

Appendix N

Road Safety Audit
Stage 1

Persimmon Homes,
Taylor Wimpey and
Barratt Homes

**Waterfront Barry,
Vale of Glamorgan**

Stage 1 Road Safety
Audit

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March 2010

Ove Arup & Partners Ltd


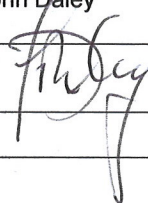
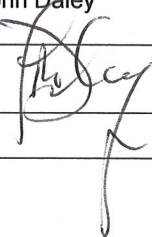
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It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party

Job number 122374-00

Job title	Waterfront Barry, Vale of Glamorgan	Job number	122374-00
Document title	Stage 1 Road Safety Audit	File reference	27
Document ref	RSA1/1		

Revision	Date	Filename	RP-CVL Barri RSA1 Issue 100310.doc		
Issue	10/03/10	Description	Issue Document		
			Prepared by	Checked by	Approved by
		Name	Chris van Lottum	John Daley	John Daley
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			

Issue Document Verification with Document

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Appendix A

Documents and Drawings

1 Introduction

Arup was appointed on behalf of a development consortium comprising Persimmon Homes, Taylor Wimpey and Barratt Homes to conduct this Stage 1 Road Safety Audit on highway improvements in connection with the Waterfront Barry development in Barry, Vale of Glamorgan.

The audit has been undertaken in accordance with the process set out in HD19/03 Road Safety Audits; and the team members meet the training and experience requirements noted therein.

The audit team consisted of Mr C van Lottum and Mr J Lowe who visited the site together on Thursday 28th January 2010. Weather conditions on site were overcast whilst the road surface was damp.

A list of information provided to the Audit Team has been provided as Appendix A to this report.

No previous road safety audits have been conducted on this scheme.

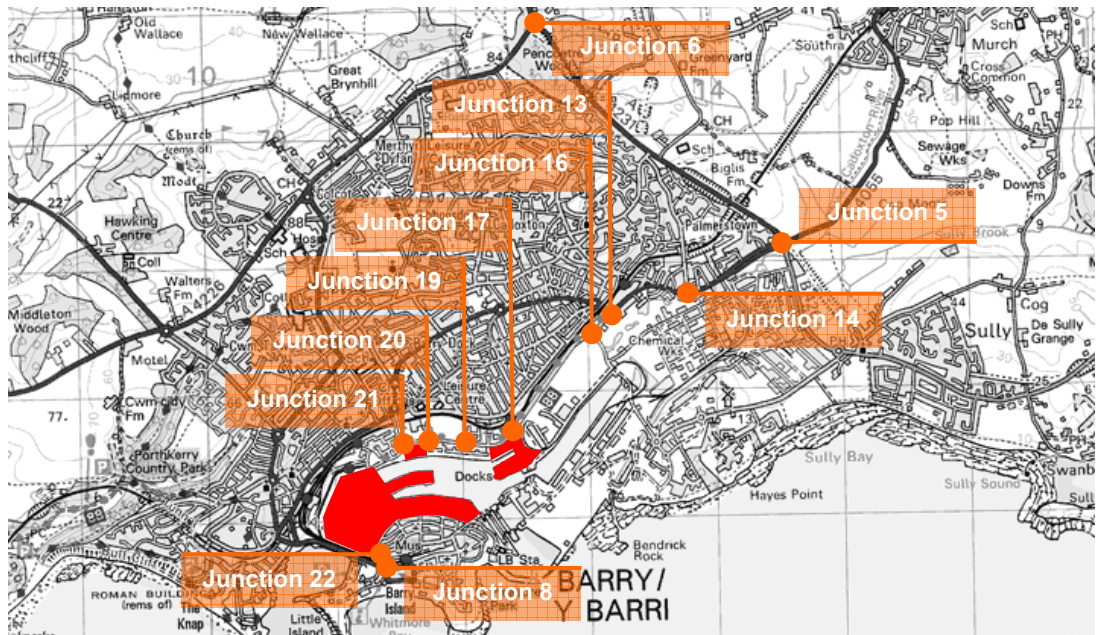
1.1 Site Description

The development area consists of a number of vacant sites situated around the former No.1 Dock in Barry, Vale of Glamorgan. The brownfield sites sit between Barry town centre and Barry Island. The dock area is reclaimed land and is largely flat rising as it meets Barry Island at the south side of the site.

The onsite works comprise a link road approximately 800 metres long around the western side of the docks. The link will connect Ffordd y Mileniwm on the north side to Paget Road in Barry Island. Three signalised junctions are proposed for the link road.

In addition to the main development site the audit also considers some eleven off-site junctions where improvement works are proposed as a result of the development proposals. These are:

- | | |
|----|---|
| 8 | Harbour Road / Station Approach / Paget Road |
| 22 | Paget Road / Plymouth Road |
| 21 | Gladstone Bridge / Ffordd y Mileniwm |
| 20 | Heol Ceiniog / Ffordd y Mileniwm |
| 19 | Y Rhodfa / Clos Tyniad Glo / Ffordd y Mileniwm |
| 17 | Cory Way / Ffordd y Mileniwm |
| 16 | Wimbourne Road / Ffordd y Mileniwm |
| 13 | Cardiff Road / Ffordd y Mileniwm |
| 14 | Cardiff Road / Palmerston Road |
| 5 | Sully Moors Road / Cardiff Road / A4231 Barry Docks Link Road |
| 6 | A4050 Port Road / A4231 Barry Docks Link Road |



1.2 Scheme Description

The Waterfront Barry scheme comprises largely residential development with a school and supermarket. The on-site highways link Ffordd y Mileniwm on the Barry Docks with Harbour Road on Barry Island by way of a new link road which will include three roundabout junctions and a number of priority junctions, all providing access to new developments.

The off-site works comprise:

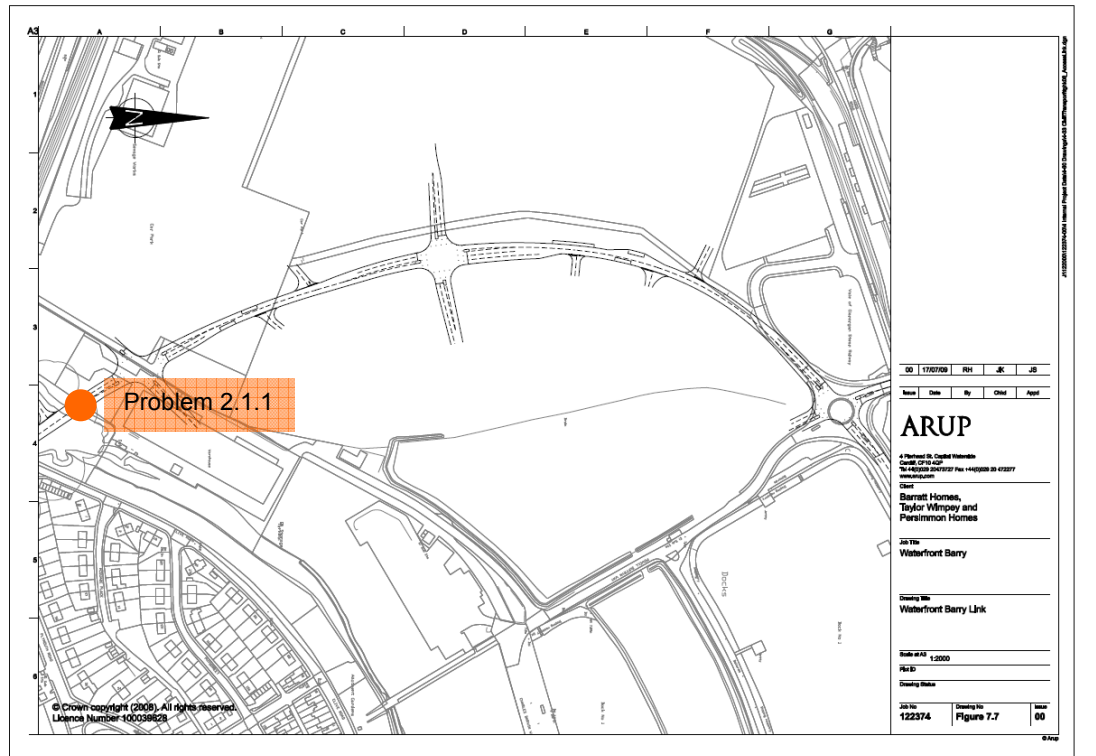
- 8 Harbour Road / Station Approach / Paget Road
Conversion of mini-roundabout to traffic signals
- 22 Paget Road / Plymouth Road
Conversion of roundabout to traffic signals
- 21 Gladstone Bridge / Ffordd y Mileniwm
Enlargement of existing roundabout
- 20 Morrison's / Ffordd y Mileniwm
Enlargement of existing roundabout
- 19 Y Rhodfa / Clos Tyniad Glo / Ffordd y Mileniwm
Entry arm amendments at existing roundabout
- 17 Cory Way / Ffordd y Mileniwm
Entry arm amendments at existing roundabout
- 16 Wimbourne Road / Ffordd y Mileniwm
Conversion of priority junction to roundabout
- 13 Cardiff Road / Ffordd y Mileniwm
Enlargement and introduction of through traffic slip lane to existing roundabout
- 14 Cardiff Road / Palmerston Road
Introduction of additional lanes at existing traffic signals
- 5 Sully Moors Road / Cardiff Road / A4231 Barry Docks Link Road
Conversion of roundabout to traffic signals
- 6 A4050 Port Road / A4231 Barry Docks Link Road
Enlargement and introduction of three slip lanes to existing roundabout.

2 Issues Raised at Stage 1 Road Safety Audit

On-site Highway Works

Listed south to north.

2.1 Waterfront Barry Link between Paget Road / Plymouth Road and West Pond / South Quay Junctions (TA Figure 7.7)



2.1.1 Problem

Location Waterfront Barry Link

Summary Steep grade

Description The Paget Road / Plymouth Road junction is significantly elevated above the existing dock area.

