north east to Putnoe and Woodside and south to the town centre or to the rail station. This major north-south route through the roundabout for cyclists conflicts with the main flow for cars and HGVs from Union Street north east along Clapham Road.

The roundabout itself has a wide circulating carriageway, dual lane entries from Union St and Clapham Road and heavy car, HGV and bus flows. The proposal is, in line with the compact style, to reduce the circulating carriageway to single lane and the exit from Union Street to single lane, to include Zebra crossings on at least 3 of the arms and to alter the angle of entry and exit to reduce vehicle speeds.

1.2 The Initial Concept

Shortly after submitting the expression of interest notification was received that this scheme would be considered for funding and an application form sent for completion. This required an outline design to be completed along with detailed costs.

As the junction is very heavily used by cars, cyclists and pedestrians a new design was felt necessary to ensure it could continue to deal with the level of traffic as well as providing vastly improved access for cyclists and pedestrians

with clear on-road and off-road provisions. Whilst considering a number of factors it was discovered a form of roundabout commonly seen in the Netherlands, a turbo roundabout, could be adapted for this location and meet the required goals. Studies and experience in other countries have shown that this type of junction can improve pedestrians and cyclist provision while also reducing potential safety issues. In most ways the design is exactly the same as a normal roundabout, you enter the roundabout giving way to traffic from the right; you circulate and leave at your chosen exit. The main difference with a turbo-roundabout is that you must choose which lane you take before you enter the roundabout, this will depend on your exit. Once in the correct lane, you will be guided towards your desired exit by line markings and small traffic islands, you will not be able to change lanes on the roundabout. Four discrete islands separating the traffic lanes in key areas to lead vehicles from the roundabout would prevent motorists from changing lanes or cutting in front of other motorists on the roundabout thus reducing the number of potential conflict points common on all roundabouts. By altering the entry and exit widths on all arms of the roundabout , coupled with traffic now being channelized, it is predicted that the speed of traffic will be lowered leading to a safer environment for cyclists and motorists alike whilst the addition of zebra crossings on all arms would aid pedestrian movements.

1.3 Detailed Design

The bid was submitted and successfully achieved funding of £300k and this was accepted by the Mayor (Decision No. 116) on the 28th May 2013. From this point various surveys were undertaken to allow a detailed design to be carried out including the use of specialist software to track various HGV's movements around the roundabout. The results of these tracks were then used to ascertain where the discrete islands could be formed to minimise over run and the extent to which entry and exit flares could be narrowed. ,

An illustrative layout of the design can be found in Appendix 1.

1.4 How it will work

What will it be like for:-

Car drivers, motor-cyclists and van drivers? Drivers will choose their lane depending on their exit as they approach the roundabout, advance signing will be used to make this as clear as possible. Once they enter the roundabout, they will circulate at speeds around 15mph, keep in their lane and be led off or decide to leave at their correct exit. The roundabout will seem just like every other roundabout, except that they will have to keep to their lane due to raised islands rather than jumping lanes. Additionally, for the main flows from Clapham Road, Union St turning left and Tavistock St, motorists will be able to enter the roundabout more easily as they will only have to look out for <u>one</u> lane of traffic from the right rather than 2, hence the potential for smoother, safer and higher flows.

Cyclists? Cyclists will have a choice.
On-road cyclists (currently 350 per day) will stay on the road and use it like a normal roundabout and follow the same paths as drivers around the roundabout. However, this should feel safer than now, as other vehicles will be moving at slower speeds more similar to cyclists. Once on the roundabout, they will not have to contend with conflicting movements and will be led off or choose to leave at their chosen exit. The lanes will be relatively narrow so that confident cyclists can take possession of the lane i.e. to cycle in the middle of the lane. However, they are also sufficiently wide if a cyclist is cycling very slowly to the left of the lane that cars (but not buses or HGV's) will be able to overtake slowly.

Off-road cyclists (currently 200 per day) will move off-road to their left as they approach the roundabout onto a dedicated shared path. They can then cross the arms of the roundabout much more easily (but with care) at the Zebras and rejoin the road at cycle lanes downstream from the roundabout. We expect most cyclists will stay on their cycles at the Zebras and wait for traffic to cede them priority (see TfL study on cycling Zebras). It is not illegal for cyclists to cycle across a Zebra, but they do not have priority.

Pedestrians? Whereas now, the 2500 pedestrians per day have absolutely no assistance crossing the arms, except the splitter islands, and everyone, including children, disabled and old people have to contend with and judge high entry and exit vehicle speeds, they will now have Zebra crossings on their desire lines at every roundabout arm. Additionally, vehicles should be approaching these crossings at lower speeds, so that it will feel and be both safer and more convenient.

2.0 Consult ation Process

2.1 Zebra Crossings

The installation of zebra crossings is subject to statutory consultation, copies of the notice were placed on Site and posted to residents in the vicinity of the area on Thursday 8th August 2013 whilst a copy of the notice appeared in the Bedford Times and Citizen, the consultation process closed on the 18th September 2013. This process resulted in 3 responses being received; two in support and one against (see Appendix 2).

These were forwarded to the safety audit team and they were asked to ensure that any relevant observations were considered within their report.

2.2 The 'Turbo' Roundabout

Whilst there was no legal requirement to consult on the measures involving the new roundabout layout it was felt that as this is to be the first of its kind in this country that to not seek wider opinion would be a serious omission and as such documents were made available on the Borough's website and an extensive list of consultees were identified to be offered the chance to offer their opinion.

A brief transcript of the responses to this consultation process is included in Appendix 3.

These were forwarded to the safety audit team and they were asked to ensure that any relevant observations were considered within their report.

3.0 The Safety Audit Process

3.1 Stage 2 Safety Audit

Following the completion of the detail design and consultation process the scheme was sent to URS for a Stage 2 Safety Audit. It had earlier been subject to a Stage 1 and the results of this along with designer comments are included within the full report in Appendix 4.

Within the package sent to the Safety Audit Team was a full set of construction drawings for the roundabout covering elements from site clearance, kerbing works, surfacing, lining, signing and electrical works. The Safety Audit Team was also asked to give their consideration to an altered version of the design. Whilst this maintained the use of zebra crossings and islands within the circulatory are of the roundabout the narrowing of the circulatory area was designed from the inner island out rather than the original design extending outer islands in. This leads to differing swept paths and lane hierarchy. The team were also asked to provide comments relating to a series of alternative designs for traffic signs to see if an altered design which did not comply with the Traffic Sign Regulations and General Directions would better forewarn motorists regarding the altered roundabout layout (Appendix 5).

Within the safety audit report a number of ‘problems’ have been identified which can relate to either general considerations, information not provided to the safety audit team or concerns with aspects of the design. Against each of these points the designer has made their comments to either accept the comments raised or give justification if it is felt that the comments are not relevant.

Our internal procedures identify a clear flowchart for the instructing of Safety Audits and how these reports are dealt with and signed off. For this project Allan Burls (Senior Engineer) has led the Design Team, Melanie MacLeod (Team Leader Transport Policy) acted as Project Sponsor and Glenn Barcham (Assistant Director Highways & Transport) Project Director. Due to the unique aspects of this project and the potential hazards present the decision has been taken to ensure that the final decision of whether to proceed to construction, or not, is taken at a more senior level. To this end this report will be signed with Glenn Barcham acting as Project Sponsor and Stewart Briggs (Executive Director of Environment and Sustainable Communities) as Project Director.

4.0 Residual Considerations

Despite the best efforts of the design team the installation of a new feature can result in potential hazards remaining. Below is a summary of those points raised in the Safety Audit which can not be mitigated for within the design. These must be considered and accepted before giving a final decision to proceed with this scheme to construction.

4.1 Future Maintenance

Swept path analysis has been utilised to position the islands outside of the swept path of HGV's accounting for all movements. Whilst we can say this is achievable within the confines of a programme, experience show us that less experienced drivers or those not taking the necessary care may over-run the islands. Whilst the risk of injury to HGV drivers is determined to be low any detritus remaining on the carriageway can pose a serious risk to more vulnerable users such as cyclists and motorcyclists and any resulting injury is likely to be more severe. Where possible, materials have been specifically chosen for their flexibility to allow them to absorb pressure from HGV tyres where more rigid materials may simply be knocked loose. These same materials allow for quicker installation times without the need to wait for concrete to cure and lengthy closures. Another issue caused by HGV's tyres side swiping the rubber kerbs would be the laying down of black rubber and how this may obscure the retroreflective strips within the kerbs, reducing their visibility and making them a hazard especially to vulnerable road users. Regular inspections of these kerbs will be required to assess their visibility and replacement carried out if required.

Another consideration is the importance of the road markings to the roundabout. These are the primary source of information to road users and need to be followed to navigate the roundabout. Road markings on roundabouts tend to suffer from wear due to repeated over run and there are areas within this design which will also be subject to the same problems. Given that the roundabout relies on the clarity of these lane markings these must be regularly refreshed to aid drivers in using the roundabout.

It is recommended that as part of the project a new CCTV camera is installed giving a clear view of the entire roundabout. This can be used not only for on-going monitoring of the roundabout and how it is functioning but also to readily identify any damage requiring repair and also, in the event of an accident, identify the causes which led to that accident.

4.2 Potential Congestion

The roundabout has been modelled giving consideration to reducing Clapham Road to a single lane exit and the new lane hierarchy which showed no discernable increase in congestion. What it has not been possible to model is the introduction of zebra crossings on all arms and it must be accepted that there is potential for an increase in traffic queues due to these. Review of the collated data does show that the peak flow for pedestrians and peak flow for traffic occur at different times of the day which should mitigate this somewhat.

In the event of traffic queuing onto the roundabout there is a potential hazard of people becoming frustrated with remaining within a queue and attempting to switch lanes to bypass the traffic and then finding themselves in the wrong lane and making the decision to either drive erratically to navigate one of the islands or attempting to drive across the island. Secondly, queuing traffic will obscure the islands within the roundabout. Cyclists or Motorcyclists may take the decision to filter through the stationary traffic to reach their desired exit however due to the traffic may not be aware of the islands leading to collisions. Lastly, in the event that a vehicle should break down within the exits to either Clapham Road or Tavistock Street no vehicle will be able to pass due to the installed islands, effectively blocking these exits for everyone. This is common to smaller roundabout within the country although in this particular case the potential length of this hazard is increased.

4.3 Close Proximity of Clapham Road Pelican Crossing and Zebra Crossing

Concern has been raised that the close proximity of the existing pelican crossing on Clapham Road to the proposed zebra crossing will result in criticism and increased congestion and that one should be removed. Surveys have shown that 763 pedestrians use the pelican crossing within a given day however 430 pedestrians and 64 cyclists have still chosen to cross at the point of the zebra crossing. It is felt that one crossing will not serve both desire lines and that only the retention of both will adequately serve that desire. However, it is recognised this may lead to further congestion.

4.4 Visibility to Crossing on Union Street Roundabout

Further concern has been raised regarding the placement of the zebra crossing on Union Street. The safety audit team feel this is too close to the roundabout and forward visibility will be affected for cars turning left from Tavistock Street to Union Street. It is the designers feeling that traffic carrying out this maneuver will be doing so at relatively low speed and the crossing will

be conspicuous from the give way line at Tavistock Street as belisha beacons will be installed on both sides of the road along with two in the central island. If the zebra crossing is moved further south on Union Street this is unlikely to prove desirable for pedestrians making this crossing and will result in some pedestrians still crossing very close to the roundabout without the benefit of a formal crossing.

4.5 M otorcycle Users

During the consultation process considerable resistance to this scheme was met by various factions of the motorcycle community owing to the perceived risk to motorcyclists colliding with the islands within the roundabout leading to serious injury. Should this scheme progress to construction it is anticipated that further negative comments will be received and that this may be highlighted within various publications.

