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Waterfront Barry

Environmental Statement
Chapter D

Transportation

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1.0 Introduction

1.1 This chapter presents an overview of the transportation issues associated with the proposed Barry Waterfront mixed use development. Whilst this chapter and associated figures and appendices have been written as a stand alone document, further detail and analysis are fully documented in a Transport Assessment (TA) completed by Arup and dated August 2009 and included here as a CD, Appendix D1. The TA accompanies the planning application for the proposed development.

1.2 The sections that follow identify and assess the key transportation impacts of the development for all modes of transport, which emerge from the TA. They identify the baseline conditions, impacts as a result of the development, mitigation measures associated with the proposals and any residual effects remaining on completion of the scheme.

1.3 Transport is a key element in the creation of any development. Whilst the Barry Waterfront site is well situated to take advantage of existing transport infrastructure and facilities, it is also important to ensure that these opportunities are maximised whilst ensuring that impacts of increased movement in the area are minimised both for environmental and social reasons.

1.4 The proposals put forward are aimed at strengthening transport connections, minimising the need to travel through the provision of a balanced development which encourages an improved modal split and minimises the impact on the surrounding highway network. The overarching objective is to develop a package of transportation measures which will encourage people to live, work and visit a new sustainable urban quarter of Barry.

2.0 Planning Policy Context

2.1 Chapter 4 'Policy Context' of the TA is a comprehensive review of planning policy and guidance relevant to the proposed development. The documents considered by the TA are:

National Policy

- Planning Policy Wales (2002)
- Technical Advice Note 18 (2007)
- Wales Transport Strategy (2008)
- Wales Spatial Plan (2008 update)
- Manual for Streets (2007)
- A Walking and Cycling Strategy for Wales

Regional Policy

- Final Draft Regional Transport Plan (2008)
- SEWTA Rail Strategy Study (2006)
- Wales Route Utilisation Strategy, Network Rail (2008)
- Walking and Cycling Strategy for South East Wales (2006)
- CSS Wales Parking Standards (2008)
- Addendum to South Wales Parking Guidelines (2001)
- Cycle Parking Guidelines (2005)

Local Policy

- Vale of Glamorgan Local Development Plan, Draft Preferred Strategy (2008)
- Adopted Vale of Glamorgan Unitary Development Plan (2005)
- Vale of Glamorgan Local Transport Plan (2000)
- Waterfront Barry Development Principles – consultation draft (2008)
- Supplementary Policy Guidance 'Barry Development Guidelines' (as amended 2006)

2.2 The most relevant guidance from three key documents is summarised below:

National Planning Guidance

2.3 National planning policy is set out in Planning Policy Wales (PPW) (2002) and Technical Advice Note (TAN) 18 on Transport. National planning policy provides general advice on the location of development, accessibility, encouraging

means of travel other than the private car, walking cycling, public transport provision, car parking and inclusive design. National guidance requires that transport assessments are provided for major developments.

Development Plan

2.4 The Development Plan for the area is the adopted Vale of Glamorgan Unitary Development Plan (UDP). Relevant policies include:

- Policy 2 favours proposals which encourage sustainable practices. Criterion (ii) refers to proposals which are located to minimise the need to travel, especially by car and help to reduce vehicle movements or which encourage cycling, walking and the use of public transport.
- Policy 8 also states that developments will be favoured in locations which:
  - Are highly accessible by means of travel other than the private car; and
  - Minimise traffic levels and associated unacceptable environment effects.
- Policy 7 refers to improvements to the transportation network including strategic transport schemes adjoining the waterfront strip at Barry. This is reinforced by Policy TRAN1 which makes provision for the Barry Waterfront to Cardiff Link.
- Barry Waterfront has been designated as a Comprehensive Redevelopment Area and the UDP states that a Traffic Impact Assessment will be required to assess the potential impact of the development on the existing highway network and to identify appropriate transport solutions (Paragraph 4.4.4).
- Finally, Policy TRAN 10 requires the provision of car parking in accordance with approved guidelines, to be accessible to public transport and related to the capacity of the highway network.

Emerging Vale of Glamorgan Local Development Plan (LDP)

2.5 The Vale of Glamorgan Council is currently preparing a new LDP for the area. To date, a draft Preferred Strategy has been published for public consultation (2007). The draft strategy sets out the land use and settlement policy for the Vale of Glamorgan and strategic planning polices. Objective 6 of the strategy aims to reduce the need for Vale residents to travel to meet their daily needs and enabling them to gain greater access to sustainable forms of transport.