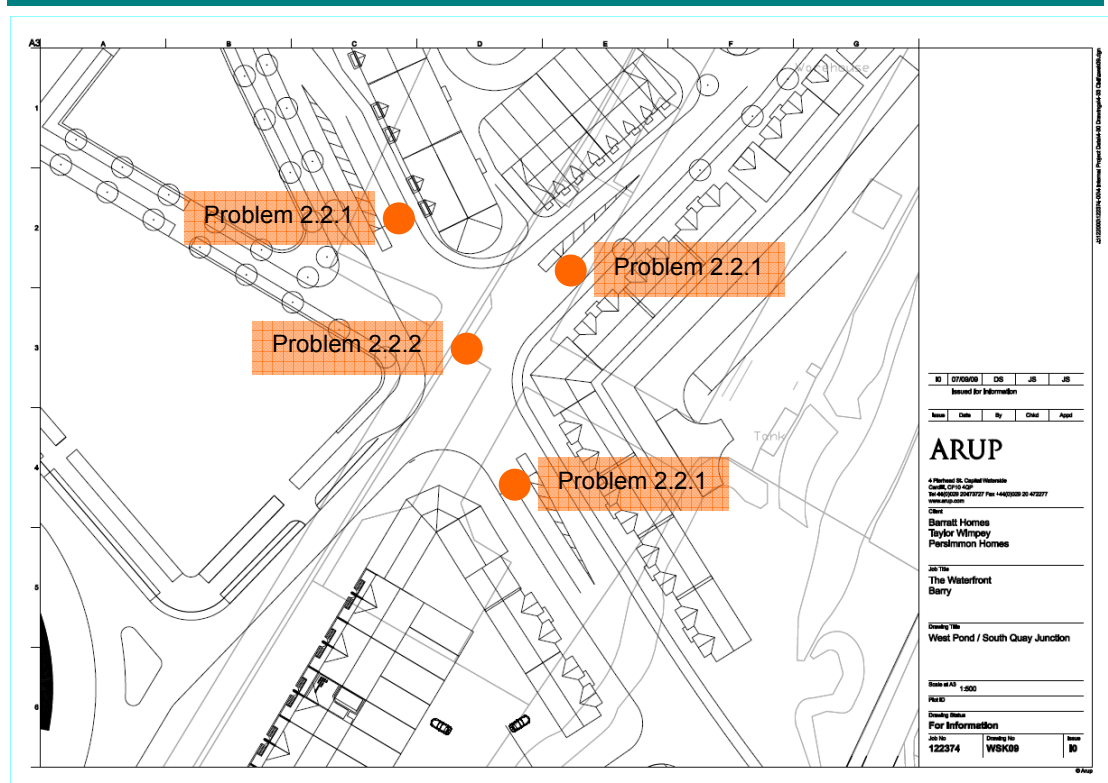


IMG_0528jpg

Steep grades can limit large vehicle's speed leading to frustration and overtaking conflicts.

Recommendation Ensure the grade does not exceed 6% (Waterfront Barry Link will be a bus route), and that vertical curves do not restrict the forward visibility of junctions.

**2.2 Waterfront Barry Link / West Pond / South Quay Junction
(TA Figure 7.7 Drawing WSK09)**



2.2.1 Problem

Location Junction

Summary Stop line set back

Description The stop lines at the proposed junction are set back a significant distance from the junction centre.

As a result there is a significant distance (approximately 60m) between opposing stop lines resulting in a large expanse of unmarked road surface. This is likely to result in large unused areas promoting the build up of detritus on the carriageway. In addition, some drivers may find the lack of direction here confusing leading to hesitancy.

Recommendation Reduce the size of the junction.

2.2.2 Problem

Location Junction

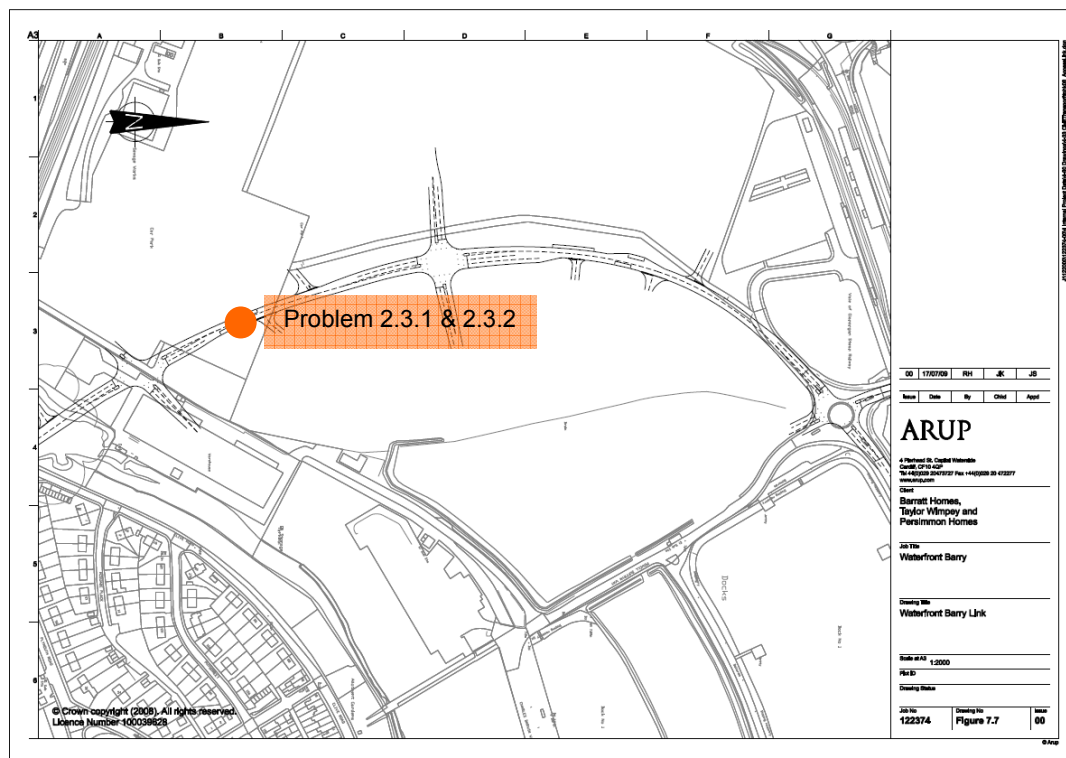
Summary Junction arrangement

Description The junction layout is such that it promotes an offside right-turning arrangement.

An off-side right-turning (hooking) arrangement can result in blocking during peak periods which can lead to driver frustration and side swipe accidents if vehicles are poorly positioned.

Recommendation Provide additional road markings in the junction as appropriate to assist right turning drivers.

2.3 Waterfront Barry Link between West Pond / South Quay and West Pond / Supermarket junctions (TA Figure 7.7)



2.3.1 Problem

Location Waterfront Barry Link

Summary Bus stops close to a junction

Description The eastbound and westbound bus stops on the southern section of the Waterfront Barry Link are located in close proximity to priority accesses serving residential properties.

The position of the southbound bus stop is within the junction visibility splay, which is likely to result in turning conflicts, whilst the northbound bus stop is located within the junction.

Recommendation Relocate the bus stops away from the junction.

2.3.2 Problem

Location Waterfront Barry Link

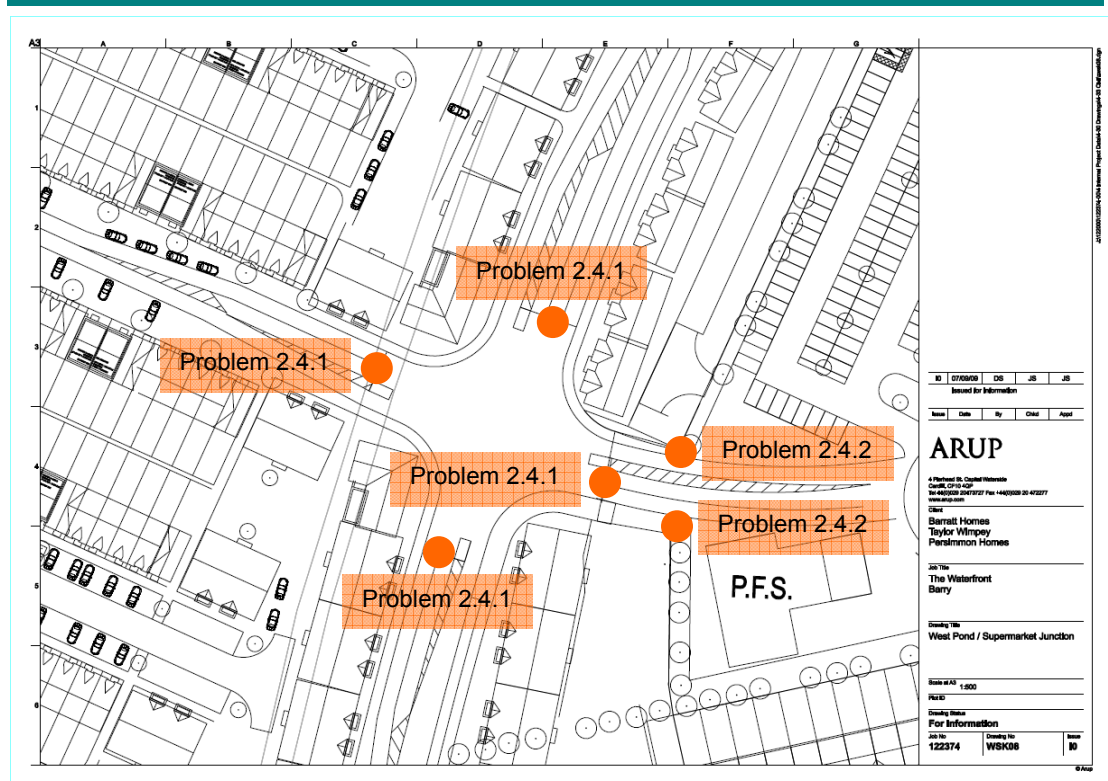
Summary Spacing of bus stops

Description The eastbound and westbound bus stops provided on this section of the link road are located approximately 25 metres apart.

Insufficient space between bus stops can result in traffic congestion and passing conflicts.