5.0 Conclusions and Recommendations

By its very nature this scheme has proven to be divisive during the consultation process and it is envisioned that this will continue should the scheme be constructed.

The schemes objective is to benefit all road users by providing a safer environment for all and reducing potential for conflict when compared to standard roundabout. However, this is achieved primarily by channelling drivers into lanes rather than giving them the freedom to make last minute changes. Despite all practical attempts to give people advance notice it is likely that there will be people who do find themselves in the wrong lane and attempt to change lanes on the roundabout risking collision with the islands. Whilst a HGV driver will be able to attempt this without risk more vulnerable road users such as motorcyclists have the potential to have serious accidents. As this scheme is the first of its kind in this country there will be a period of adjustment as road users discover the new layout and then begin to learn how to navigate it. It is at this stage that despite the schemes long term goals there will be a heightened risk of accidents occurring. Additionally to this there will be an on-going maintenance requirement for this roundabout more so than a normal roundabout. This is to ensure road markings and islands remain as conspicuous as possible. Finally it is anticipated that the presence of zebra crossings will lead to some congestion around the junction.

However, the benefits to vulnerable road users, in giving pedestrians safe priority crossing points and cyclists a choice of how they navigate the roundabout whilst providing a safer environment for all road users in reducing speeds and conflict points, cannot be ignored.

To this end it is recommended that the scheme is taken forward to construction in its original form and with the signing originally proposed and all designer comments are accepted in response to those problems raised within the Stage 2 Safety Audit Report.

6.0 Signatures

Designers Comments to Stage 2 Safety Audit Report accepted and scheme authorised for construction.

PROJECT SPONSOR

GLENN BARCHAM - Assistant Director Highways & Transport

SIGNATURE;_____ DATE; 23/1/14

PROJECT DIRECTOR

STEWART BRIGGS - Executive Director of Environment and Sustainable Communities

SIGNATURE;_____ DATE; 24 January 2014

APPENDIX 1 – Illustrative Design

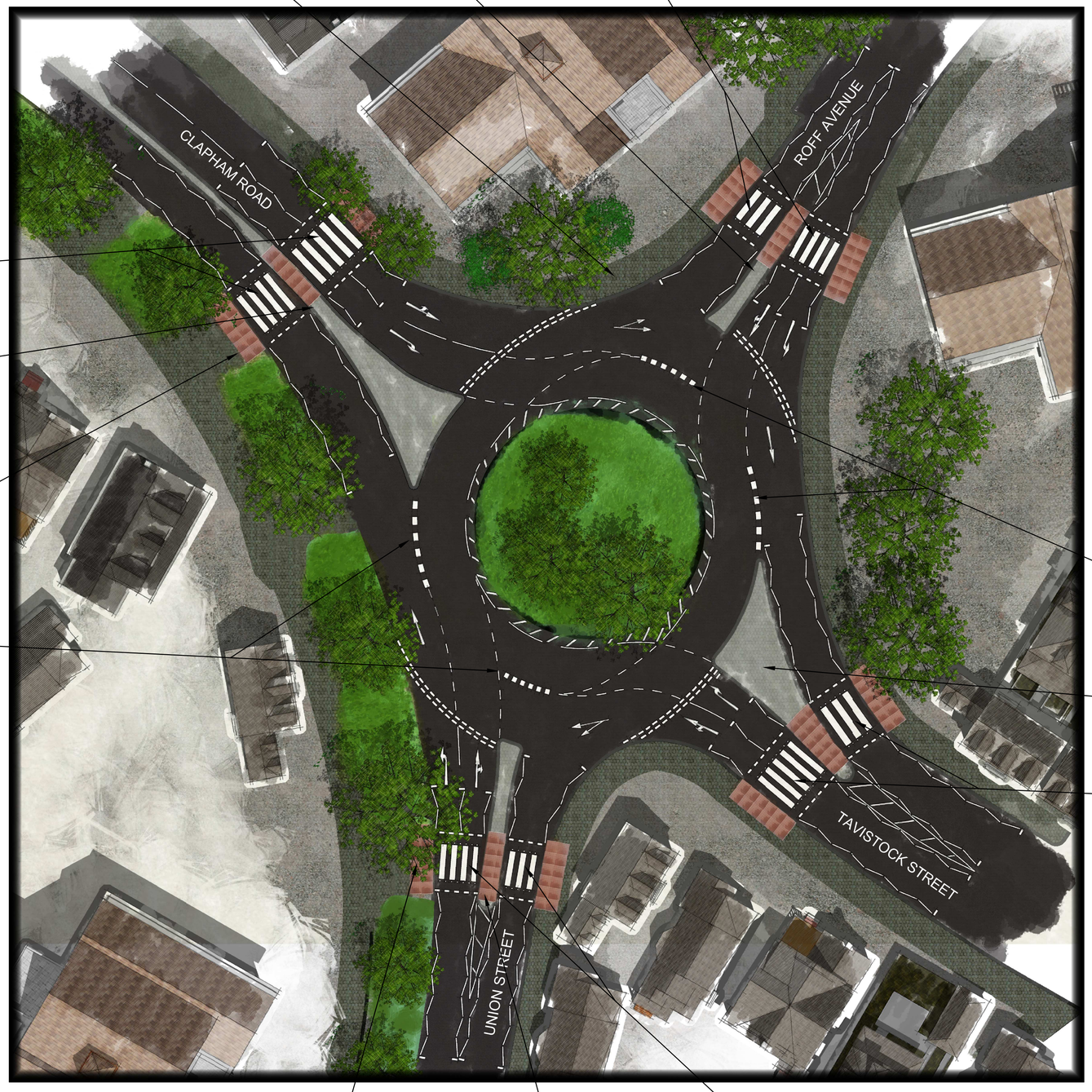
Proposed Layout

PROPOSED LAYOUT FOR UNION STREET ROUNDABOUT SAFETY IMPROVEMENTS

Footway widened to allow for cyclist/pedestrian shared use

Refuge island widened to accommodate zebra crossing

Proposed zebra crossing to aid pedestrian movement



Proposed zebra crossing to aid pedestrian movement

Refuge island widened to accommodate zebra crossing

Footway modified to accommodate proposed zebra crossings and aid cyclist movement around the junction

Rubber kerbs installed on carriageway with 125mm up-stand for lane separation. See fig. 01

Rubber kerbs installed on carriageway with 125mm up-stand for lane separation. See fig. 01

Refuge island widened to accommodate zebra crossing

Proposed zebra crossing to aid pedestrian movement

Footway modified to accommodate proposed zebra crossings and aid cyclist movement around the junction

Refuge island widened to accommodate zebra crossing

Proposed zebra crossing to aid pedestrian movement

Fig. 01

Rubber kerbs in-filled with bituminous material and overlaid with white banding to increase visibility

PRINTS FROM THIS DRAWING ARE UNCONTROLLED UNLESS OTHERWISE STATED

A1

NOTES:

1. Colours used are for illustrative purposes only.
2. This drawing is not to be reproduced in part or full without the approval of the Bedford Borough Council.

DATE	AMENDMENTS	REV	BY
AUG '13	First Issue	0	ABC

BEDFORD BOROUGH COUNCIL

Engineering Services

BOROUGH HALL, CAULDWELL ST, BEDFORD, MK42 9AP
Tel. (01234) 276958

CLIENT
Environment and Sustainable Communities

SCHEME
Union Street Roundabout

DRAWING TITLE
Proposed Layout

DRG No.
C897.C.0100.04

DRG STATUS
Information

SCALE @ A1	DATE	DRAWN	CHECKED
NTS	AUG '13	CC	ACB

APPENDIX 2 – Zebra Crossing Consultation

Public Notice

Letter to Residents

Transcript of Responses

BEDFORD BOROUGH COUNCIL

PUBLIC NOTICE

ROAD TRAFFIC REGULATION ACT 1984 – SECTION 23

BEDFORD BOROUGH COUNCIL PROPOSES TO ESTABLISH FOUR ZEBRA CROSSINGS ON THE ARMS OF THE ROUNDABOUT ON UNION STREET, ROFF AVENUE, TAVISTOCK STREET AND CLAPHAM ROAD JUNCTION, BEDFORD.

Reason for Proposal: This proposal is aimed at improving pedestrian and cyclist safety on the junction of Union Street, Roff Avenue, Tavistock Street and Clapham Road. A zebra crossing will provide identified, controlled crossing points for pedestrians.

The Locations of the Proposed Zebra Crossings are on Union Street, Bedford, outside 69 Union Street, approximately 10 metres south of the roundabout, Roff Avenue, Bedford, approximately 10 metres north east of the roundabout, Tavistock Street, Bedford, outside 120 Tavistock Street, approximately 10 metres south east of the roundabout and Clapham Road, Bedford, outside 4 Clapham Road, approximately 12 metres north west of the Roundabout

Further Details of the proposed zebra crossings, a plan and a statement of reasons for proposing to establish the crossing may be examined during normal working hours at Borough Hall, Cauldwell Street, Bedford. These documents are also available on the www.bedford.gov.uk/tro website. The details will be placed on deposit until 6 weeks after the crossings are commissioned or until it is decided not to continue with the proposal. For enquiries concerning this proposal, please contact Allan Burls at Bedford Borough Council on 01234 276808.

Objections should be sent in writing to Allan Burls, Senior Project Engineer (Highways and Drainage), Room 445 4th Floor, Borough Hall, Cauldwell Street, Bedford, MK42 9AP stating the grounds on which they are made by Wednesday 18th September 2013.

Date: Thursday 8th August 2013

Borough Hall
Cauldwell Street
Bedford
MK42 9AP

Stewart Briggs
Executive Director for Environment and
Sustainable Communities

BEDFORD BOROUGH COUNCIL

Borough Charter granted in 1166

Chief Executive: P. J. Simpkins

The Occupier
IMPORTANT INFORMATION ENCLOSED – THIS IS NOT A CIRCULAR

Please ask for: Allan Burls

Direct Line: 01234 276808
E-mail allan.burls@bedford.gov.uk
Fax No:
Your Ref:
Our Ref: C897
Date: Thursday 8th August 2013

Dear Sir/Madam

Union Street/Roff Avenue/Tavistock Street/Clapham Road – Zebra Crossing Proposals

Please find enclosed the public notice and associated plan regarding the proposed zebra crossings for Union Street/Roff Avenue/Tavistock Street/Clapham Road that Bedford Borough Council is currently consulting on.

The notice will be published in the Times and Citizen and as per that notice objections are required by Wednesday 18th September 2013.

The zebra crossings are proposed as part of a larger scheme to improve cycling, walking and vehicular safety through this very busy roundabout and an informal consultation is being undertaken on-line relating to the overall scheme, this can be accessed, next week, via the web address www.bedford.gov.uk/tro, clicking on the "other highways schemes" tab and clicking on Union Street Roundabout. I do urge you to visit this page to understand the scheme we are hoping to implement and welcome your feedback. You can do this by e-mailing allan.burls@bedford.gov.uk and using the subject title "Union Street Roundabout".

If you have any comments or queries, do not hesitate to contact me.

Yours sincerely

Allan Burls
Senior Project Engineer (Highways and Drainage)

[redacted]

Alan Burls
Senior Project Engineer (Highways and Drainage)
Room 445 4th floor
Borough Hall
Cauldwell Street
Bedford
MK42 9AP

9 August 2013

Dear Mr Burls

I read in this week's Beds Times a public notice announcing the latest anti-motorist idea from Mayor Hodgson's Borough Council – the installation of four pedestrian crossings on the arms of the Union Street roundabout. Not one, not two, not three, but *four* pedestrian crossings. I would have thought that the problems to road safety and traffic flow at the Bromham Road/Ashburnham Road mini-roundabouts caused by the proximity of the pedestrian crossing in Shakespeare Road would have alerted your department to the dangers caused by pedestrian crossings sited close to roundabouts, but presumably such clarity of thought is beyond you, your colleagues, and our Mayor.