2.6 Barry is identified as a key settlement in the strategy. The strategy identifies the continued development of Barry Waterfront, which will be supported by the implementation of the Barry Waterfront to Cardiff Link Road in order to improve accessibility and alleviate peak time congestion along the A4055 between Barry and Cardiff (Policy CSP 11). Policy CSP1 on sustainable development is also relevant. In terms of transportation, it aims to create safe, attractive and accessible environments and to offer sustainable transport choices that reduce the need to travel by car.

3.0 Assessment Methodology & Significance Criteria

Scope of Assessment

3.1 The scope and methodology of the TA has been discussed and agreement reached on key assumptions (in particular the junctions and forecast year to be assessed) with the Vale of Glamorgan Council. Details of the meetings held are included in Appendix A of the TA, Appendix D1. Due to the scale of the development, the local authority has requested testing of a significant traffic network including the junction and link capacity assessment. The TA considers 24 junctions, indicated on Figure D1, and assesses 21 of these in detail:

- Merrie Harrier Signals Junction
- Murch Crossroads
- Biglis Roundabout
- Port Road/Barry Docks Link Road Roundabout
- Waycock Cross Roundabout
- Harbour Road/Station Approach/Paget Road Roundabout
- Harbour Road / Earl Crescent Priority
- Harbour Road/Nicholas Road (Ship gyratory) Priority
- Harbour Road/Broad Street (Ship gyratory) Priority
- The Parade / Harbour Road Mini Roundabout
- Gladstone Bridge Roundabout
- Dock View Road Gyratory
- Buttrills Road/Barry Road Staggered Junction
- Barry Road/Ty Newydd Road/Cemetery Road Roundabout
- Gladstone Road/Cardiff Road/Ffordd Y Milemiwm
- Palmerston Road/Cardiff Road Signals Junction
- Vere Street/Hillary Rise/Gladstone Road
- Wimbourne Road/Ffordd y Mileniwm Priority T-junction
- Cory Way/Ffordd y Mileniwm Roundabout
- Subway Road/Ffordd y Mileniwm Priority left in / left out
- Y Rhodfa/Ffordd y Mileniwm/Clos Tynaid Glo Roundabout
- Retail/Morrisons/Ffordd y Mileniwm Roundabout

- Gladstone Bridge/Ffordd Y Mileniwm Roundabout
- Plymouth Road/Earl Crescent Roundabout
- Broad Street / Hood Road Signals

3.2 Link capacity was assessed on the connecting links between the junctions as indicated on Figure D2.

3.3 In addition to highway conditions a qualitative assessment of the local pedestrian, cycle, bus and rail transport facilities surrounding the site was also completed. This has been undertaken in accordance with the IEMA Guidelines which include an assessment of the following road network conditions:

- Severance;
- Pedestrian amenity and delay;
- Fear and intimidation; and
- Accidents and Safety

Method of Baseline Data Collection

3.4 Baseline conditions were assessed in order to understand and measure the existing conditions and to provide the standard for comparing the impact of the proposed development.

3.5 A number of site visits were undertaken during the preparation of the TA and this ES paper. A major network inventory was completed in January 2008 which included observation of conditions in the busy AM and PM peak hours. The network inventory included junction surveys (layout, signal timings, operating conditions and queue lengths) and a thorough investigation of public transport, services and walking/cycling routes and facilities.

3.6 Subsequent site visits have been undertaken periodically since the initial inventory including a comprehensive link capacity assessment in December 2008. A key element in the preparation of the Transport Assessment. The information from these site visits was used in the assessment process.

3.7 Traffic data for the junctions to be assessed was purchased from the Vale of Glamorgan Council in the form of manual classified 12-hour turning counts and several additional counts were commissioned to supplement the available data.

3.8 Personal Injury Accidents (PIA) data for a 4 year period between 2002 and 2006 was obtained from the Vale of Glamorgan Council. This information was input into a GIS database and filtered for the junctions and links. The data includes accident severity (slight, severe and fatal), details of casualties and accident descriptions. Full details of the accident assessment are included at section 2.3, Figure D3 and Appendix C of the TA.