Recommendation Provide a minimum tail to tail offset of 40 metres to allow traffic to safely pass a stationary vehicle.

**2.4 Waterfront Barry Link / West Pond / Supermarket
(TA Figure 7.7 , Drawing WSK08)**



2.4.1 Problem

Location Junction

Summary Stop line set back

Description The stop lines at the proposed junction are set back a significant distance from the junction centre.

As a result there is a significant distance (approximately 50m) between opposing stop lines, resulting in a large expanse of unmarked road surface. This is likely to result in large unused areas promoting the build up of detritus on the carriageway. In addition, some drivers may find the lack of direction here confusing leading to hesitancy.

Recommendation Reduce the size of the junction.

2.4.2 Problem

Location Supermarket

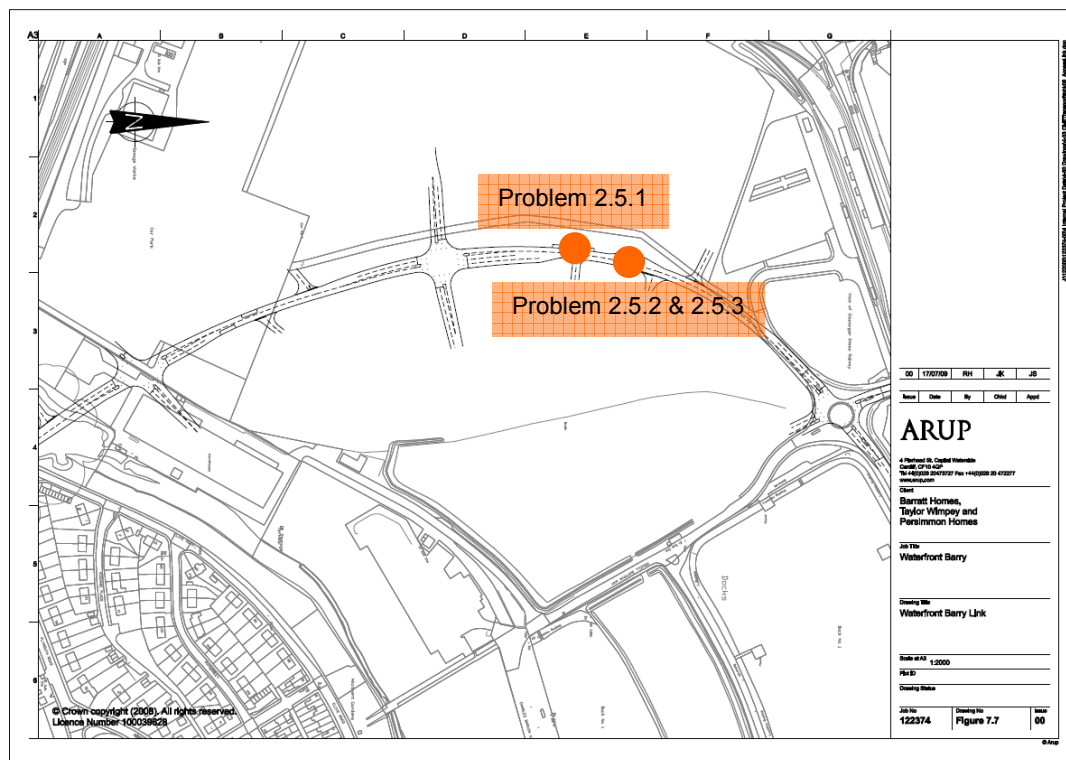
Summary Footway continuity to supermarket

Description The proposals show footways on both side of the Supermarket access, however these stop after a short distance.

A lack of pedestrian access from the surrounding residential area will result in pedestrians either using the verge, risking slips and falls, or using the access road at the risk of a collision with a vehicle.

Recommendation Ensure adequate intuitive footway links are provided to the supermarket.

2.5 Waterfront Barry Link between West Pond / Supermarket West Pond Northern junctions (TA Figure 7.7)



2.5.1 Problem

Location

Waterfront Barry Link

Summary

Parking bays within a junction

Description

There is a group of kerbside parking bays opposite the junction to service residential properties on the northern section of the Waterfront Barry Link. The parking bays on the northbound carriageway introduce an additional conflict within the junction.

Recommendation

Relocate the parking area away from the junction.

2.5.2 Problem

Location

Waterfront Barry Link

Summary

Bus stops close to a junction

Description

The bus stops on the northern section of the Waterfront Barry Link are located in close proximity to two priority accesses serving residential properties and the supermarket service yard. The position of the southbound bus stop is within the junction visibility splay, which is likely to result in turning conflicts. Whilst the northbound bus lay-by introduces an additional conflict within the junction.

Recommendation

Relocate the bus stops away from the junction.

2.5.3 Problem

Location Waterfront Barry Link

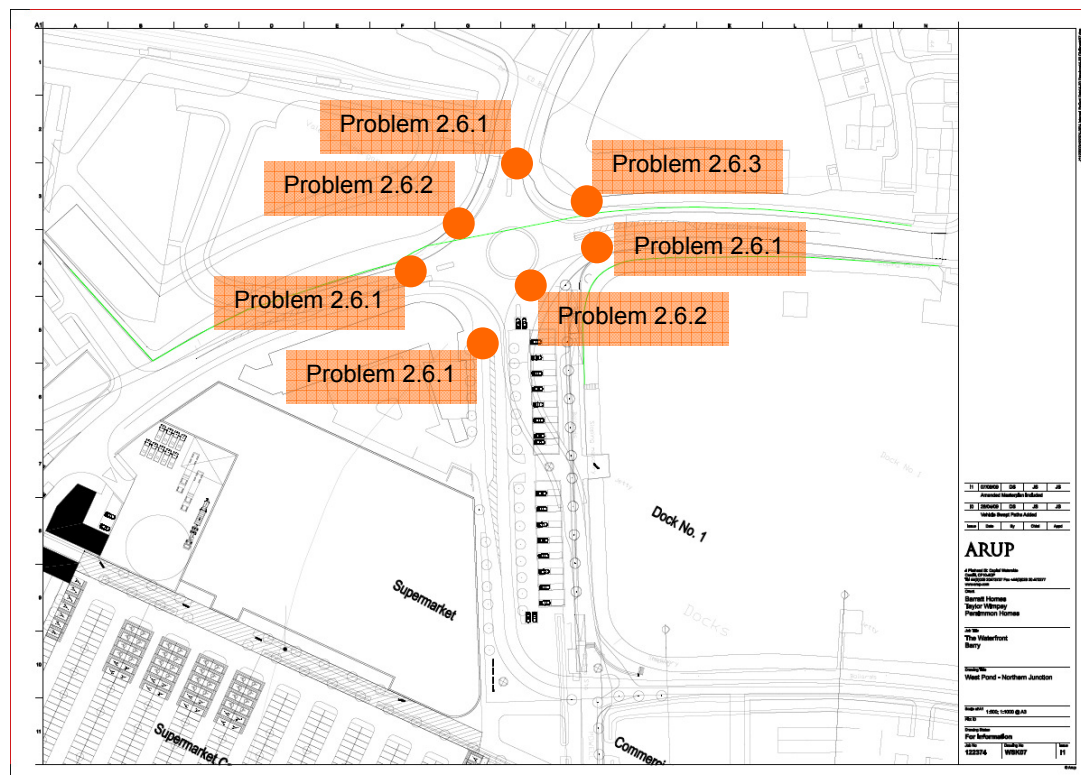
Summary Spacing of bus stops

Description The bus stops provided on this section of the link road are located opposite one another, rather than tail to tail.

This is likely to result in a high risk pedestrian crossing path behind and between the buses, placing pedestrians at risk of conflict with passing traffic.

Recommendation Provide a minimum offset of 40 metres to allow traffic to safely pass a stationary vehicle.

**2.6 Waterfront Barry Link / West Pond Northern Junction
 (TA Figure 7.7 , Drawing WSK07)**



2.6.1 Problem

Location Junction

Summary Stop line set back

Description The stop lines at the proposed junction are set back a significant distance from the junction centre.

As a result there is a significant distance (approximately 70m) between opposing stop lines, resulting in a large expanse of unmarked road surface. This is likely to result in large unused areas promoting the build up of detritus on the carriageway. In addition, some drivers may find the lack of direction here confusing leading to hesitancy.

Recommendation Reduce the size of the junction.

2.6.2 Problem

Location Junction

Summary Sweeping kerb lines

Description The junction has been provided with sweeping radii particularly in the north western and south-eastern corners.
 Sweeping radii can result in high entry speeds, leading to loss of control on the exit.

Recommendation Reduce the junction radii to reduce traffic speeds within the junction.

2.6.3 Problem

Location Junction

Summary Provision for cycles

Description It is not clear from the proposed arrangement how National Cycle Route 88, currently running alongside the existing junction is to be accommodated.