I would be grateful for details of what research has been carried out by the Council on the necessity for these four planned pedestrian crossings, and figures on how many pedestrians and cyclists have been injured in recent years – and the severity of their injuries – in Union Street, Roff Avenue, Tavistock Street and Clapham Road close to their junctions with the Union Street roundabout.

One shouldn't be surprised at this latest crackpot scheme, following as it does the decision to impose a 20mph limit in the Landsdowne Road area, which everyone in the town knows has been for a number of years a never-ending scene of carnage and road traffic accidents as petrified pedestrians and cyclists take their lives into the own hands when attempting to use or cross these roads.

Perhaps Mayor Hodgson and your department should consider imposing a 20mph speed limit on every road within Bedford's boundaries, install average speed cameras on every stretch of straight road more than 10 metres long, and install pedestrian crossings on every road within 10 metres of every roundabout. I shouldn't jest – he, and you, probably are.

Yours sincerely

[redacted]

[redacted]

Alan Burls
Senior Project Engineer (Highways and Drainage)
Room 445 4th floor
Borough Hall
Cauldwell Street
Bedford
MK42 9AP

12 September 2013

Dear Mr Burls

I would appreciate a reply to my letter of 9 August in which I asked for details of the research carried out by Bedford Borough Council on the necessity for the four pedestrian crossings you plan to install in Union Street, Roff Avenue, Tavistock Street and Clapham Road on the arms of the Union Street roundabout.

As requested, I would also be grateful for figures on how many pedestrians and cyclists have been injured in recent years on, or near, the sites where the crossings are planned, and the severity of their injuries.

Yours sincerely

[redacted]

BEDFORD BOROUGH COUNCIL

Borough Charter granted in 1166

Chief Executive: P. J. Simpkins

[redacted]

Please ask for: Allan Burls
Direct line: 01234 276808
E-mail: allan.burls@bedford.gov.uk
Fax no:
Your ref:
Our ref: C895
Date: 13/09/2013

Dear [redacted],

Thank you for your two previous letters concerning proposals to install pedestrian crossings at the roundabout of Union Street, Roff Avenue, Tavistock Street and Clapham Road. I apologise for not getting back to you following your requests in your first letter.

Between 2002 and 2012, there were altogether 32 casualties (8 serious) in 27 accidents at the roundabout resulting in injuries to 8 pedestrians (3 serious), 7 cyclists (2 serious), 4 PTW users (1 serious) and 13 car drivers/passengers (2 serious). Cars were involved in 25 of the 27 accidents however in 18 cases none of the car occupants were hurt.

More specifically 2 serious pedestrian casualties occurred in Union Street at the proposed location of the zebra crossing, 2 slight pedestrian casualties occurred in Roff Avenue at the proposed location of the zebra crossing and 1 serious pedestrian casualty and 1 serious cyclist casualty occurred in Clapham Road at the proposed location of the zebra crossing.

Safety is not the only reason for proposing the installation of the zebra crossings. Equally important is improving pedestrian convenience and accessibility. A video survey undertaken in 2012 showed that between 7am and 7pm, 788 adult pedestrians, 52 children and 13 cyclists crossed Union Street, 405 adult pedestrians, 29 children and 64 cyclists crossed Clapham Road, 242 adult pedestrians, 59 children and 19 cyclists crossed Roff Avenue and 693 adult pedestrians, 87 children and 58 cyclists crossed Tavistock Street – all in the locations of the proposed Zebras.

I hope this letter contains the information you requested and provides you with an understanding of why the proposed zebra crossings are being proposed.

Yours sincerely

Mr Allan Burls
Senior Project Engineer

[redacted]

Alan Burls
Senior Project Engineer (Highways and Drainage)
Room 445 4th floor
Borough Hall
Cauldwell Street
Bedford
MK42 9AP

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Perhaps Mayor Hodgson and your department should consider imposing a 20mph speed limit on every road within Bedford's boundaries, install average speed cameras on every stretch of straight road more than 10 metres long, and install pedestrian crossings on every road within 10 metres of every roundabout. I shouldn't jest – he, and you, probably are.

Yours sincerely

[redacted]

Hello

I just wanted to let you know how pleased I am at the council's decision to introduce zebra crossings into Union Street and the other streets leading off the roundabout.

I live at XX Union Street and have done for almost 22 years now. I have grandchildren whom I take to school 2 days a week and find Union Street both frightening and difficult to cross; especially to reach the residents' parking areas i.e. Warwick Avenue. The traffic is particularly heavy on Union Street at peak times and I have to say car drivers often look astonished that people actually live on Union Street. I think many think it is just a commercial and not a residential area.

With the implementation of the crossing I look forward to being able to cross the road both safely and promptly both with my grandchildren and on my own! I also look forward to the crossing on Tavistock Street as this is where our local shops are situated.

You have my whole hearted support for this scheme.

Yours faithfully,

Response from PE
X Clapham Road

Has no access to e-mails and phoned on the 9th August at 10:45, I spoke with him.

Believes the introduction of the 4 zebra crossings are needed and will improve crossing facilities around the roundabout however has concerns that the existing ped. Crossing on Clapham Road is not being removed and believes the scheme would be better suited if this existing crossing was removed.

Allan Burls

APPENDIX 3 – Union Street Roundabout Consultation

Transcript of Responses

Correspondence relating to informal consultation for the scheme as a whole

NC
Freight Transport Association

Good morning Allan,

I think this looks like a really interesting proposal. My only concern would be whether the manoeuvrability and turning circles of hgvs has been taken into account. On many roundabouts, larger vehicles need to straddle more than one lane in order to complete the manoeuvre. I don't know this particular roundabout and therefore how tight the turn would be. However, the Dutch-style roundabouts (where cyclists & pedestrians have priority) which TRL is trialling on behalf of TfL do have an overrun area in the centre of the roundabout.

Kind regards,

Many thanks for taking the time to e-mail me. The scheme has been designed using AutoTRAK, this has enabled us to track a wide range of vehicles included articulated HGV's and rigids. The alignment is tight for these vehicles travelling from either the west to south or east to north however the programme shows that it can be made keeping within the lanes. Having reviewed the traffic data for the roundabout the numbers making these particular movements are rare. Further to this I have specified the rubber kerbs to allow for any unintentional clipping of the islands by HGV's as I felt concrete would degrade and then present ongoing issues with maintenance. Displaced rubber kerbs can be quickly unbolted from the surface and replaced without the need to wait for concrete bedding to cure.

If you have any further questions or would like to see the tracked movements please feel free to contact me again.

Kind regards

Allan

Many thanks for your response Allan,

I thought that you would probably have already considered this issue, but wanted to raise it just in case.

Kind regards,

FJ
Estate Officer (Community)
NHS

Hello Alan,

I like it.

The only suggestions I can make about the new road layout, you've probably already considered. But just in case:

1. Publicise this in the local press, stating that BBC is the first place in the UK to try out the turbo roundabout – 'Union Street turbo?' Get people to understand how it should work.

2. New / good road signs on the approaches indicating new road layout, roundabout lane segregation, and reduced road speeds. (Zebra crossings will act as a constraint on vehicles exiting the roundabout – causing possible temporary gridlock as carrying capacity interrupted.

3. Slight modification to your webpage text (4th paragraph - attached) saying if you are in the wrong lane, go around the roundabout and pick your exit, rather than panic and jump the rubber guide kerbs – damage to kerb and car and possible accident. (More people in hospital = L.)

All the best,

Many thanks for taking the time to contact me regarding this. It is a major imperative for me that this is publicised to the public as a whole and the local press is one example I aim to use. I am currently in talks with our communications officer to put a plan in place to not only allow the public to have their comments about the scheme but also as an educational tool for how to use the roundabout. As you have pointed out signage will play an important role in this scheme and we are currently finalising the design of sings in advance of the junctions (two in each direction) denoting the lane layout and arrows showing which lane leads where. This will also be something that will equire ongoing monitoring from us after opening to ensure improvements are made where required.

If you have any further comments or questions please do not hesitate to contact me again and I thank you for those you have already made.

Kind regards

Allan

Good luck with it Allan.

I'm sure it will be a great success.

AL
Visual Impairment Team
Bedford Borough Council

Hello Allan

We have had a look at the proposed changes to Union Street Roundabout and below are our comments:

1. The zebra crossings seem very close to the entrance and exist to the roundabouts and the concern is this could cause congestion. People with a visual impairment depend very heavily on their hearing to judge when it is safe to cross a road. If there is a large volume of stationary traffic it could then be difficult for someone to judge when it is safe to cross the road.
2. Will bikes have the right of way? People do not always hear oncoming bikes. We encourage people to use symbol canes to make people aware of their sight loss, but not everyone likes using them.
3. Could Pelican crossings be installed instead of the Zebra crossings? Could the crossings be moved further away from the roundabouts?

I hope this is helpful. If we can be of any other help please don't hesitate to contact me.

With kind regards

Cycling Campaign for North Bedfordshire

Allan

Re your request for opinions on the proposed new roundabout.

Cycling Campaign for North Bedfordshire (CCNB) strongly supports Bedford Borough Council's proposed changes to the roundabout to improve its safety for both cyclists and pedestrians.

The roundabout is on one the town's major cycle routes for cyclists from Brickhill in the north of the town and Putnoe in the north east to the railway station and the town centre. It is currently not cycle friendly and has an accident history.

We believe the proposed scheme to modify the roundabout to make it more compact, similar in style to a continental roundabout, will make it much safer. This should then give a better cycle route, encouraging more cyclists and result in reducing the negative impacts of congestion and pollution in the area while increasing the town's economic benefits.

Traffic Management
Bedfordshire Police

Allan

Thank you for the notification of this project, I am sure that there will be resistance from some parties as there always is with change, we feel that as long as there is early warning /road markings as to what lane to get into(lane markings prior to the crossings on Clapham Road and Tavistock Street)and earlier warning signage prior to the roundabout that will be of help.

I would consider how much Impact the new design would have on Queuing along Clapham Road and Tavistock Street at rush hour times but I am sure that you have taken this into consideration.

It can be foreseen that issues will arise when motorists get into the wrong lane once on the roundabout but that will come back to education.

I hope the comments are of help.

AJR

Dear Alan,

I don't think it is a good idea to put zebra crossings there. Other places where there are zebra crossings on roundabouts, e.g. Cardington Road and St John's roundabouts, people on the roundabout head for the direction they want, start to accelerate and then have to brake suddenly, with the people behind them also doing so this surely increases the risk of accidents (vehicle to vehicle and vehicle to pedestrian), not reduces them. You also get increased traffic clog on the roundabout itself.

PB

Dear Allan

I have just found out about the consultation on the proposed changes from the Sustrans survey on cycling in Bedford.

I have looked at the proposals and feel that rather than making this safer for cyclists the proposed layout will be more dangerous, unless the 'option', as described in the information sheet, is used.

As a cyclist who uses the Union Street/Roff Avenue route on a daily basis I can see several issues with the proposed layout:

The greatest danger is moving to the right hand lane on Union Street to go across to Roff Avenue. The new layout does not alter this.
Currently the Left lane on Roff Avenue is also straight on which means as a Cyclist you do not have to make this manoeuvre in that direction. The new layout makes this lane left turn only.
The proposed raised kerbs in the middle of the roundabout will be a severe danger to cyclists who are then unable to move away from vehicles
The longer optional route using shared paths will be less used due to the increased length of the detour.
It is not legal to cycle across Zebra crossings so I assume the optional route will entail all cyclists getting off to cross the roads.

One option that may improve the junction for cyclists would be to replace the Zebra crossings with Toucan crossings. This would allow cyclists who wish to use a safer route to ride and would also give breaks in the traffic to allow those wishing to use the roundabout safer passage.