Assessment Modelling

3.9 The impact of four traffic flow scenarios on the capacity of the local network of links and junctions has been assessed for the observed AM (08:30-9:30) and PM (16:30-17:30) peak hour periods using appropriate junction modelling software packages (ARCADY, PICADY, or LINSIG).

3.10 The tested scenarios are:

- 2008 Existing Situation – using observed traffic count data;
- 2020 Base Situation – consisting of the observed traffic flows factored to 2020 levels and committed developments;
- 2020 Development Situation – consisting of the base flows and the traffic generated by the development at completion; and
- 2020 Development with Barry Island peak tourism – this flow scenario is based on the 2020 PM Peak Development Situation with the addition of further traffic to and from Barry Island, in order to investigate the effect of peak traffic from the Waterfront Development coinciding with significant tourism movements to and from Barry Island.

3.11 The aim of the modelling exercise is to compare traffic conditions before and after completion of the development. By doing this, it is possible to assess the impact that the development may have on the surrounding road network and to gain a better understanding of mitigation measures that may be required.

3.12 In order to growth base traffic levels to forecast year conditions a TEMPRO adjusted National Road Traffic Forecast (NRTF) growth rate has been applied to the survey data.

Trip Demand Assessment

3.13 Future travel demand has been estimated for each land use using data from other comparable sites throughout the United Kingdom contained in the Trip Rate Information Computer System (TRICS) database. Details of the trip generation methodology are contained within Chapter 6 of the TA.

3.14 Where possible a multi-modal trip rate has been used in order to derive a modal split. Trip generation calculations have also been informed by gathering survey data from local developments which are similar to the proposed Barry Waterfront development.

3.15 Trip rate profiles, showing the number of inbound and outbound vehicle trips associated with each land use component, have been obtained from the TRICS database and aggregated to provide an overall estimate of theoretical vehicle trip attraction. Land uses include:

- Apartments*

- Houses*
- Food Store
- Petrol Filling Station
- Hotel
- Offices
- Retail
- Food and Drink
- Leisure**
- Marina**
- Primary School***

3.16 These landuses include some that are not included in this planning application but which are anticipated, they have been included in order to present a robust assessment of cumulative effects and since they will be dependant on the Barry Waterfront infrastructure. Landuses which do are not wholly included in this planning application are marked *, landuses which are to be progressed as part of other planning applications are marked ** and landuses which already have planning permission are marked ***. The scenarios tested are therefore robust whilst recognising the benefits and trip patterns likely to arise from a completely regenerated Waterfront area.

3.17 Not all development related trips will be 'new' trips on the local network. For all new large mixed-use developments, there is an element of reduction to the theoretical number of car-based trips travelling on the local highway network due to the generation of linked, pass-by and diverted trips. Each of these issues has been investigated in order to set an appropriate level of reduction to theoretical car traffic on the road network.

3.18 Adjustments have been made to the trip rates to take into account the scale and mix of the development. Three types of reduction have been applied:

- Linked Trips: 'Cross-visitation' between land uses (for example a trip visiting both the retail store and leisure facility), which could result in the double counting of trips;
- Pass by Trips: Trips where a stop is made en-route to a final destination, (for example a commuter stopping to fill with petrol on the way home), again this would otherwise result in the double counting of trips; and
- Internal Trips: Those trips which do not emerge onto the external highway network such as a commuter living and working within the Waterfront Development but choosing to travel to work by car.

3.19 The vehicle trips generated by the development and emerging onto the external highway network have been distributed using a Gravity Model as requested by

the Vale of Glamorgan Council. This method of trip distribution has been selected in preference to the 2001 census journey to work data due to the age of the census data, and the changing employment and development situation in the area surrounding the development.

3.20 The inputs to the gravity model consisted of planning data for population and employment both current and forecast, taken from the TEMPRO database (a software program issued by the Department for Transport which includes planning data projections for all areas of the United Kingdom); this data is regularly updated by local authorities. The model divided the surrounding area into zones, each of which was attributed a population and number of jobs according to the TEMPRO data. The output of the gravity model was calibrated to the 2001 census data and then used with 2020 TEMPRO data for forecasting purposes.

3.21 The attraction/destination output proportions of each gravity model zone were then assigned to a set number of 'routes' to the boundary of the considered highway network.