IMG_0554.jpg

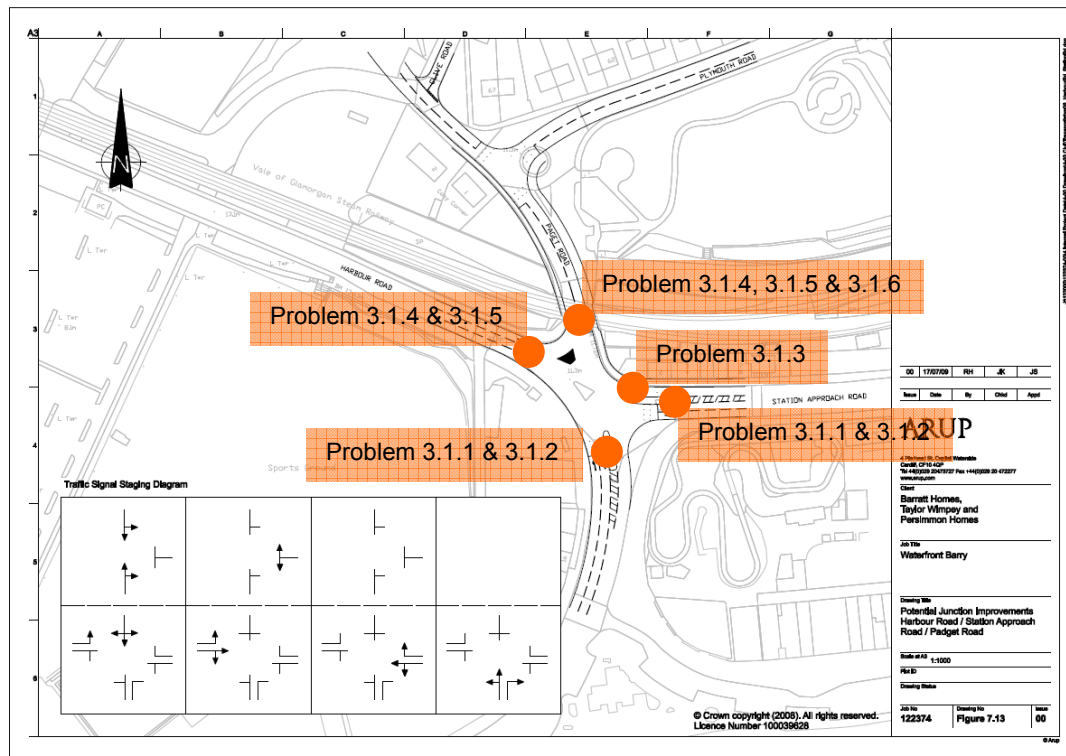
Cyclists are particularly vulnerable to side swipes at junctions and could be struck while crossing at splitter islands not specifically designed to accommodate them.

Recommendation Include measures to assist cycles at the junction.

3 Issues Raised at Stage 1 Road Safety Audit Off-site Highway Works

Listed South to North

3.1 Harbour Road / Station Approach / Paget Road (TA Junction 08 Figure 7.13)



3.1.1 Problem

Location Station Road Approach / Harbour Road (south)

Summary Staggered pedestrian crossings

Description The crossings proposed on the southern and eastern arms of the junction have right-left staggers.

The right-left stagger results in pedestrians approaching the second half of the crossing, facing away from oncoming traffic. This could result in a pedestrian continuing to cross, oblivious to oncoming traffic.

Recommendation Provide the crossings with a left-right stagger.

3.1.2 Problem

Location Station Road Approach / Harbour Road (south)

Summary Limited pedestrian crossing opportunity

Description Due to the phasing of the junction, there will only be limited opportunity to cross the southern and eastern arms of the junction.

Limited crossing opportunities cause pedestrian frustration at busy times, such as the holiday season. As a result pedestrians will be likely to make crossing movements against the signals placing them at risk of injury.

Recommendation Consider an all red crossing arrangement of this junction.

3.1.3 Problem

Location Station Road Approach

Summary Narrow exit lane

Description The exit arm on Station Approach has a narrow throat as a result of the proposed splitter island.

This is likely to result in overrunning of the splitter island, damage to street furniture and possibly injury to pedestrians.

Recommendation Assess the junction using AutoTrack to ensure there is adequate carriageway width for large vehicles.

3.1.4 Problem

Location Harbour Road / Paget Road

Summary Limited pedestrian movement

Description Pedestrian crossing facilities are not proposed on the northern or western sides of the junction.

The lack of crossing facilities places pedestrians using the northern footway on Harbour Approach at risk of injury.

Recommendation Consider an all red crossing arrangement of this junction.

3.1.5 Problem

Location Paget Road approach

Summary Visibility of traffic signals under bridge

Description The Paget Road arm of the junction runs under a railway bridge in the immediate vicinity of the junction. As a result drivers will emerge from the shadow of the bridge as they meet the traffic signals.



IMG_0495.jpg

As a result the signals may be difficult to see, especially in bright or low winter sun conditions, leading to overrunning of the stop line.

Recommendation Provide backing boards on the traffic signal heads in order to maximise visibility.

3.1.6 Problem

Location Left Turn from Harbour Road to Paget Road

Summary Narrow traffic lane for large vehicles

Description Paget Road is a bus route and buses currently struggle to turn from Harbour Road without encroaching on the southbound lane. The proposed kerb line will narrow the exit arm.



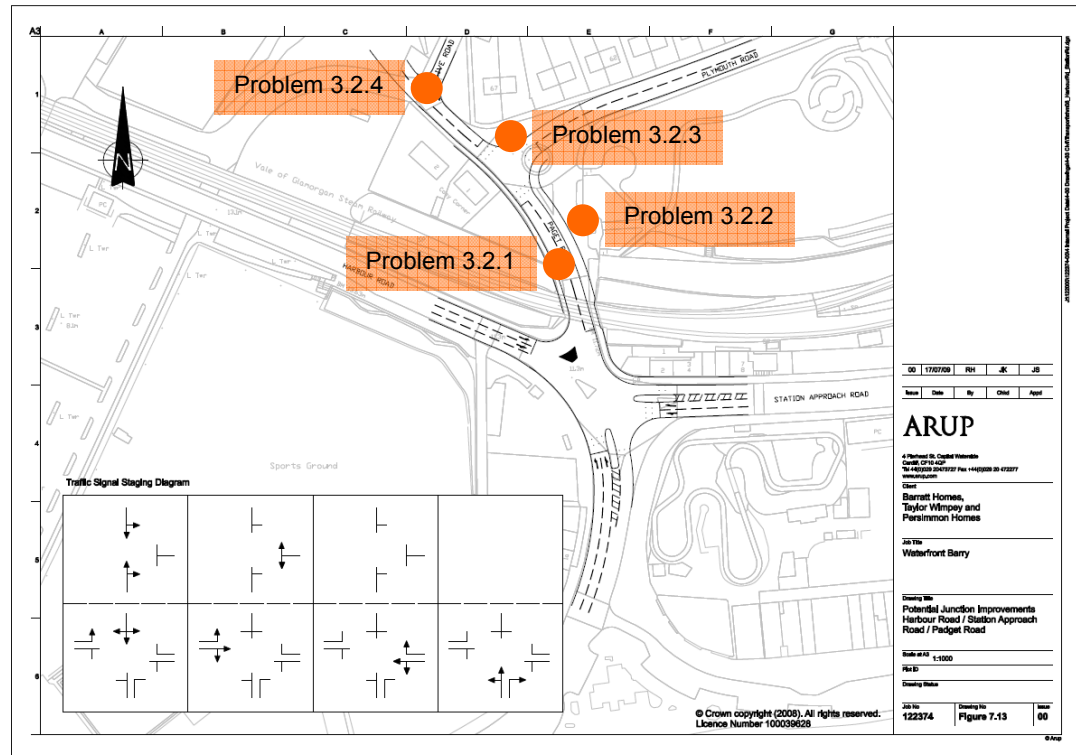
IMG_0486.jpg

This could result in sideswipe or even head on collisions on this arm of the junction.

Recommendation

Ensure the lane markings provided on Paget Road can accommodate buses turning from Harbour Road.

3.2 Paget Road / Plymouth Road (TA Junction 22 Figure 7.13)



3.2.1 Problem

Location

Junction

Summary

Direction signing

Description

Road markings presently directing visitors to the car park are not shown on the proposed road layout.



IMG_0521.jpg

A lack of adequate direction signing could result in drivers entering the residential streets of Barry Island leading to unnecessary congestion and conflict.

Recommendation

Provide appropriate traffic signing and/or road markings to guide visitors to the car park.

3.2.2 Problem

Location

Paget Road

Summary

Park access

Description

The maintenance access to Maslin Park from Paget Road is not maintained in the proposed road layout.



IMG_0518.jpg

A failure to provide for existing accesses can result in damage to footways and unexpected pedestrian vehicle conflicts.

Recommendation

Ensure adequate access is maintained for the park.

3.2.3 Problem

Location

Plymouth Road

Summary

Parking in junction

Description

There are several properties set around the junction area where, despite parking restrictions, kerbside parking occurs. It is proposed to enlarge the footway in this area which may be attractive for parking.



IMG_0506.jpg

Parking on footways causes damage leading to trips and falls. Furthermore vehicles joining the carriageway within the controlled junction are unexpected and can present a danger to other drivers.

Recommendation

Introduce deterrent measures to prevent footway parking around the junction.

3.2.4 Problem

Location

Clive Road

Summary

Steep grade

Description

Clive Road has a steep grade, and the proposals introduce a priority junction at the foot of the grade.



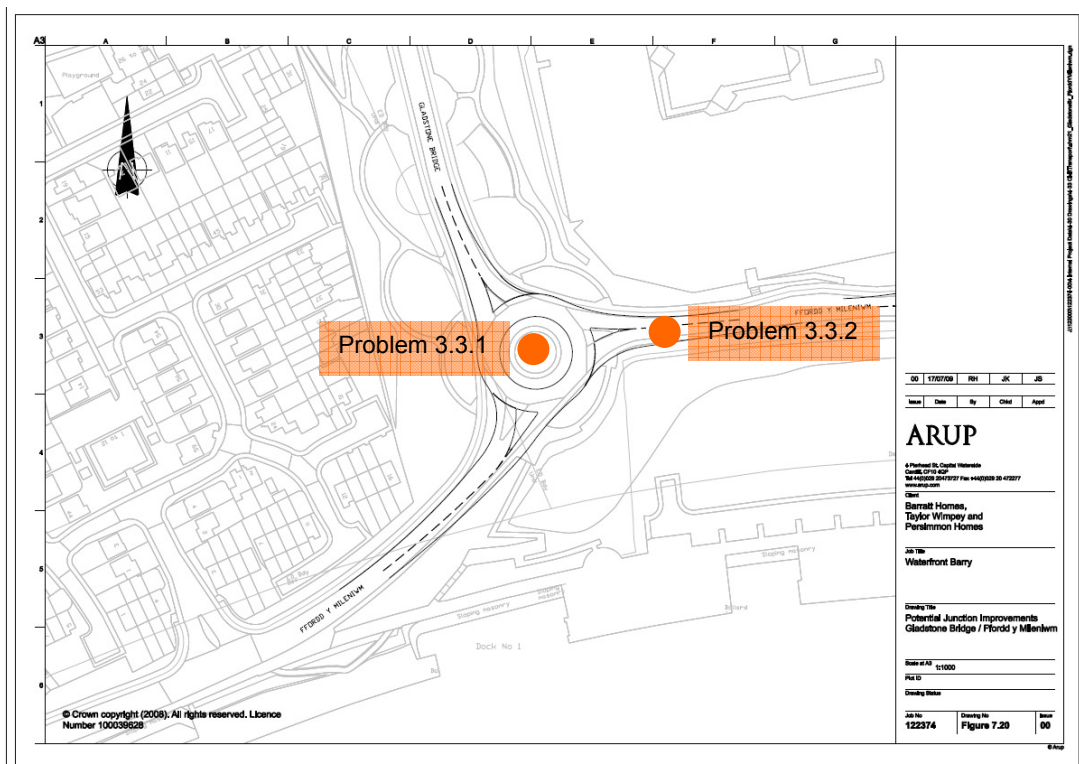
IMG_0510.jpg

Steep approaches lead to difficulty braking leading to over-running.