I feel these proposals will not make it safer for a cyclist using the roundabout itself, if anything it will make it worse.

JC

Dear Allan,

As a cyclist who uses the roundabout going from Roff Avenue to Union Street on my way to the station each morning, the proposed layout concerns me and I cannot see how this will improve my safety. In fact, I think this will present more danger to me than the current layout.

As an experienced motorist, I can see that this layout should improve the traffic flow around the roundabout and aid the motorists' understanding, in a similar way to the recent changes to the road marking at the roundabout at St Johns/Rope Walk. The plans also clearly enhance pedestrian safety with path widening and improved crossings.

However, the rubber kerbs on the carriageway will add risk to cyclists' and motorists' safety and rely on motorists always navigating the roundabout at the correct speed and in the correct lane. This in practise will not happen, and could lead to more erratic driving around the roundabout.

As a cyclist in particular, I am unsure how I am expected to pass through the proposed layout. If I cycle on the roundabout itself from Roff Avenue, I will have to cycle in the right hand lane from Roff Avenue, on to the roundabout within the rubber kerb, but probably with a vehicle close behind who will have little room to drive between myself and the inner circle of the roundabout. This does not feel like it improves my safety at all, but passes it into the hands of motorists who have varying degrees of consideration for cyclists.

If the plans intend me to use the extended paths around the roundabout and use the zebra crossings, I will have to dismount from my bike to cross the zebra crossing. This does not sound ideal and in practise, I cannot see the majority of cyclists doing this. This could result in more cyclists riding across the zebra crossings impacting pedestrian safety.

Could the removal of the rubber kerbs and reduction in the size of refuge islands from Clapham Road and Tavistock Street be considered? This would provide more space to cyclists on the roundabout and also be more forgiving on driver error. Are there results from the St Johns/Rope Walk roundabout enhancements that support improved traffic flow from line markings alone?

OW

Just curious as to where exactly are the cycle facilities at the Union Street roundabout?

In the planning note, you mention that Dutch turbo roundabouts "can" allow cycle provision. They do this by reducing the size of the central roundabout, giving space to put a continuous cycle path around the edge, having priority at each place that it crosses a road.

I don't see any of that in the Bedford plan - the only improvements on your map are there to benefit motor traffic.

Turbo roundabouts aren't intended to have cyclists present, so have an inner roundabout that is motor-traffic only and the outer one is cyclists only. The priority over side-roads is what persuades cyclists to use the facilities. Would it help if I got you in contact with TRL, who are very excited about testing the real Dutch-style roundabouts that TrL will use to actually improve cycle safey.

If anything, the Union Street plan manages to make an accident blackspot *more* dangerous, by increasing the speed and rate of motor traffic flow, confusing drivers at the vital moment, and enraging drivers when they can't pass a cyclist within the width of one lane.

The token section of legalised pavement-cycling only helps if it goes all the way to Sainsburys (which would be a grand idea, by the way :)

Best regards,

LM
Motorcycle Action Group

Dear Patrick and Alan,

Thanks for drawings that illustrate the existing layout of the Union St roundabout and the nature of changes proposed.

It has become clear from comparing these drawings and two lengthy conversations with Patrick that the safety of Powered Two Wheeler (PTW) riders has not been given due consideration.

And, for the avoidance of doubt, the Motorcycle Action Group (MAG (UK)) objects in the strongest possible terms to some aspects of these proposals because it is the well informed opinion of MAG that they would, if implemented, have a seriously adverse and potentially fatal impact on PTW rider safety.

In my lengthy conversation with Patrick earlier this week I explained the reasons for our key objections in detail, and below is a very brief summary of key points in response to Patrick's request for me to send an outline of them by Friday. Discussion amongst experts on MAG's National Committee has thrown up various other concerns but I can relay and discuss those with you both in due course.

1. The most dangerous aspect of this scheme in its current form is the proposal to introduce a series of linear 'Trip Hazards' in the form of kerbs on the roundabout itself which are shown in plan views and in detail in Fig 01. Such an element would be dangerous enough in good conditions but in the dark and heavy rain they could easily be lethal.

2. The second element that would reduce PTW rider safety is the proposal to extend the length of refuge islands which will effectively halve the lane width at key points on the roundabout. And to be clear, narrowing the width of carriageway for PTW riders to manoeuvre in, and/or creating pinch points, inevitably has an adverse impact on rider safety.

It is also now clear from recent conversations that that key differences in road use by PTW riders compared to car drivers or cyclists has not been properly considered – and some basic elements of the dynamics of crashes involving PTWs had not been known about or understood until I explained what such things as 'high-side' and 'low-side' incidents were.

Please note that these objections are sent with an offer to assist you and to continue a productive dialogue as we have a common interest in enhancing road safety for all road users, and especially those who are PTW riders as well as cyclists or pedestrians.

Additional Note; Allan Burls had a very lengthy telephone conversation with LM following on from this e-mail. His initial conversations with Patrick Lingwood have led to the comments in the penultimate paragraph and LM was assured that PTWs had been considered as part of the scheme given that Allan is himself a rider. LM's main concerns appeared to reflect a belief that any upstand within the carriageway, be it the proposals of this scheme or any pedestrian refuge impacts negatively on PTW.

HR

Hi,

Union Street Roundabout Safety Improvements

Having read on Bedford Borough Councils' website, the Information Sheet associated with the above improvements, and the proposed installation of traffic islands around the roundabout, I notice that it is stated, as an implied justification for this scheme, that this roundabout has had 'the highest level of serious cyclist accidents over the last 10 years within the Borough'. Please could you answer/supply the following:

- Exactly what 10 year period is referred to (dates from – to)?
- How many 'serious' cyclists accidents have occurred on this roundabout within this 10 year period?
- What are the details/circumstances of these 'Serious' cyclist accidents (what actually happened)?
- How would the placing of the proposed traffic islands on the roundabout have prevented these 'serious' cyclist accidents from occurring?
- How do the number of 'Serious' cyclist accidents at this roundabout compare with St Johns roundabout at the junction of Ampthill Rd & St Johns Street, Rope Walk Roundabout at the junction with Rope Walk & Cardington Road, the A6/A421 Roundabout to the South of Elstow Park & Ride for example?

I look forward to your swift response.

Following on from your request for information relating to the Union Street Roundabout proposals I am happy to provide the following…

The 10 year period referred to is 1/4/2002 to 30/3/2012

There have been two serious accidents within this time frame that specifically relate to cyclists.

The brief details are as follows;

1. Cycling circulating roundabout going from Tavistock Street to Clapham Road, was struck by motorist entering roundabout going from Union Street to Roff Avenue. Time 18:45. Weather: dry. Dark with lighting.
2.
3. Cyclist going from Union Street to Roff Avenue crossing mouth of Clapham Road from footway to footway struck by car entering roundabout from Clapham Road. Car driver did not stop. Time 20:30. Weather: rain, surface wet. Dark with lighting.

The raised dividers (I assume these are the traffic islands referred to) will direct the paths of traffic circulating the roundabout, meaning that traffic will have to follow the marked lanes and cannot "straight line" between entry and exit. This will reduce traffic speed and make it easier for other traffic (including cyclists) to enter the

roundabout because they will be able to predict the paths of vehicles circulating the roundabout and those vehicles will be circulating more slowly.

For cyclist accident 1, it is a typical “looked but failed to see” (LBFTS) accident where a vehicle entering the roundabout does not see the cyclist circulating. This is typically exacerbated by cyclists hugging the outside kerb too closely and in this accident case, night time conditions would also have contributed. The new roundabout layout could have helped prevent this accident occurring because the car entering from Union Street would first have had to pass over a Zebra crossing, so increasing the driver’s alertness and reducing his speed on the approach and secondly at the roundabout, he would be able to distinguish the path of any traffic (such as the cyclist) approaching from the right on the roundabout, so that the visual scanning requirements would be reduced, essential to reducing this type of LBFTS accident. It is also to be hoped that the cyclist would feel more confidence in taking the lane around the roundabout and will therefore be cycling further away from the kerb, increasing his conspicuity.

Accident 2 is another typical cyclist accident at a roundabout where a cyclist circulates the roundabout cycling not on the carriageway but cycling from footway to footway. The provision of Zebras at the roundabout arms would have provided this cyclist greater priority at the crossing and both focused the area of crossing and increased the cyclist’s conspicuity to the driver. The raised dividers are only relevant to this type of accident in helping to reduce entry and exit speeds on the roundabout.

Regarding your final question a comparison of all cyclist accidents between 2004 and 2010 was undertaken for all junctions in Bedford Borough. There were 2 serious cyclist accidents at Union Street roundabout – the highest figure, compared to 1 serious cyclist accident at each of the following locations: the Embankment/St Mary’s turn, St Cuthbert’s Gyratory, Dawlish Drive/Polhill junction. The only junction with a higher number of cyclist accidents was Wilmers Corner roundabout (St Johns St/Amphill Rd) which had 10 slight, but no serious, cyclist accidents and was considered for this grant, but was already being funded from developer contributions and undergoing a new design.

Union Street roundabout was also highlighted twice in the national database of problem junctions for cyclists, was highlighted as a problem in the 2008 and 2013 survey of cyclists at Bedford Midland Rail Station, identified in A&D plan for Bedford cycle network as needing work to improve cyclist safety and identified in Cycle Network Review for CIL as high priority as a route barrier.

I hope this has answered all of your questions and if you require any additional information please do not hesitate to contact me.

GC

Dear Mr Burls

Thank you for your email.

I have yet to read the information in detail, but the words "sledgehammer" and "nut" initially spring to mind. As someone who owns two apartments in Union Street and for more than 25 years ran in business in offices in Union Street, I have used the roundabout literally thousands of times, and have never, ever, encountered the slightest problem. I am also intrigued that the details of the scheme claim that this roundabout has the "highest level of serious cyclist accidents over the last 10 years within the Borough." In your letter to me of September 13 you say that two cyclists were seriously injured in the ten years 2002-12. Two is two too many, but it hardly makes the roundabout a major cyclist accident blackspot, which the wording in the information is obviously designed to imply.

I also note that construction of this scheme was scheduled to start last month.

Unknown

From: [redacted]
Sent: 21 November 2013 13:54
To: Allan Burls
Cc: Simon Deards; Helen.North@amey.co.uk; chair@motorcyclingmatters.org
Subject: Proposed changes to Union Street Roundabout, Bedford
Follow Up Flag: Follow up
Flag Status: Red

Allan

Further to your presentation at the Motorcycling matters Forum meeting of Wednesday 14th August 2013 and the issue of the consultancy documentation on the Bedford Borough Council web site, please see following responses from individual members of the forum, the British Motorcycling Federation and local motorcyclists represented by members of the forum. I believe you have already received a response form the Motorcycle Action Group which was reported in the last edition of "The Road" magazine (MAG's own publication to members) under the title "Lethal roundabout design".

The first response received was from [redacted] [redacted] for the BMF

"I'm baffled by this. It isn't the same type of "dutch" style roundabouts that are currently being trialled by TRL for Transport for London (which have a separate roundabout for cyclists outside the main roundabout and gives cyclists on this outer-ring priority over vehicles entering and exiting the roundabout) and I don't understand how it helps cyclists in the slightest as there are no dedicated cycling facilities.

Obviously, the BMF will be opposed to unnecessary road furniture such as these bizarre humps on the road that this proposes for no apparent reason. I shall send this to a friend who knows what he's talking about for further comment, but as I said before, I'm completely baffled as to what the advantage of this is."