Recommendation

Provide speed reduction measures and high friction surfacing on the Clive Road approach to the Waterfront Barry Link

3.3 Gladstone Bridge / Ffordd y Mileniwm (TA Junction 21, Figure 7.20)



3.3.1 Problem

Location

Junction

Summary

Heavily landscaped circulatory island

Description

There is an excessive amount of vegetation and hard landscaping on the circulatory island of the roundabout



IMG_0567.jpg

Excessive landscaping blocks visibility for all road users, especially pedestrians who cannot see approaching vehicles, whilst hard landscaping can present a hazard for errant vehicles.

Recommendation Remove the vegetation and hard landscaping.

3.3.2 Problem

Location Ffordd y Mileniwm (east)

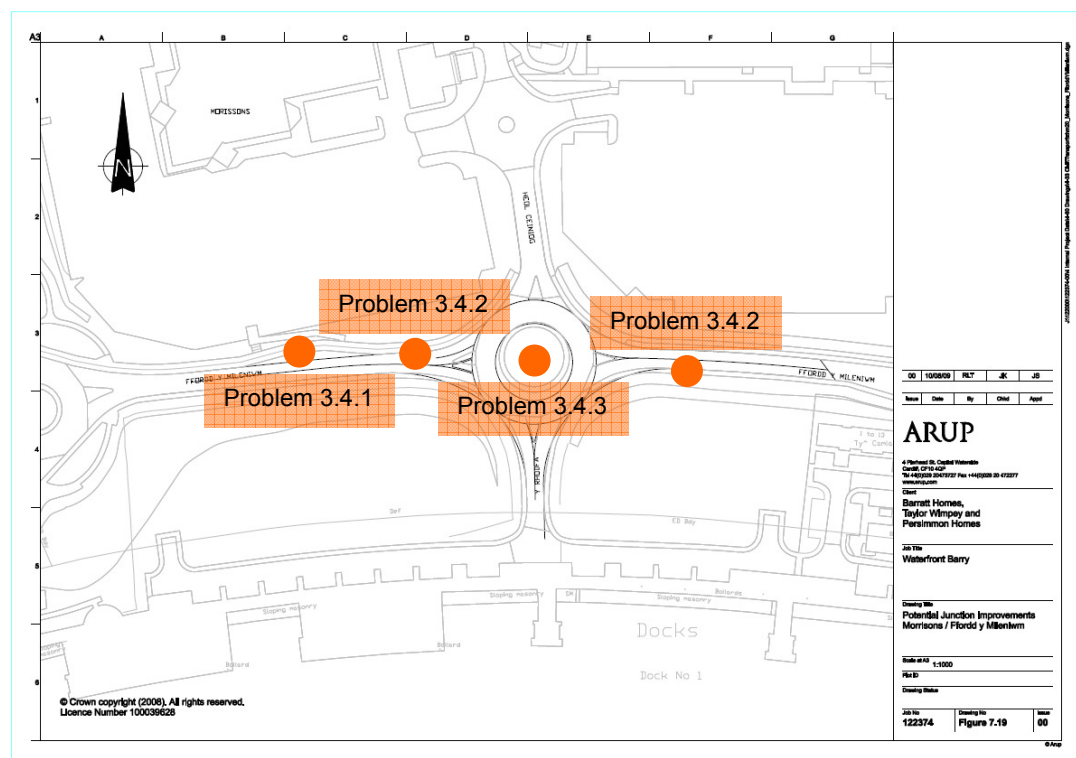
Summary Inadequate entry deflection

Description The proposed alteration to the junction layout results in an increase in the deflection radius of in the westbound approach of Ffordd y Mileniwm.

Insufficient entry deflection can lead to inappropriate entry speed into and around the junction, resulting in overrunning of the give-way lines, conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms.

Recommendation Alter the junction layout in order to provide sufficient entry deflection.

3.4 Heol Ceiniog / Ffordd y Mileniwm (TA Junction 20, Figure 7.19)



3.4.1 Problem

Location Ffordd y Mileniwm

Summary Bus Stop

Description The proposals appear to show the removal of the existing bus stop lay-by on the north side of Ffordd y Mileniwm, adjacent to Morrison's supermarket.



IMG_0604.jpg

This bus stop appears well used and removal of the bay would result in an obstruction to traffic, leading to overtaking conflicts on this busy stretch of road.

Recommendation

Retain the bus stop bay on Ffordd y Mileniwm.

3.4.2 Problem

Location

Ffordd y Mileniwm

Summary

Inadequate entry deflection

Description

The proposed alteration to the junction layout results in an increase in the deflection radius on the approaches to the junction, particularly Ffordd y Mileniwm

Insufficient entry deflection can lead to inappropriate entry speed into and around the junction, resulting in overrunning of the give-way lines, conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms.

Recommendation

Alter the junction layout in order to provide sufficient entry deflection.

3.4.3 Problem

Location

Junction

Summary

Heavily landscaped circulatory island

Description

There is an excessive amount of vegetation and hard landscaping on the circulatory island of the roundabout



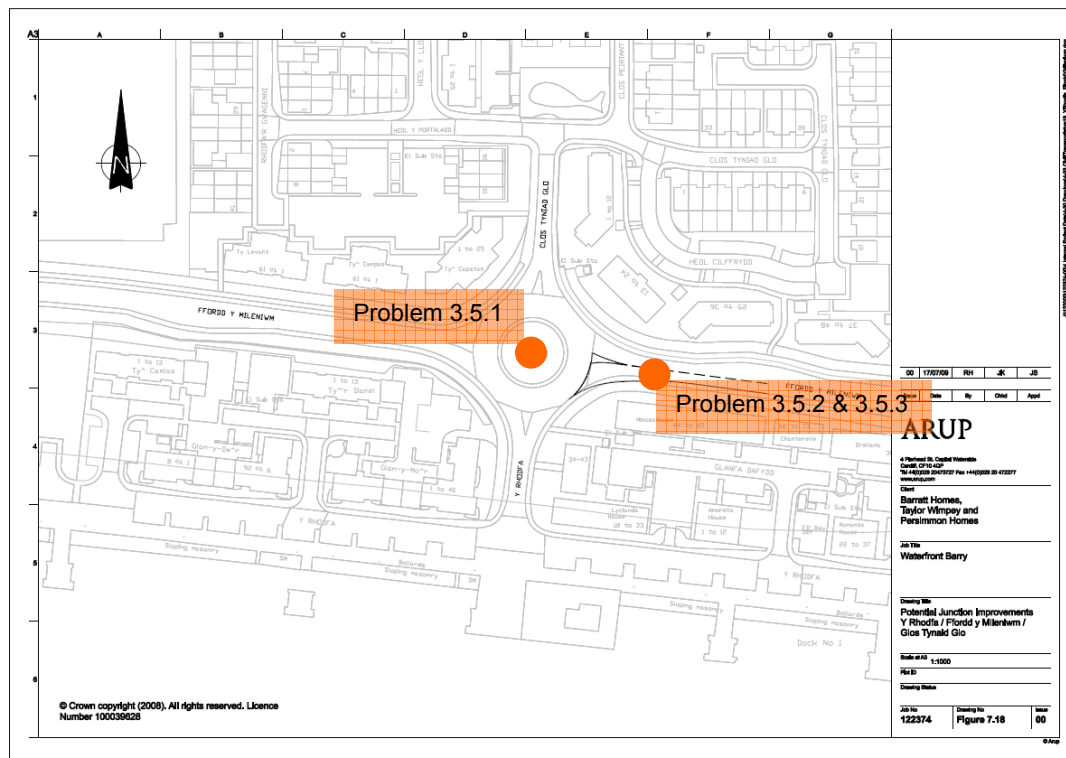
IMG_0599.jpg

Excessive landscaping blocks visibility for all road users, especially pedestrians who cannot see approaching vehicles, whilst hard landscaping can present a hazard for errant vehicles.

Recommendation

Remove the vegetation and hard landscaping from the roundabout

3.5 Y Rhodfa / Clos Tyniad Glo / Ffordd y Mileniwm (TA Junction 19, Figure 7.18)



3.5.1 Problem

Location Junction

Summary Heavily landscaped circulatory island

Description There is an excessive amount of vegetation and hard landscaping on the circulatory island of the roundabout.



IMG_0646jpg

Excessive landscaping blocks visibility for all road users, especially pedestrians who cannot see approaching vehicles, whilst hard landscaping can present a hazard for errant vehicles.

Recommendation Remove the vegetation and hard landscaping from the roundabout

3.5.2 Problem

Location Ffordd y Mileniwm (east)

Summary Increased forward visibility

Description The widening of the road to the south on the approach to the junction will increase forward visibility.



IMG_0666.jpg

An increase in forward visibility is likely to result in higher vehicle entry speeds leading to conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms.

Recommendation

Review the junction layout to ensure sufficient entry deflection is provided to minimise entry speeds.

3.5.3 Problem

Location

Ffordd y Mileniwm (east)

Summary

Inadequate entry deflection

Description

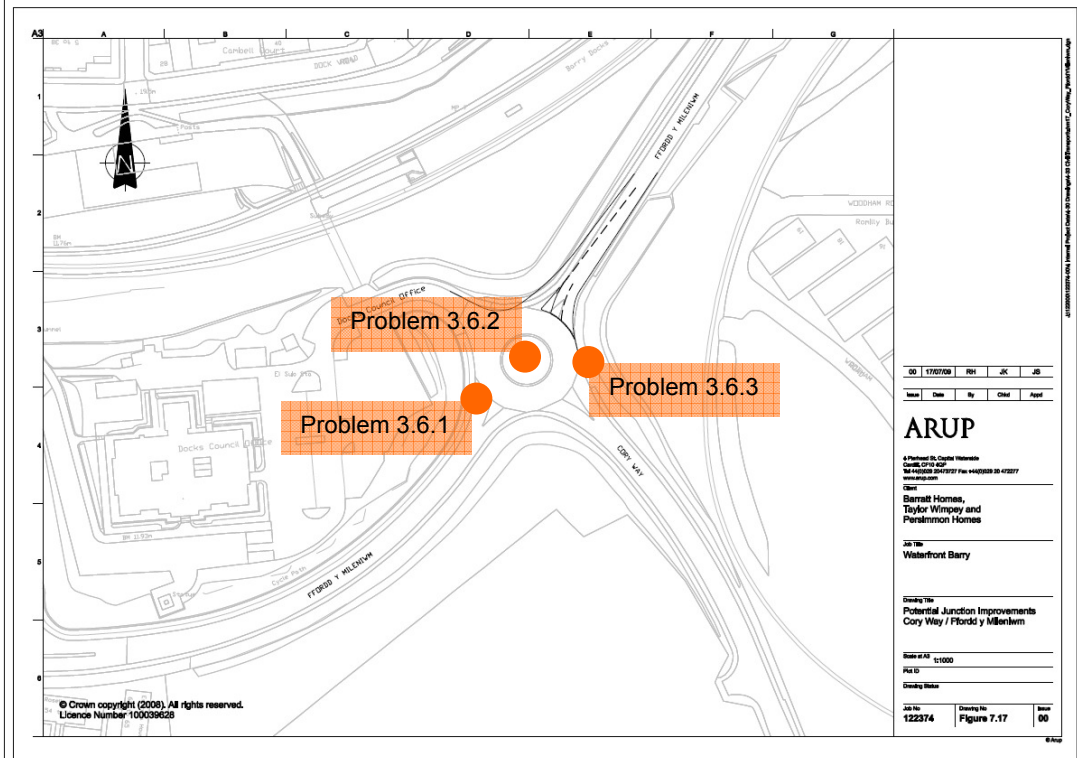
The proposed alteration to the junction layout results in an increase in the deflection radius from westbound Ffordd y Mileniwm.

Insufficient entry deflection can lead to inappropriate entry speed into and around the junction, resulting in overrunning of the give-way lines, conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms

Recommendation

Alter the junction layout in order to provide sufficient entry deflection.

3.6 Cory Way / Ffordd y Mileniwm (TA Junction 17, Figure 7.17)



3.6.1 Problem

Location

Ffordd y Mileniwm (northeast)

Summary

Inadequate entry deflection

Description

The proposed alteration to the junction layout results in an increase in the deflection radius for northeast bound traffic.

Insufficient entry deflection can lead to inappropriate entry speed into and around the junction, resulting in overrunning of the give-way lines, conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms.

Recommendation

Alter the junction layout in order to provide sufficient entry deflection.

3.6.2 Problem

Location

Junction

Summary

Heavily landscaped circulatory island

Description

There is an excessive amount of vegetation on the circulatory island of the roundabout



IMG_0670.jpg

Excessive landscaping blocks visibility for all road users, especially pedestrians who cannot see approaching vehicles.

Recommendation Remove the vegetation.

3.6.3 Problem

Location Cory Way

Summary Missing footway link

Description There is no footway around the eastern side of the junction, between the north side of Ffordd y Mileniwm to the east side of Cory Way.

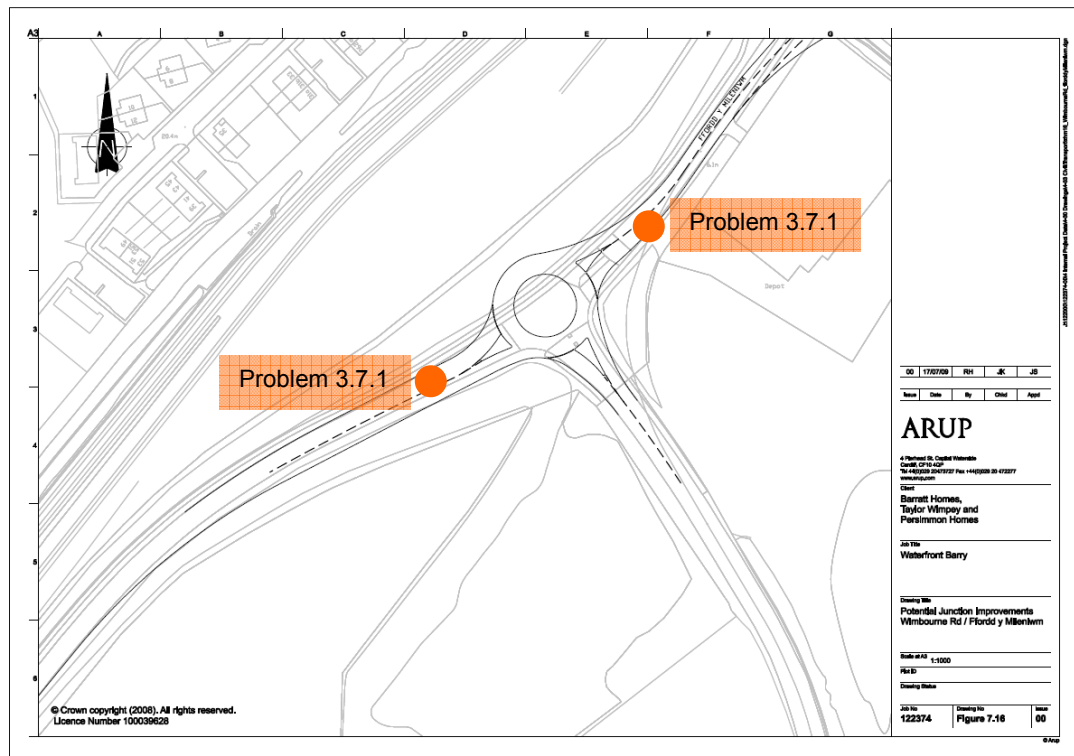


IMG_0690.jpg

Cory Way will provide the principal access to the East Quay development area, a predominantly residential development. This is likely to significantly increase pedestrian movements at the junction. Insufficient pedestrian facilities are likely to lead to inappropriate crossing movements resulting in pedestrian vehicle conflicts.

Recommendation Extend the footway on the eastern side of Cory Way to Ffordd y Mileniwm and provide an appropriate pedestrian crossing point on Ffordd y Mileniwm.

3.7 Wimbourne Road / Ffordd y Mileniwm (TA Junction 16, Figure 7.16)



3.7.1 Problem

Location

Ffordd y Mileniwm

Summary

High approach speeds

Description

The Ffordd y Mileniwm / Wimbourne Road junction is located on a grade 150m inside a 40 mph speed limit.



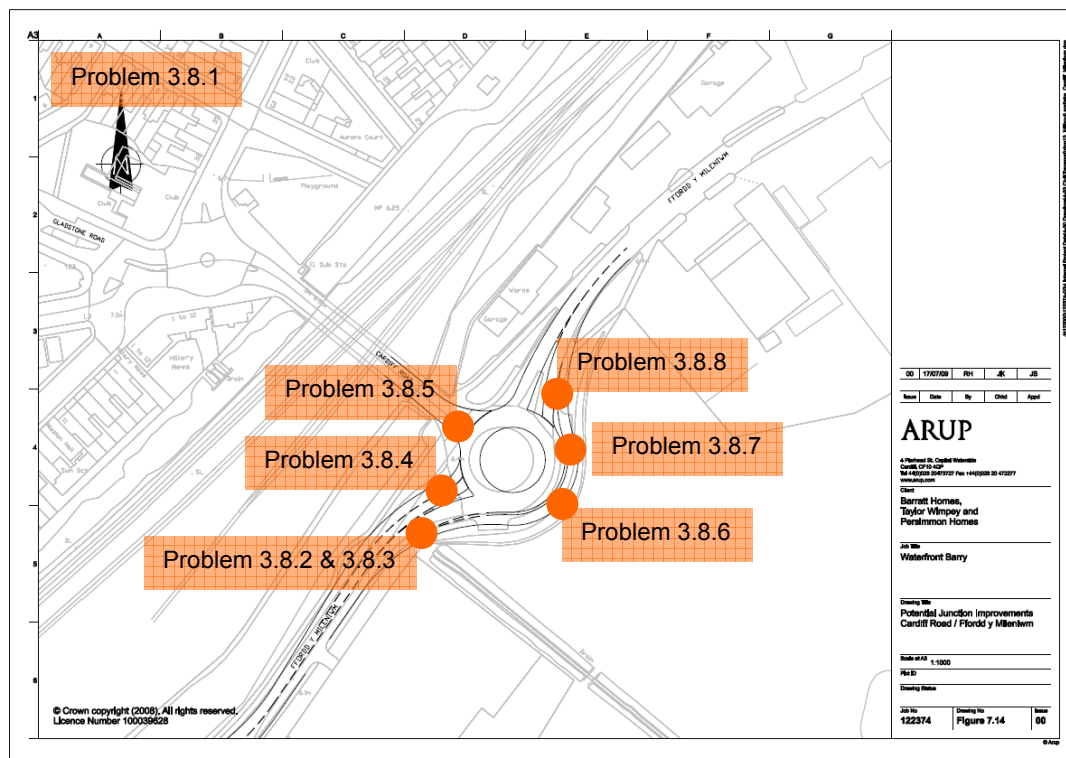
IMG_0717.jpg

The junction location is likely to result in high approach speeds on Ffordd y Mileniwm, especially northeast bound traffic. This could lead to over-running the give-way line.

Recommendation

Extend the 30 mph speed limit to the west of the junction and introduce speed reducing measures on Ffordd y Mileniwm on the approaches to the junction.