After further consultation [redacted] followed up with the following;

Hi [redacted]

My contact wasn't very convinced that it was a great design. He suggested these points to follow up:

- *Well you could ask for a summary and copy of the collisions reports (Stats 19 police reports) for the site and see the numbers of and where the problems they are trying to address actually are .*
- *You could point out that the lane markings as they stand are only advisory and that the proposals (arguably) require them to be backed by TRO prohibiting "conflicting" movements*
- *Suggest that the left turn movements on Union Street/Roff Avenue approaches should be revisited to make them "self enforcing" by "proper" footway works for the left turn into Clapham Road and Tavistock Street. In addition the Ahead/Right turn movements from Clapham Road and Tavistock Street could be reviewed to combine them and then make the left turn "self enforcing" if this was done the diameter of the roundabout could be increased along "continental roundabout" design standards*
- *You could ask for a copy of the Road Safety Audit for the scheme (they should have done one, it's a public document so no need for a FOI!) and see whether concerns for collisions with "vulnerable users" (Pedal and Motor cycles) have been addressed*
- *Point out that with a 125mm up stand the proposed kerbs should be more conspicuous than they are proposed (And certainly will be at night after some years "in service") and arguably should have plain face bollards defining them.*
- *Point out the "turbo roundabouts" (as used on main land Europe) usually involve significant works to remodel the central roundabout design (for examples Google "turbo roundabouts" and look at some of*

the images) and that the lane separation on such roundabouts is more defined than they currently propose

- *And finally you could point out the motorcycles (and indeed pedal cycles) are over represented in collisions on 4 arm roundabouts and that you believe (if you do!) that the proposals will not reduce but may increase such collisions here?*

There's a fair amount of work there, sorry. He's very thorough!

Yours,

[redacted]
British Motorcyclists Federation

In the above, [redacted] raises the issue of casualty reports for this location. This point was extensively researched by Forum member Kevin Penfold and I would draw your attention to the attached documents 'Vehicle movement calculations' and Union Street roundabout 10yrs all casualties'. These would seem to indicate that the KSI rate for cyclists on this roundabout over the ten year period 2002-2012 equates to only 0.00015% of total cyclist movements. The documents also indicate that the injury figures for pedestrians, cyclists and small motorcycles are effectively equal over the same period, so we must query why the considered alterations should be allowed to be detrimental to at least one of these already vulnerable groups.

Next I would draw your attention to the attached document 'EIR disclosure' which has provided Kevin with the statistics and in particular the sentence;

'The provision of Zebras at the roundabout arms would have provided this cyclist greater priority at the crossing and both focused the area of crossing and increased the cyclist's conspicuity to the driver'

The concern here is that Zebra crossings are for the use and protection of pedestrians, and cyclists have no priority under the highway code. You now seem to be proposing that pedestrians should have cyclists competing with them for use of the space, increasing their vulnerability in the process. In addition driving conditions for all motorist are difficult enough with pedestrians stepping onto crossings without breaking stride and with no consideration to the proximity of traffic, secure in the knowledge that the law is on their side, promoting cyclists to this position at the much higher speeds they attain is surely a recipe for disaster. The proposal is further confused by the statements in the following article http://www.transportxtra.com/magazines/local_transport_today/news/?id=34392 which confirms that signs will have to be erected instructing cyclists to give way to motorised traffic on the crossings.

[redacted] e-mail is included in full as follows;

Hi [redacted]

Whilst not necessarily opposed, in principle, to the proposed Zebra crossings, the idea of placing 125cm (5") 'kerb' lane dividers between the lanes around the roundabout
would, in my view, be extremely detrimental to the safety of riders of all powered two wheeled vehicles, and cyclists too, who for whatever reason, have the misfortune to 'clip' them with their front wheel.

As requested, please find attached the electronic versions of the documents I presented at yesterday's Forum meeting.

The three attached documents :

- *Information Sheet*
- *Public Notice*
- *Proposed Layout*

are taken from the Bedford Borough Council website page Here

The EIR (Environmental Information Regulations) Disclosure doc content has been cut & pasted into 'word' format
from the Bedford Borough Council website page Here and then scroll down to item ***Ref No: 4991*** *dated 29/10/2013*

The three attached documents

- *Union St rndbt 10yrs all casualties.pdf*
- *Union St rndbt 10yrs cyclist KSI (Killed or Seriously Injured) casualties.pdf*
- *Union St rndbt 10yrs cyclist KSI (Killed or Seriously Injured) casualties - model.pdf*

Were created by myself.

The attached document 'Veh Movement Calcs' was also created by myself, using the figures stated in the Bedford Borough Councils 'information sheet' as detailed above & also attached.

Further to the above, I also visited the following two websites for information regarding 'Turbo Roundabouts' and cyclist safety
http://www.aviewfromthecyclepath.com/2012/01/turbo-roundabouts-be-careful-what-you.html

http://bicycledutch.wordpress.com/2013/05/09/a-modern-amsterdam-roundabout/#comment-6142

The second link contains an interesting statement posted by Patrick Lingwood, Walking & Cycling Officer for Bedford Borough Council,
Regarding the proposed improvements (scroll about halfway down to find his post).

If you have any queries regarding the attached, or require any further information, please don't hesitate to get in touch.
Could you let me know if you have received this email.

Regards,
[redacted]

Patrick Lingwood's article is interesting in that the accident statistics he quotes bear no resemblance to the figures that we have been given in the EIR document, exaggerating the number of cycle accidents, and by its unashamedly pro cycling tone, apparently with no positive consideration for other road users including pedestrians.

The scheme also raises the issue of traffic leaving the roundabout having to stop for the crossings on the exits (a point where it is acknowledged that most pedestrian casualties have occurred and where the driver is distracted trying to leave the roundabout). This was raised by [redacted] of Herts & Beds Advanced Motorcyclists

"The pedestrian crossings would back up traffic onto roundabout, but I do accept something needs to be done for pedestrians. But the 5 inch lane control islands can only impede the flow of traffic, and cause driver frustration. It stated somewhere if you're in the wrong lane, carry on to next roundabout, come back and try again... Will just move traffic issues (if there are any) elsewhere...

My fears are for motorcyclists, if your tyres touch the side of the rubber lane separators there is only one or two outcomes, separation of rider and bike or the bike will suddenly change course into traffic.

It's bad enough now when as a motorcyclist I have to take evasive or avoiding action on a roundabout when other vehicles take my road, cut lanes or simply pull out when I am apparently invisible. I wouldn't want to have to negotiate a 5" high rubber barrier to cope with any of those situations.

If Beds Borough have money to spend on road improvements maybe they should consider re positioning a number of manhole and drain covers that are placed on roundabouts, that suitably impair motorcycles. Or other more worthwhile schemes that do not endanger the lives of the motorcyclist."

The most significant part of the scheme that will directly affect motorcyclists is the proposal for the 125mm high kerb demarcation of the lanes guiding traffic through the roundabout. Hitting these will cause a motorcycle to tip over, throwing the rider into the path of the traffic alongside.. Their visibility after time, when warning paint has worn off and dirt has accumulated, at night and in the rain with the glare of headlights reflecting from a helmet visor, will be questionable. There will be accidents and until now there has not been a fatality on this roundabout, this scheme seems to be the surest way of ensuring one.

When you attended the forum meeting of 14th August, I asked what data and research you were using to prove this scheme prior to implementation. Actual statistics for an installation already in service proving the benefit to cyclists and pedestrians, and more importantly indicating that there would be no adverse effect on other road users and in particular motorcyclists. As I recall you were unaware of any such data and undertook to research into this. I note that this has not been forthcoming. Without such figures the perceived benefits of the scheme are subjective and by consequence, so will any objections.

In simple language, there appears to be no proof that this scheme will work, and moreover, none that its implementation will not have an adverse effect on motorcycles. In short it is a live experiment that in my mind constitutes gambling with the lives of motorcyclists.

At the most recent meeting of the forum, and having debated all of the above, we took a show of hands to indicate whether we were in favour or objected to this scheme. The result was a unanimous objection from the assembled members attending.

The Motorcycling Matters Forum would therefore like to officially register its objection to the Union Street roundabout scheme in its current form.

Regards

[redacted]
Motorcycling Matters Forum
[redacted]

BEDFORDSHIRE AND LUTON
MOTORCYCLING MATTERS

[redacted]

APPENDIX 4 – Stage 2 Safety Audit

Stage 2 Safety Audit Report

Alternative Layout

Originally Proposed Sign Faces

Alternative Sign Faces

URS

Turbo Roundabout, Clapham Road- Tavistock Street, Bedford

Stage 2 Road Safety Audit

January 2014

47067365.13S0

Prepared for:
Bedford Borough Council

UNITED
KINGDOM &
IRELAND

Project Title:	Turbo Roundabout, Clapham Road-Tavistock Street, Bedford
Report Title:	Stage 2 Road Safety Audit
Project No:	47067365.13S0
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Client Contact Name:	Allan Burls
Client Company Name:	Bedford Borough Council
Issued By:	URS Infrastructure & Environment UK Limited, RS House, Horne Lane Bedford MK40 1TS United Kingdom Tel: +44 (0)1234 349 641 Fax: +44 (0)1234 216 268 www.ursglobal.com

Document Production / Approval Record

Issue No: 1	Name	Signature	Date	Position
Prepared by	Mrs E Sands			Audit Team Leader
Checked by	Chris Brown			Audit Team Member
Approved by	Mrs E Sands			Associate

REVISION SCHEDULE

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	December 2013	Issue of report to Client	Mrs E Sands Audit Team Leader	Chris Brown Audit Team Member	Mrs E Sands Associate
1	January 2014	Alternative design issues added. Report issued to Client	Mrs E Sands Audit Team Leader	Chris Brown Audit Team Member	Mrs E Sands Associate

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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between November 2013 and January 2014 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

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The statistical collision data referred to in this document was not derived from the National validated collision statistics but was sourced from local authority datasets. As this data has not been validated by DfT it cannot be assumed to be a complete data set as it may be found to be incomplete or contain inaccuracies. The requirement for up to date information for operational purposes was a consideration in the decision to use this data.

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1. INTRODUCTION

1.1 Brief

This report results from a Stage 2 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 Wednesday 04 December 2013 between 12:30 and 13:30hrs. 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. However, in order to clearly explain a safety problem or the recommendation to resolve a problem, the Audit Team may on occasion have referred to a design standard for information only. Any audit comments should not be considered as implying that a technical audit has been undertaken in any respect.

Therefore only the items raised as PROBLEM are relevant to the scheme as presented and audited in accordance with HD19/03. Furthermore, any recommendations included within this report should not be regarded as being prescriptive design solutions to the problems raised. They are intended only to indicate a proportionate and viable means of eliminating or mitigating the identified problem, in accordance with HD 19/03, and in no way imply that a formal design process has been undertaken. There may be alternative methods of addressing a problem which would be equally acceptable in achieving the desired elimination or mitigation and these should be considered when responding to this report.

Bedford Borough Council also asked URS to consider the responses to the consultation that was carried out on this scheme.

1.2 Scheme Description

The roundabout currently operates with two lane flared entries on all approaches with a wide circulatory carriageway, which although not marked as such 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 and excessive visibility of circulatory carriageway. 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. Bedford Modern sports field, including their cricket pitch and swimming pool are located at the end of Clarendon Street.

The proposal audited at Stage 1 was to convert this junction to an altered form of 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 existing 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. The northbound cycle lane on Union Street appears to just disappear just north of the junction with Warwick Avenue where a 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.

The scheme as presented for this Stage 2 Road Safety Audit makes use of Turbo concept to make drivers choose the correct lane before entering the roundabout but does not provide the option for going straight ahead in both lanes.

An alternative layout for the roundabout and approach splitter islands was also submitted for Audit, along with some alternative Advance Direction Sign designs.

2. ITEMS RAISED AT STAGE 1 AUDIT

A Stage 1 Road Safety Audit was completed in April 2013.

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

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 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

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

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

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 the success or otherwise of the scheme.

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. ITEMS RAISED AT THIS STAGE 2 AUDIT

The following problems are listed in the order that they were identified whilst walking around the site.