3.8 Cardiff Road / Ffordd y Mileniwm (TA Junction 13, Figure 7.14)



3.8.1 Problem

Location Ffordd y Mileniwm

Summary Narrow lanes

Description A number of the traffic lanes proposed at the junction are narrow (less than 3.0 metres).

Narrow lanes are likely to result in side swipe type accidents, especially on twisting alignments.

Recommendation Provide consistent lane widths, able to accommodate all types of traffic.

3.8.2 Problem

Location Ffordd y Mileniwm (southwest)

Summary Priority at merge

Description It is not clear from the proposals as to which traffic stream will have priority at the downstream merge of the south west bound slip lane and Ffordd y Mileniwm.

Lack of clear priority at the merge is likely to result in sideswipe accidents, and late braking conflicts.

Recommendation Provide appropriate road markings at the merge.

3.8.3 Problem

Location Ffordd y Mileniwm (southwest)

Summary Crossing at merge

Description The proposed slip lane merge would occur coincident with an existing pedestrian crossing point to the southwest of the junction.



IMG_0745.jpg

Pedestrians crossing in the merge area will be at significant risk from collision with vehicles, as well as facing two streams of traffic, pedestrians will also face drivers who will be concentrating on their merge manoeuvre, rather than the presence of pedestrians.

Recommendation

Relocate the pedestrian route away from the merge.

3.8.4 Problem

Location

Ffordd y Mileniwm (southwest)

Summary

Inadequate entry deflection

Description

The proposed alteration to the junction layout results in an increase in the radius of deflection for traffic approaching on Ffordd y Mileniwm

Insufficient entry deflection can lead to inappropriate entry speed into and around the junction, resulting in overrunning of the give-way lines, conflicts within the circulatory carriageway, and loss of control accidents, especially on the exit arms.

Recommendation

Alter the junction layout in order to provide sufficient entry deflection.

3.8.5 Problem

Location

Cardiff Road

Summary

Narrow exit lane

Description

The exit lane from the roundabout to Cardiff Road is situated immediately after the Ffordd y Mileniwm entry arm. The location of the splitter island results in a narrow exit lane.



IMG_0748.jpg

Narrow exit lanes can result in overrunning by larger vehicles placing pedestrians on the footway at risk of collision, particularly for left turning vehicles from Ffordd y Mileniwm.

Recommendation

Ensure the exit lane can accommodate all types of traffic.

3.8.6 Problem

Location Junction

Summary Site access from junction

Description Welsh Water has a permanent access to the land to the southwest of the junction.



IMG_0735.jpg

Maintaining the access from the slip lane is likely to result in turning conflicts and shunt type accidents, as traffic on the slip lane will not expect to have to slow until the merge. In addition access traffic would be limited to left in left out, leading to inappropriate u-turns in the vicinity of the junction.

Recommendation Provide an alternative access for utilities.

3.8.7 Problem

Location Slip lane

Summary Tight radii

Description The south westbound slip lane proposed for the roundabout is excessively bendy with a 3.5 metre lane

Narrow bends result in over running, especially larger vehicles which require additional width in tight bends for their trailing axles. Over running of the kerbs can present a danger to pedestrians, and in extreme circumstances can result in overturning.

Recommendation Provide appropriate lane widening on tight radii to accommodate larger vehicles.

3.8.8 Problem

Location Ffordd y Mileniwm (northeast)

Summary Crossing on slip lane

Description The proposed slip lane crosses an existing pedestrian crossing point immediately west of the southwestbound diverge point.

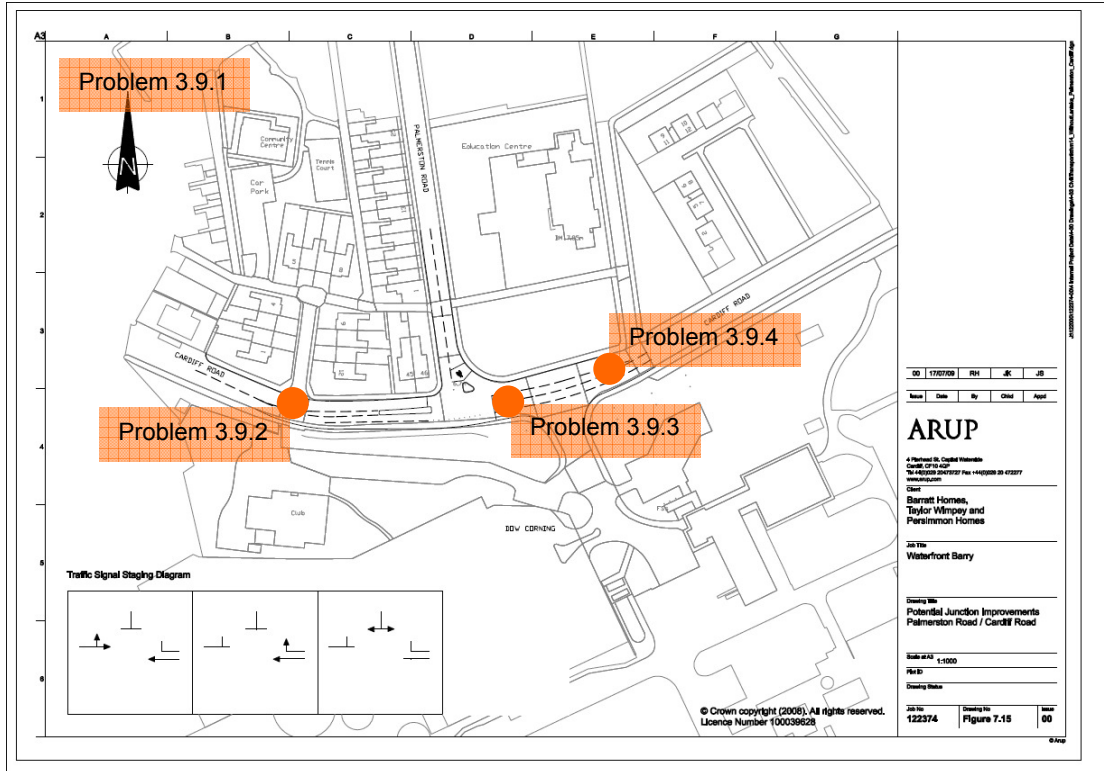


IMG_0757.jpg

The crossing point is situated immediately after the diverge of the slip lane and as a result pedestrians will have to cross two distinct traffic streams placing themselves at greater risk.

Recommendation Ensure there is an appropriately sized refuge between the traffic streams at the crossing, and that pedestrians are aware of the road layout.

3.9 Cardiff Road / Palmerston Road (TA Junction 14, Figure 7.15)



3.9.1 Problem

Location Cardiff Road

Summary Provision for cycles

Description The proposed junction omits the existing advanced cycle stop lines provided on Cardiff Road at the junction, which is located on National Cycle Route 88.



IMG_0762.jpg

Cyclists are particularly vulnerable to side swipes at junctions and could be struck while crossing at splitter islands not specifically designed to accommodate them.

Recommendation Replace the cycle stop lines.

3.9.2 Problem

Location

Edmund Place

Summary

Conflict between turning and merging vehicles

Description

Edmund Place on the north side of the Cardiff Road is located such that vehicles waiting to turn right into the road would have to wait within the westbound exit merge.



IMG_0789.jpg

Vehicles waiting in the merge area are at risk of rear end shunt from drivers concentrating on the merge manoeuvre.

Recommendation

Alter the proposed road layout in order to provide a right turning pocket for Edmund Place.

3.9.3 Problem

Location

Cardiff Road

Summary

Incorrect road marking

Description

The nearside westbound lane of Cardiff Road is incorrectly shown with a 'straight on and left' arrow at the junction with Palmerston Road.

Incorrect road markings can cause confusion leading to unnecessary lane changing and sideswipe and late braking accidents.

Recommendation

Provide a straight on arrow in the nearside lane.

3.9.4 Problem

Location

Cardiff Road

Summary

Provision for pedestrians

Description

The proposed junction affects the removal of the existing refuge on Cardiff Road to the east of the junction. No pedestrian facilities are proposed at the revised junction.



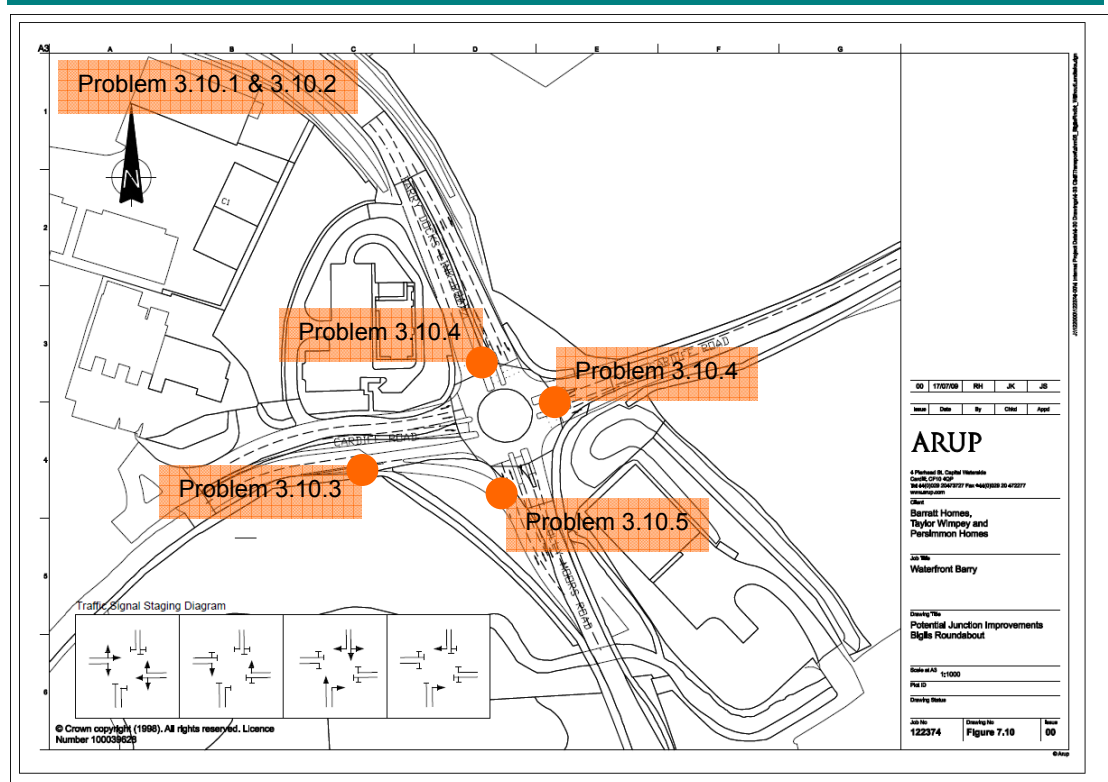
IMG_0769.jpg

The removal of the pedestrian refuge will be a disbenefit for pedestrians crossing Cardiff Road, increasing the risk of pedestrian conflicts.

Recommendation

Provide pedestrian facilities at the junction.

3.10 Sully Moors Road / Cardiff Road / A4231 Barry Docks Link Road (TA Junction 5, Figure 7.10)



3.10.1 Problem

Location Junction

Summary Provision for cycles

Description The proposed junction makes no provision for cyclists but it is located on National Cycle Route 88.

Cyclists are particularly vulnerable to side swipes at junctions and could be struck while crossing at splitter islands not specifically designed to accommodate them.

Recommendation Include measures to assist cycles at the junction.

3.10.2 Problem

Location Junction

Summary Inadequate space for turning manoeuvres

Description It would appear from the junction layout that larger vehicles turning at the junction will foul the proposed splitter island positions.

Insufficient turning space at junctions can result in damage to vehicles and street furniture including traffic signals, or could result in drivers reversing within the junction to complete their turning manoeuvres placing other road users at risk.

Recommendation Undertake an AutoTrack assessment of the junction to ensure all turning manoeuvres are possible by larger vehicles.

3.10.3 Problem

Location	Cardiff Road (west)
Summary	Relocation of bus stop
Description	The proposed Left Turn Slip Lane (LTSL) from Sully Moors Road to Cardiff Road would require the relocation of the existing bus stop on Cardiff Road.



IMG_0862.jpg

Repositioning the bus stop in the vicinity of the merge could result in rear end shunts by drivers concentrating on the merge manoeuvre.

Recommendation	Ensure the bus stop is relocated so as to avoid undue influence on the LTSL merge.
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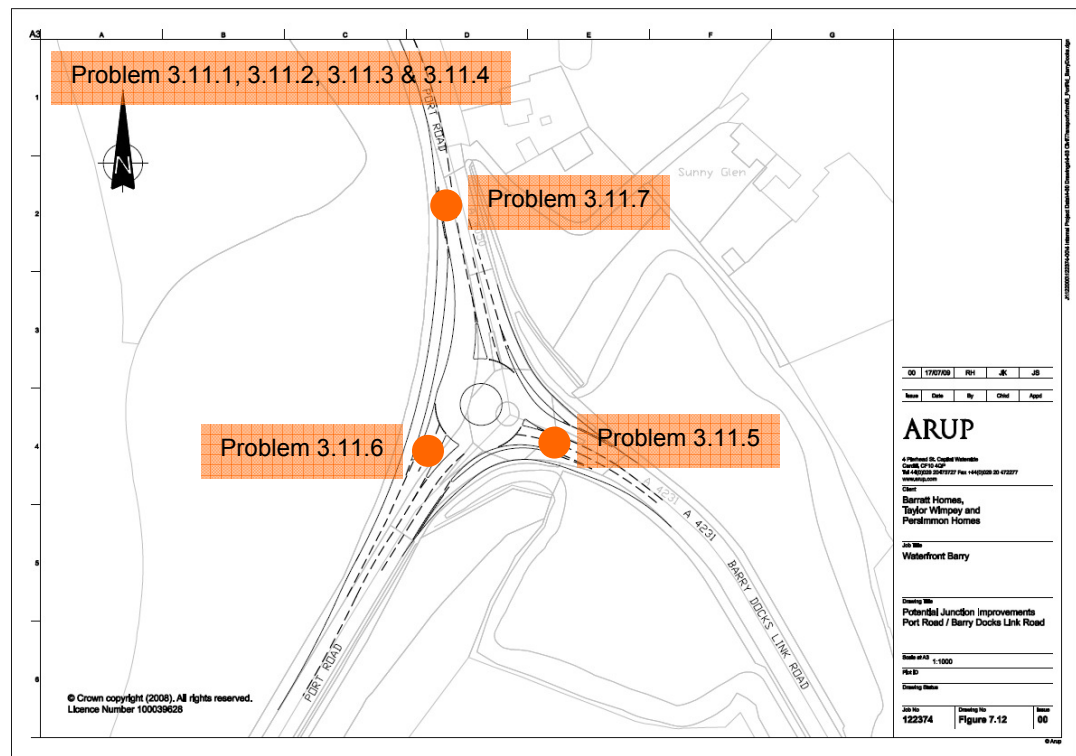
3.10.4 Problem

Location	Barry Docks Link Road and Cardiff Road (east)
Summary	Staggered pedestrian crossings
Description	The proposals show right-left staggered pedestrian crossings on the northern and eastern arms of the junction. The right-left stagger results in pedestrians approaching the second half of the crossing, facing away from oncoming traffic. This could result in a pedestrian continuing to cross, oblivious to oncoming traffic.
Recommendation	Provide the crossings with a left-right stagger.

3.10.5 Problem

Location	Sully Moor Road
Summary	Access to Left Turn Slip Lane (LTSL)
Description	The LTSL from Sully Moors Road to Cardiff Road diverges close to the stop line. The proposed diverge location provides limited storage for traffic moving ahead before the LTSL becomes blocked, limiting its effectiveness, leading to driver frustration which could lead to vehicles using the verge to access the lane placing pedestrians and other road users at risk.
Recommendation	Lengthen the LTSL from Sully Moors Road allowing traffic to diverge earlier, reducing queuing and driver frustration on this approach.

3.11 A4050 Port Road / A4231 Barry Docks Link Road (TA Junction 6, Figure 7.12)



3.11.1 Problem

Location Junction
Summary Poor lane development

Description It is not immediately clear from the proposal how the multiple lane approaches for the roundabout or the slip lanes are developed from the single lane approaches.
Multiple lane development from a single lane approach can be confusing for drivers leading to late lane changing resulting in side swipes and rear end shunts due to late braking.

Recommendation Ensure lane development at each arm of the junction is clear and consistent to avoid confusion and reduce late lane changing on the approaches to the roundabout.

3.11.2 Problem

Location Junction
Summary Insufficient lane width.

Description A number of the lanes shown in the proposed scheme appear to be narrow.
Insufficient lane width at junctions can lead to side swipe accidents

Recommendation Ensure adequate lane width is available where multiple lanes are marked on the carriageway.

3.11.3 Problem

Location	Junction
Summary	Meandering entry alignment
Description	<p>The development of two lane entries, and Left turn Slip Lanes from single approach lanes on all arms of the junction result in compound and reverse curves on the immediate approaches to the junction.</p> <p>Curving alignments in braking zones are likely to result in loss of control under braking especially when the road surface is wet or icy.</p>
Recommendation	Smooth the entry alignments.

3.11.4 Problem

Location	Junction
Summary	Poor visibility at merges
Description	<p>The proposed merges for the Left Turn Slip Lanes (LTSL) are short with a very acute angle. The location of the junction on a crest may result in additional visibility issues as a result of the vertical alignment.</p> <p>Inadequate visibility or a poor viewing angle at a merge will lead to side swipe accidents, or late braking leading to rear end shunts</p>
Recommendation	Ensure adequate visibility is available at the LTSL merges. In addition, either the approach angle for the merge should be increased, or the appropriate parallel merge length provided.

3.11.5 Problem

Location	Junction
Summary	Poor forward visibility of junction
Description	Moving the junction to the west will reduce forward visibility of junction over the crest from A4231 Barry Docks Link Road.



IMG_0908.jpg

Poor forward visibility of the roundabout is likely to lead to overshoot accidents at the circulatory carriageway, or rear end shunts on the approach due to late braking.

Recommendation	Ensure adequate forward visibility can be maintained throughout the junction.
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3.11.6 Problem

Location	Port Road (south)
Summary	Insufficient entry deflection
Description	The relocation of the central island of the roundabout results in the removal of the entry deflection on the Port Road approach for northbound traffic.

Insufficient entry deflection is likely to result in high entry speeds and corresponding overshoot incidents on the circulatory carriageway.

Recommendation

Introduce sufficient entry deflection for all arms of the junction.

3.11.7 Problem

Location

Port Road (north)

Summary

Meandering exit alignment

Description

the proposed realignment results in a left-right-left alignment on the exit from the roundabout.

The reverse curve is likely to lead to loss of control accidents on the exit from the roundabout.

Recommendation

Smooth the exit alignment.

4 Audit Team Statement

I certify that this audit has been carried out in accordance with the process set out in HD19/03 Road Safety Audits.

AUDIT TEAM LEADER

Chris van Lottum MEng(Hons), MCIHT, MSoRSA

Senior Engineer

Ove Arup & Partners

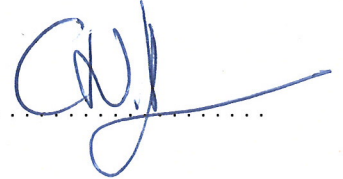
Central Square

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Signed



Date

10.03.10

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Appendix A

**Documents and
Drawings**

A1 Documents and Drawings

A1.1 Documents

Title	Reference	Revision
Waterfront Barry Transport Assessment	08/7365	12/08/2009
Linsig Output - Internal Northern Junction	-	-
Linsig Output - Internal Supermarket Junction, Barry	-	-
Linsig Output - Internal Southern Quay Junction, Barry	-	-

A1.2 Drawings

Title	Drawing No	Revision
West Pond / South Quay Junction	WSK09	10
West Pond - Northern Junction	WSK07	11
Proposed Road Layout	SR06	-
West Pond / Supermarket Junction	WSK08	10