3.1 PROBLEM

Location: **General**

Summary: Area with potential build-up of detritus – possible skidding hazard

Details: The rubber kerbing delineating the Clapham Road exit from the circulatory carriageway ties in with the new traffic island such that an area of redundant carriageway is created. This area could become filled with detritus. This could create a skidding hazard for powered two wheeled vehicles. This could be the case in similar situations around the junction.

RECOMMENDATION

Re-align the traffic island such that a smooth transition to the rubber kerbing is created and reduces the area of redundant carriageway prior to the start of the zig-zag markings for the Zebra Crossing.

Design Team Response

Having reviewed the swept path analysis results achieved using AutoTrack it is agreed that some minor realignment could be carried out to the kerbing on the Clapham Road exit to minimise the area of unused carriageway. A similar review of the Tavistock Road exit shows that there is no scope to carry out similar realignment with the swept paths showing no unused carriageway.

Project Sponsor Comment

3.2 PROBLEM

Location: **General** (Dwg. No. 47067365/13S0/RSA2)

Summary: Conspicuity of rubber kerbs in adverse weather – potential for loss of control collisions involving powered two wheeled vehicles

Details: Details provided as to the type of treatment given to the rubber kerbs is that they are "Rubber kerbs in-filled with bituminous material and inlaid with white banding to increase visibility". There is the potential for HGV tyres to scrub the kerbs, either removing the white material or depositing a layer of tyre rubber over the paint.

Motorcyclists helmets can become covered in spray in the wet and at night visibility can be substantially reduced at key moments. As a result it may become difficult to see the rubber kerbs should the conspicuity of the white retro-reflective become diminished.

Photo 1: Proposed Rubber Kerbing

RECOMMENDATION

Ensure that white markings remain visible after wear and especially during adverse weather conditions.

Design Team Response

As communicated to the Audit Team discussions with the manufacturer of the kerbing have confirmed the manufacturing process of the kerb as follows…

'…a white fabric tape which is impregnated with glass beads. This tape is placed within the mould and the rubber added effectively casting the tape in place. This was found to have far superior longevity then merely sticking a tape on to the kerb after manufacture.'

The glass beads give the tape retrorefletive properties and thermoplastic lining will be laid across the island to give a continuous white line banded across the full width of the island.

Agree that the visibility of these lines will need to be monitored and maintained.

Project Sponsor Comment

3.3 PROBLEM

Location: **General**

Summary: Longevity of rubber kerbs– potential for loss of control collisions

Details: No information has been provided as to the robustness of the rubber kerbs when subjected to stress from a turning HGV tyre. Also no details are available as to how the bituminous backfill material will perform under the same conditions.

The information provided suggests that the temporary nature of the construction will benefit from a quicker repair response time and shorter repair period, whilst benefiting from providing a more passive form of delineation than permanent kerbs with bedded concrete foundations. This suggests that the kerb has been chosen for its more forgiving nature than its robustness.

The audit team are concerned that these kerbs may have the potential to disintegrate; either over an extended period of time, thereby depositing small particles; or suddenly leading to large pieces of material being dislodged. In either case a hazard could be created leading to loss of control collisions, especially with powered two wheeled vehicles.

RECOMMENDATION

Ensure that kerbing is reasonably robust and that whichever method is adopted that the maintenance of this junction is treated with a high priority.

Design Team Response

Rubber kerbs have been used to create kerbed build outs in other areas of the country for traffic calming purposes. They have been selected for use in this project as they will benefit from;

easier workmanship for the installers with less weight than their concrete counterparts

quicker installation leading to shorter contract durations and making the installation of the roundabout easier whilst allowing traffic to use the road space during the day

in the event of HGV overrun concerns were raised that concrete kerbs may be knocked loose of their rigid concrete bed and pose a serious risk to road users. Rubber kerbs would allow for some flexibility and less susceptibility to be knocked loose.

It is proposed to use a 6mm asphalt within the island. Again this is a flexible material which will allow some movement in the event of kerbs being knocked however it is accepted that in the event of continued movement some material may be stripped out and be left on the carriageway surface posing a threat to more vulnerable road users. Agree with the comment that maintenance will need to be high priority.

Project Sponsor Comment

3.4 PROBLEM

Location: **General**

Summary: Swept path for large vehicles – potential for side-swipe collisions

Details: The extension of the traffic islands at Tavistock Street and Clapham Road has created and oval shaped circulatory carriageway separated into two streams of traffic. The extension of the traffic islands has also effectively reduced the entry path radius for vehicles making vehicle slow down.

The straight through routes from Tavistock Street to Clapham Road and Clapham Road to Tavistock Street have therefore been delineated. Whereas before a HGV could position itself such that it could take a more direct route it must now stay within the lanes as marked. In practice a large articulated vehicle is likely to overrun the rubber kerbed areas. This could lead to the rubber kerbing to become dislodged or discoloured which may reduce its conspicuity to traffic resulting in the intended layout becoming disregarded or side swipe collisions with vehicles to their offside occurring.

RECOMMENDATION

Ensure that large vehicles are able to negotiate the roundabout within the constraints of the physical measures.

Design Team Response

The software package AutoTrack has been used to analyse the swept paths of a range of HGV's and the results of this have directly influenced the positioning of the islands outside of these swept paths.

Project Sponsor Comment

3.5 PROBLEM

Location: **A** (Dwg. No. 47067365/13S0/RSA2)

Summary: Reduced x-height for advance direction signing – potential late lane changes and collisions with other vehicles including cyclists

Details: The recommended minimum x-height for advance direction signing for roads with and 85th percentile speed of 20-30 mph is 75mm, as is currently used with existing signs Ref 03 and 04 and street name sign Ref 07. It is considered that the importance of a driver being able to assimilate which lane they require before entering this type of roundabout is even more important than with a normal roundabout. The replication of the destinations on the lane designation signs is unnecessary as it adds to the information that a driver has to assimilate whilst they are approaching the junction. Drivers being unable to assimilate the information in a timely manner; either through the legend being too small; or to much information, may find themselves in the incorrect lane when entering the roundabout leading to late braking, lane changing and possible collisions with other vehicles.

Additionally the level of information a driver can assimilate in this particular location may have other consequences as, unlike a conventional roundabout where cyclists typically remain in the left hand lane and stay to the left whilst circumnavigating the circulatory carriageway, cyclists must now also change lanes before entry to circumnavigate the roundabout. Drivers who are concentrating on assimilating the information on the traffic signs may not be expecting cyclists to be to their right and in a blind spot. This could lead to a collision with a cyclist as a vehicle changes lane whilst reading a traffic sign.

RECOMMENDATION

Remove the duplication of destinations from the lane designation signs (Diagram number 877) and increase the x-height of the advance direction signs to ensure the information can be assimilated in a timely manner.

Design Team Response
Agree with the Audit Teams response

Project Sponsor Comment

3.6 PROBLEM

Location: **B** (Dwg. No. 47067365/13S0/RSA2)

Summary: Change in signing strategy – potential for late lane changes resulting in either side-swipe collisions or harsh braking and rear end shunt collisions

Details: The existing signing of "The University of Bedfordshire" has not been retained along Union Street. It is signed at the previous junction along Bromham Road and therefore should be continued until the destination is reached. Drivers following the signing for this destination will suddenly be unsure of where to go leading to late lane changes and the potential for collisions with other road users.

RECOMMENDATION

Ensure continuity of signing is maintained.

Design Team Response
University of Bedfordshire to be added to the advanced direction sign.

Project Sponsor Comment

3.7 PROBLEM

Location: **C** (Dwg. No. 47067365/13S0/RSA2)

Summary: Existing cycle facilities terminated – potential pedestrian/cyclist collisions

Details: The existing road marking along Union Street indicates that an advisory cycle lane is present on the carriageway on both sides of the road. These markings do not appear to have been considered when providing the zebra crossing at the northern end of Union Street. The sudden termination/commencement of the cycle lane without any warning could result in cyclists and other road users being unaware of their responsibilities resulting in a collision involving a cyclist.

RECOMMENDATION

Install signs to indicate to all road users the end of the cycle lane in the northbound direction and the start of the advisory cycle lane in the southbound direction.

Note: The Designers Response within the Stage 1 Road Safety Audit suggests that cyclists are to remain on the carriageway therefore taking the cyclists onto a shared facility is not an option.

Design Team Response

Firstly in the Stage 1 Report the Design Team response stated that the surrounding footpaths would become shared use footpaths whilst the Project Sponsor response stated the scheme aim was to make the carriageway safer for cyclists. It is hoped that by implementing this design those already confident in cycling on carriageway will continue to do so, those whom have some confidence will feel safer and remain on carriageway whilst those lacking any confidence will be able to use the shared use facilities around the roundabout.

With regards cycle facilities northbound on Union Street the advisory lane terminates south of Warwick Avenue and does not continue to the point of the proposed zebra crossing. Cycle symbols are on the carriageway advising cyclists to leave the carriageway and join the footpath and these will not be replaced. With regards the cycle lane southbound on Union Street this currently starts at the roundabout and instead this will start immediately south of the proposed crossing and the existing sign will be relocated to this point.

Project Sponsor Comment

3.8 PROBLEM

Location: **D** (Dwg. No. 47067365/13S0/RSA2)

Summary: Narrow exit from roundabout – collision with rubber kerbing

Details: The rubber kerbing delineating the Clapham Road exit from the circulatory carriageway visually appears to significantly narrows the exit width. In contrast the corresponding exit at Tavistock Street appears as a constant width exit. Neither layout provide sufficient room to pass a vehicle should one break down in this area.

Additionally, should traffic back up to this point; either by virtue of a queue at either the new Zebra Crossing or the existing Pelican Crossing; or as a result of some other congestion further along Clapham Road, a situation could develop where stationary vehicles leave gaps but obscure the presence of the 125 mm high rubber kerbing.

Cycles and powered two wheel vehicles tend to weave through gaps in stationary traffic should they be unaware of the raised rubber kerbs and collide with them, this could result in the rider becoming unseated.

Furthermore, in the event of any queue forming, for instance into Union Street, there may be the temptation to change lanes hoping to avoid the queue not realising that the rubber kerbing would prevent the vehicle from leaving the circulatory area in the direction required. Colliding with the kerbing may result in the vehicle losing control and colliding with another vehicle.

RECOMMENDATION

Provide KEEP CLEAR road markings at points where queuing vehicles may obscure raised kerbs.

Design Team Response

As per problem 3.1 the kerbing on the Clapham Road exit will be realigned as much as is possible whilst not conflicting with HGV's swept paths. It is true that neither exit lane, Clapham Road or Tavistock Street, allow sufficient room should a vehicle break down in these area as however the potential for this to happen is considered low and this situation occurs with many single lane exit roundabouts within the country where traffic islands are present and so is not a unique situation to this design.

The second point relating to queuing traffic is an important point. Queuing traffic will obscure the islands and as such lead to a hazard to vulnerable road users who decide to try and filter through traffic. Keep Clear markings can be installed although the designer does feel this may lead to a lot of road markings being laid leading to an increased amount of information for drivers to assimilate. There is also no guarantee that the addition of these markings will completely remove the risk as they rely on drivers respecting the road markings.

Project Sponsor Comment

3.9 PROBLEM

Locations: **E** (Dwg. No. 47067365/13S0/RSA2)

Summary: U-Turning traffic – potential unexpected lane changes leading to side-swipe collisions

Details: The current situation, unaltered by this scheme, is such that vehicles exiting Clarendon Street or Slade Walk wishing to travel north-west along Clapham Road must perform a U-Turn manoeuvre at the roundabout. An alternative route to Clarendon Street is available via a lengthy detour along Stanley Road, Foster Hill Road and Roff Avenue. Slade Walk provides access to the rear of properties in Clarendon Street but more significantly there is Livingston e Lower School and a pre-school children's centre. No alternative route exists and it is envisaged that this could be a significant trip generator in the AM peak.

The proposed new layout does not cater for U-Turns insofar that a driver will normally expect to remain in the right hand lane all the way around the central island until breaking to the outside just before their exit. With the current layout a driver will be required to break to the outside lane opposite the Tavistock Street entry to avoid the raised rubber kerbing opposite the Union Street arm. It is considered unlikely that anyone would consider this a natural manoeuvre and therefore may find themselves having to weave between the raised rubber kerbs opposite Union Street and those leading to the extended traffic island on Clapham Road. This situation could lead to late braking and lane changes resulting in rear end shunt or side swipe collisions.

RECOMMENDATION

Ensure drivers leaving Clarendon Road are aware of the layout prior to entering the roundabout. This also applies to those u-turning from Tavistock Street.

Design Team Response

Suggest repositioning the advanced direction sign on Clapham Road from the central island to a point in view of Clarendon Street. The scheme is wholly reliant on users following the markings and whilst it is anticipated in the early life of the scheme there may be some confusion this will diminish as local drivers become used to the new layout.

Project Sponsor Comment

3.10 PROBLEM

Location: **F** (Dwg. No. 47067365/13S0/RSA2)

Summary: Private Access: no access to roundabout – potential U-turns

Details: The proposed enlargement of the traffic island along Clapham Road sees the island extend approximately 9 metres into the existing circulatory carriageway. This makes entry onto the roundabout from the private access to Number 4 Clapham Road impossible. There are marked bays for up to 11 vehicles within this property suggesting this is well used.

Drivers wishing to proceed in any direction other than along Clapham Road are faced with a lengthy detour to Linden Road to turn around. They may decide to proceed along Clapham Road and attempt a U-turn manoeuvre at the end of the traffic island opposite Slade Walk despite the presence the of the U-Turn ban. This could lead to rear end shunt, side swipe or head on type collisions with either following or oncoming vehicles.

Alternatively a driver may attempt to enter the roundabout against oncoming traffic that is exiting the roundabout. They will have to travel over the rubber kerbs which would add to the difficulty of the manoeuvre. Any driver attempting this risks collision with oncoming traffic.

RECOMMENDATION

Erect signs to diagram number 606 (Vehicular traffic must proceed in the direction indicated by the arrow) indicating that drivers must proceed left (north-west) along Clapham Road. Alternatively provide a safe means of access to the roundabout for vehicles exiting No. 4 Clapham Road.

Design Team Response

With the new design there is no way to provide a safe means of access to the roundabout and therefore agree to erect a sign to diagram number 606.

Project Sponsor Comment

3.11 PROBLEM

Location: **G** (Dwg. No. 47067365/13S0/RSA2)

Summary: Signs Ref 10 & 11 obscuring existing Pelican Crossing traffic signal heads

Details: The proposed signs Ref 10 and Ref 11 are located in the central reservation either side of the existing Pelican Crossing on Clapham Road. It is possible that these signs may obscure the off side signal head to the crossing, which could lead to late braking and rear end shunts or collisions with pedestrians.

RECOMMENDATION

Ensure sufficient visibility is maintained to the signal heads.

Design Team Response

From problem 3.9 it is proposed to relocate these signs to the nearside footpath rather than in the central island. In either case signs would always be positioned to ensure clear visibility to the signal heads.

Project Sponsor Comment

3.12 PROBLEM

Location: **H** (Dwg. No. 47067365/13S0/RSA2)

Summary: Interaction between Pelican Crossing and Zebra Crossing in close proximity

Details: The existence of the Pelican Crossing opposite Clarendon Street does not appear on any of the drawings. It is assumed that it will remain in place. The existing Pelican Crossing ziz-zag markings extend to a point approximately 4 metres from the ziz-zag markings for the Zebra Crossing. On the north bound carriageway to the south of the crossing, the proposed Zebra crossing only has four marks and terminates approximately 25 metres from the existing Pelican Crossing zig-zags.

There is little guidance on the distance between consecutive crossings but LTN 2/95 paragraph 2.1.1.1 states:

> *"Crossings should be located away from conflict points at uncontrolled junctions. This will give drivers an adequate opportunity to appreciate the existence of a crossing and to brake safely. The 'safe' distance will depend on the geometry of the junction and type of side road. However, a minimum distance of 20 metres is suggested for a signalled-controlled crossing and an absolute minimum of 5 metres for a Zebra crossing... "*

The presence of the side roads and roundabout alone suggest that greater consideration should be given to locating crossings in this area especially when near an area with a high level of usage by school children. The proximity of the two crossings to each other and Clarendon Street could lead to a situation where a driver's attention is drawn to a specific area, either the crossings or the side roads, at the detriment of the other. This could lead to a collision with a pedestrian or another road user as the driver has too much information to take in over such a short distance.

RECOMMENDATION

Provide details on pedestrian movements and predicted future use. Review need for two crossing points in quick succession. The desire line from Slade Walk suggests the Pelican Crossing was installed to serve the school. If this is the case then it is recommended that the proposed Zebra Crossing is not provided and the Pelican Crossing is retained as it offers a higher level of protection for pedestrians.

Design Team Response

Surveys have shown that 763 pedestrians use the pelican crossing within a given day however 430 pedestrians and 64 cyclists have still chosen to cross at the point of the zebra crossing. It is felt that one crossing will not serve both desire lines and that only the retention of both will adequately serve that desire.

Project Sponsor Comment

3.13 **Location**: **I** - Not used

3.15 PROBLEM

Location: **J** (Dwg. No. 47067365/13S0/RSA2)

Summary: Removal of street lighting – potential dark areas and loss of definition of kerb face

Details: Two lighting columns outside Centurion Court are being removed. No replacement lighting is proposed. This could result in the lighting of the roundabout being below the required levels in these locations as well as removing the amenity for pedestrians. This could result in collisions with kerbs, other road users or pedestrians.

RECOMMENDATION

Ensure street lighting levels are provided to maintain a safe environment.

Design Team Response

The design of the lighting has been carried out by the Borough's Lighting Engineer, whilst two columns are being removed and not replaced this is being mitigated by new lanterns on the remaining columns using LED white light lanterns which will maintain required lighting levels and improve the quality of the light.

Project Sponsor Comment

3.16 PROBLEM

Locations: **K** (Dwg. No. 47067365/13S0/RSA2)

Summary: Inappropriate road marking – poor skid resistance leading to loss of control for PTWV

Details: The bifurcation arrow used opposite the Roff Avenue and Union Street exits is normally reserved for entry into a parallel lane or diverge. It is not considered that this marking conveys the correct message and may confuse some drivers. It is also likely to suffer excessive wear and become illegible. Furthermore if this marking is constructed with such that it creates a large area of surfacing with poor skid resistance it may create a skidding risk for powered two wheel vehicles.

RECOMMENDATION

Remove bifurcation arrow road marking. If the designer feels that road markings are necessary in this instance it is recommended that ahead arrows to diagram 1038 are used; one at the point of exit (to both Roff Avenue and Union Street) and on the circulatory carriageway opposite the traffic island.

Design Team Response
Designer is happy to remove bifurcation arrows with no replacements.

Project Sponsor Comment

3.17 PROBLEM

Location: **L** (Dwg. No. 47067365/13S0/RSA2)

Summary: Lack of illumination to regulatory traffic sign – use by inappropriate vehicles or late lane changes. Lack of advance warning.

Details: The weight limit sign (Ref 01) located within the footway at the Roff Avenue exit is not shown as being illuminated. This could lead to the sign not being seen in a timely manner leading to potential late braking or lane changing manoeuvres involving a heavy goods vehicle, resulting in a collision with another road user.

Also, there is a lack of advance warning, and alternative route signing of this ban. This would normally be less of an issue with a conventional roundabout as lane changes are achievable. There currently exists an existing traffic sign located outside Centurion court which is very old (blue border) indicating that lorries should proceed along Tavistock Street.

The introduction of strict lane designation will exacerbate this issue leading to the same consequences as described above.

RECOMMENDATION

Provide suitable illumination to regulatory sign. Consider advance signing of ban with the option of providing an alternative route.

Design Team Response

Drawing C897.C.1200.02.A does show the weight limit signs being illuminated. The existing alternative route sign for HGV's will be retained as part of this scheme as there is currently a town centre wide signing review, which the proposed signing allows for, and this is one of the issues being reviewed.

Project Sponsor Comment

3.18 PROBLEM

Location: **M** (Dwg. No. 47067365/13S0/RSA2)

Summary: Sign Ref 14 may obscure visibility – potential for collisions between exiting and side road vehicles.

Details: Lack of mounting height and lateral clearance information makes it impossible to determine if sign Ref 14 will impede visibility east along Tavistock Street for vehicles exiting Tavistock Place. This could lead to side impact or rear end shunt type collisions as vehicles either pull out injudiciously or edge forward for an improved view.

RECOMMENDATION

Ensure sign Ref 14 is located such that existing visibility levels are maintained.

Design Team Response

Drawing C897.C.1200.03.C shows that the mounting height of this sign will be 2300mm and the sign will be erected on a single post at the back of the footpath to ensure visibility is maintained.

Project Sponsor Comment

3.19 PROBLEM

Location: **N** (Dwg. No. 47067365/13S0/RSA2)

Summary: Sign Ref 15 in footway – potential obstruction to pedestrians

Details: Lack of lateral clearance and post spacing information makes it impossible to determine if sign Ref 15 will impede pedestrian movement on narrow footway. Consideration should be given to wheelchairs, mobility scoters and pushchairs to avoid the need for them to enter the carriageway.

RECOMMENDATION

Ensure sign Ref 15 is located such that non-motorised users are not impeded on narrow footway.

Design Team Response
Drawing C897.C.1200.03.C shows that the mounting height of this sign will be 2300mm and the sign will be erected on a single post at the back of the footpath to ensure the maximum width of footpath is maintained.

Project Sponsor Comment

3.20 **Location: O -** Not used

3.21 PROBLEM

Location: **P** (Dwg. No. 47067365/13S0/RSA2)

Summary: Lack of visibility for pedestrians crossing Union Street – potential for pedestrian/vehicle collisions

Details: Pedestrians crossing Union Street from east to west have reduced visibility. The existing uncontrolled crossing point is located at the extremity of Union Street and pedestrians can see vehicles approaching along Tavistock Street from approximately 35 metres from the give way line. Vehicle speeds around this turn into Union Street can be excessive if the driver does not have to slow down for traffic on the roundabout. The proposed zebra crossing is located 8 metres further south along Union Street. This location reduces the visibility for pedestrians and requires them to look behind them more than they currently have to. The enlarged island and lack of pedestrian guard railing may encourage crossing at any point within this area as the crossing is no longer on the desire line.

Whilst the zebra crossing offers a little extra protection for pedestrians vehicles are not required to yield once inside the zig-zag marking. This could lead to collisions between pedestrians and vehicles where one has failed to see the other.

RECOMMENDATION

Relocate crossing further south along Union Street to increase visibility for vulnerable pedestrians.

Design Team Response

The survey results show that a total of 841 pedestrians crossed Union Street at this location during the course of the survey period. One of the scheme's primary aims is to provide safe crossing points on all arms and it is not possible to position a zebra crossing at the location of the existing uncontrolled crossing point as it would not meet with require standards. It has been located at a point far enough away to allow for adequate forward visibility whilst still keeping the crossing close enough to the desire line to attract pedestrians and dissuade them from crossing closer to the roundabout, moving the crossing further south would diminish its appeal to pedestrians who do not like walking out of their way resulting in some pedestrians still crossing close to the roundabout with the potential for accidents. The designer feels that as cars are exiting from a roundabout they will have adequate forward visibility to the crossing.

Project Sponsor Comment

3.22 Location Q – Not used.

3.23 PROBLEM

An alternative layout for the roundabout and approach splitter islands was also submitted for Audit, along with some alternative Advance Direction Sign designs.

The majority of the Problems raised within this report are still valid in relation to this Alternative design.

Location: **General** on Alternative Advance Direction Sign Design

Summary – Layouts do not show true layout of junction, drivers may expect physical islands between flows of traffic without which side swipe collisions could occur.

Details – The designs shown do not represent the true layout of the junction ahead. As such drivers may expect a physical island between the flows of traffic. Upon finding no such separation exists, side swipe type collisions may occur or rear end shunt type collisions should drivers hesitate due to uncertainty as to where they are expected to go in order to reach their intended destination.

RECOMMENDATION

Provide signs which represent the true layout of the junction ahead.

Design Team response

Regarding the alternative layout

Without any considered opinion of if the alternative layout would provide a clearer or more confusing layout to road users the designer suggests the original layout is maintained.

Regarding the alternative sign designs

If the safety audit team feel the original designs better reflect the layout of the roundabout than the alternatives supplied the designer is happy to keep them.

Project Sponsor comments

4. AUDI T TEAM STATEMENT

Turbo Roundabout, Clapham Road-Tavistock Street, Bedford

Stage 2 Road Safety Audit

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

AUDIT TEAM LEADER

Mrs E Sands

Audit Team Leader

URS Infrastructure & Environment UK Limited
URS House
Horne Lane
Bedford
MK40 1TS

Signed

Date

Appendix A List of drawings

Number	Title	Scale	Original Size
C897.C.0100.01	Location Plan	1:1,000	A3
C897.C.021	Highway Boundary	1:860	A2
C897.C.0100.04	Proposed Layout	NTS	A1
C897.C.0200.01.A	Site Clearance	1:250	A1
C897.C.0500.01	Drainage Layout	1:250	A1
C897.C.0700.01	Pavements	1:250	A1
C897.C.0700.02	High Friction Surfacing	1:250	A1
C897.C.0110.01.B	Kerbing Works	1:250	A1
C897.C.1100.02.A	Footway Construction	1:250	A1
C897.C.1200.01	Road Marking Layout	1:250	A1
C897.C.1200.02.A	Traffic Signs and Street Furniture	1:250	A1
C897.C.1200.03.C	Sign Schedule	NTS	A1
C897.ME.1400.01.A	Electrical Works	1:250	A1
C897.C.07	Alternative Layout	1:250	A1
C897.C.1200.03.C	Alternative Sign Designs	NTS	A3

Appendix B PROBLEM Location Plans

PRINTS FROM THIS DRAWING ARE UNCONTROLLED UNLESS OTHERWISE STATED

A1

CLAPHAM ROAD

ROFF AVENUE

UNION STREET

TAVISTOCK STREET

North End Club

Garage

Aspley Court

El Sub Sta

4.64m
3.55m
3.58m
7.22m
5.89m
5.77m
3.40m
3.40m
9.44m
4.86m
6.66m
5.74m
5.83m
2.83m
2.85m
5.70m
139 to 145

DATE	AMENDMENTS	REV	BY
NOV '13	First Issue	0	ABC

BEDFORD BOROUGH COUNCIL

Engineering Services
BOROUGH HALL, CAULDWELL ST, BEDFORD, MK42 9AP
Tel. (01234) 276958

CLIENT
Environment and Sustainable Communities

SCHEME
Union Street Roundabout

DRAWING TITLE
ALTERNATIVE LAYOUT

DRG No.
C897.C.07

DRG STATUS
Feasibility

SCALE @ A1	DATE	DRAWN	CHECKED
1:250	DEC '13	ABC	ACB

Sign Reference ref 01	
Height	600mm
Width	600mm
Area	0.28 sq.m
Material	Class RA2 (12899–1:2007)
Mount Height	2300

Scheme Ref. UNION STREET			
Sign	Ref. ref 02	x–height	75.0
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	905mm
Border	BLACK	Height	430mm
Material	Class RA2 (12899–1:2007)	Area	0.39sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	2300mm	Bases	Individual
Number	1	Base Width	1100mm
Size	88.9x4.0CHS	Base Length	1100mm
Length	4280mm	Base Depth	700mm
Centres	N/A	Base Vol. o/a	0.85 m3
Illumination	Yes	Earth Cover	50mm

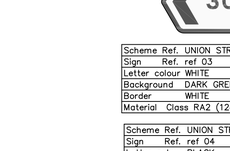
* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

Scheme Ref. UNION STREET			
Sign	Ref. ref 03	x–height	75.0
Letter colour	WHITE	SIGN FACE	
Background	DARK GREEN	Width	1505mm
Border	WHITE	Height	450mm
Material	Class RA2 (12899–1:2007)	Area	0.68sq.m

Scheme Ref. UNION STREET			
Sign	Ref. ref 04	x–height	75.0
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1240mm
Border	BLACK	Height	415mm
Material	Class RA2 (12899–1:2007)	Area	0.51sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1200mm	Bases	Combined
Number	2	Base Width	1300mm
Size	76.1x3.2CHS	Base Length	900mm
Length	2565mm	Base Depth	500mm
Centres	900mm	Base Vol. o/a	0.59 m3
Illumination	No	Earth Cover	50mm

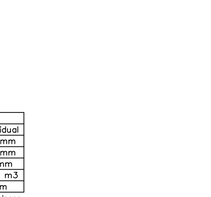
* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.



Scheme Ref. Union Street Roundabout			
Sign	Ref. 09	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1170mm
Border	BLACK	Height	940mm
Material	Class RA2 (12899–1:2007)	Area	1.10sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1800mm	Bases	Combined
Number	2	Base Width	1400mm
Size	88.9x3.2CHS	Base Length	1000mm
Length	3190mm	Base Depth	500mm
Centres	900mm	Base Vol. o/a	0.70 m3
Illumination	No	Earth Cover	50mm

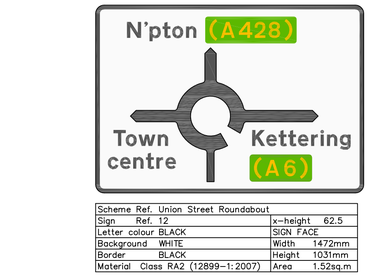
* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.



Scheme Ref. Union Street Roundabout			
Sign	Ref. 10	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1069mm
Border	BLACK	Height	1006mm
Material	Class RA2 (12899–1:2007)	Area	1.08sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1800mm	Bases	Combined
Number	2	Base Width	1300mm
Size	88.9x3.2CHS	Base Length	1100mm
Length	3256mm	Base Depth	500mm
Centres	800mm	Base Vol. o/a	0.72 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.



Scheme Ref. Union Street Roundabout			
Sign	Ref. 12	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1472mm
Border	BLACK	Height	1031mm
Material	Class RA2 (12899–1:2007)	Area	1.52sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	2300mm	Bases	Individual
Number	1	Base Width	1200mm
Size	120x60x3.6RHS	Base Length	1200mm
Length	4081mm	Base Depth	800mm
Centres	N/A	Base Vol. o/a	1.15 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

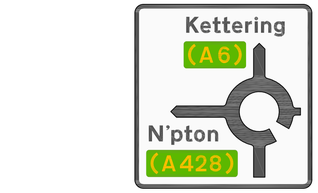
Sign to be erected at the back of the footpath on a single post with an offset bracket to ensure footpath is clear of obstacles.

Scheme Ref. Union Street Roundabout			
Sign	Ref. 13	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1189mm
Border	BLACK	Height	1253mm
Material	Class RA2 (12899–1:2007)	Area	1.49sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	2300mm	Bases	Individual
Number	1	Base Width	1200mm
Size	120x60x3.6RHS	Base Length	1200mm
Length	4303mm	Base Depth	800mm
Centres	N/A	Base Vol. o/a	1.15 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

Sign to be erected at the back of the footpath on a single post with an offset bracket to ensure footpath is clear of obstacles.



Scheme Ref. Union Street Roundabout			
Sign	Ref. 11	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1145mm
Border	BLACK	Height	935mm
Material	Class RA2 (12899–1:2007)	Area	1.07sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1800mm	Bases	Combined
Number	2	Base Width	1300mm
Size	88.9x3.2CHS	Base Length	1000mm
Length	3185mm	Base Depth	500mm
Centres	800mm	Base Vol. o/a	0.65 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

Scheme Ref. Union Street Roundabout			
Sign	Ref. 14	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	972mm
Border	BLACK	Height	1010mm
Material	Class RA2 (12899–1:2007)	Area	0.98sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	2300mm	Bases	Individual
Number	1	Base Width	1100mm
Size	100x50x3.2RHS	Base Length	1100mm
Length	3960mm	Base Depth	700mm
Centres	N/A	Base Vol. o/a	0.85 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

Sign to be erected at the back of the footpath on a single post with an offset bracket to ensure footpath is clear of obstacles.

Scheme Ref. Union Street Roundabout			
Sign	Ref. 05	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	1134mm
Border	BLACK	Height	414mm
Material	Class RA2 (12899–1:2007)	Area	0.47sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1200mm	Bases	Combined
Number	2	Base Width	1200mm
Size	76.1x3.2CHS	Base Length	700mm
Length	1964mm	Base Depth	400mm
Centres	800mm	Base Vol. o/a	0.34 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

Scheme Ref. Union Street Roundabout			
Sign	Ref. 06	x–height	62.5
Letter colour	BLACK	SIGN FACE	
Background	WHITE	Width	890mm
Border	BLACK	Height	414mm
Material	Class RA2 (12899–1:2007)	Area	0.37sq.m

POST(S) & FOUNDATION DESIGN (BS 873*)			
Mounting Height	1200mm	Bases	Individual
Number	1	Base Width	700mm
Size	76.1x3.2CHS	Base Length	700mm
Length	2064mm	Base Depth	500mm
Centres	N/A	Base Vol. o/a	0.25 m3
Illumination	No	Earth Cover	50mm

* Please note, these details should be checked by a Structural Engineer for compliance with current Standards.

All signs to be located with at least 450mm clearance to the edge of the carriageway

JAN '14	Post Details Added	A	ABC
NOV '13	Signs amended	A	ABC
SEP '13	First Issue	0	ABC
DATE	AMENDMENTS	REV	BY

BEDFORD BOROUGH COUNCIL

Engineering Services

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CLIENT
Environment and Sustainable Communities

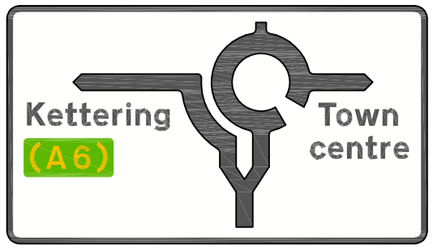
SCHEME
Union Street Roundabout

DRAWING TITLE
Sign Schedule

DRG No.
C897.C.1200.03.C

DRG STATUS
Construction

SCALE @ A1	DATE	DRAWN	CHECKED
NTS	SEP '13	ABC	ACB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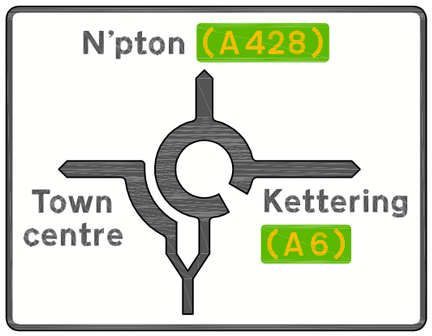
(A6)
Town
centre


Town centre
N'pton
(A428)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Town
centre
Kettering
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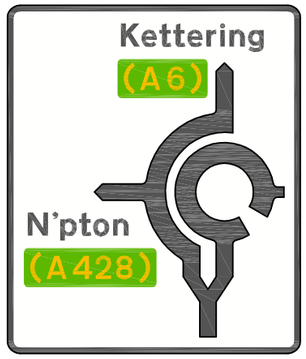
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(A6)
N'pton
(A428)