Method of Assessment of Effects

3.22 The assessment of effects of the development will be made by comparison of junction and link capacity with and without development in the forecast year of 2020 when it is anticipated that the development may have been completed. The 2008 conditions have also been assessed in order to give a baseline standard of existing conditions.

3.23 In addition, due to the concerns of the local highway authority, a 2020 tourism scenario has been tested. This is based upon a PM peak scenario (when the traffic activity of the Waterfront development is most significant). To simulate the effect of tourism traffic movement to and from Barry Island, traffic in the PM peak was doubled. It was not deemed appropriate to assess a weekend scenario as the level and timing of peak traffic related to the Waterfront development would be lower and occur at a different time to that of typical tourism related trips.

3.24 The link capacity assessment of the considered road network has been completed according to DMRB advice Note TA 79/99 and is included in Appendix G of the TA.

3.25 IEMA Guidelines for the Environmental Assessment state: *"Highway links should be assessed when traffic flows have increased by more than 30% or other sensitive areas are affected by traffic increases of at least 10%"*

3.26 The sensitivity of assessed links will vary depending on the following surrounding conditions and receptors:

- Areas of low sensitivity to traffic flows – Receptors of negligible sensitivity;

- Public open space, nature conservation areas, residential areas with adequate footways – Receptors of low sensitivity;
- Congested junctions, hospitals, community facilities, conservation areas – Receptors of medium sensitivity; and
- Sections of highway close to schools and colleges or accident black-spots – Receptors of high sensitivity.

3.27 In order to group together the 33 considered links Table D1 below considers four key 'corridors' out of the network and their overall sensitivity based on the above criteria.

Road Link	Sensitivity	Reason for Sensitivity
A48 via Waycock Cross	Medium Sensitivity	Mixed urban/ rural character, passing through residential areas along St. Nicholas Avenue/Pontypridd Road. The residential area contains adequate footpaths. The route is currently below 80% of assessed capacity.
A48 via A4050	Medium Sensitivity	This route follows the major distributor roads of Ffordd y Mileniwm, Cardiff Road, Barry Docks Link and Port Road. Several existing junctions experience congestion at peak hours and one link operates at 80-90% of assessed capacity in the PM peak hour, two junctions experience congestion in peak hours. There are adequate pedestrian facilities and partial cycle facilities along this corridor.
Cardiff via A4055	Medium Sensitivity	This route follows the major distributor roads of Ffordd y Mileniwm and Cardiff Road passing through both urban and rural areas, two isolated links have been assessed as operating at 80-90% of capacity in the PM peak, two junctions experience congestion in peak hours.
Through Barry Town	High Sensitivity	This corridor includes all routes through Barry town centre, these routes are not classified as congested by junction assessment however high levels of pedestrian activity and retail activity with on-street parking make them less compatible with vehicular movement. Although generally of a slight nature there are a higher number of accidents in this more urban area.

Table D1: Sensitivity of Road Links with Development in 2020, AM and PM

Significance Criteria

3.28 The TA assesses the potential impact of the development with completion in 2020. The significance levels attributed to each impact has been assessed based on the magnitude of change as a result of the proposed development and the sensitivity of the affected receptor to that change. Both the magnitude

of change and receptor sensitivity are assessed on a scale of negligible, low, medium and high.

3.29 The IEMA defines impacts of differing levels with the following terms:

3.30 **Major Impact:** where the proposed development could be expected to have a very significant environmental impact, either positive or negative, (equating to a change in excess of 90% in traffic flows) on severance, driver stress and delay, pedestrian and cyclist amenity, fear and intimidation and accidents and safety and exceptional loads during the construction and operational phases;

3.31 **Moderate Impact:** Where the Proposed Development could be expected to have a noticeable environmental impact, either positive or negative, (equating to a change between 60 and 89% in traffic flows) on severance, driver stress and delay, pedestrian and cyclist amenity, fear and intimidation and accidents and safety and exceptional loads during the construction and operational phases;

3.32 **Minor Impact:** Where the Proposed Development could be expected to have a small, barely noticeable environmental impact, either positive or negative, (equating to a change between 30 and 59% in traffic flows) on severance, driver stress and delay, pedestrian and cyclist amenity, fear and intimidation and accidents and safety and exceptional loads during the construction and operational phases; and

3.33 **Negligible:** Where no discernable environmental impact is expected (equating to a change of less than 30%, or 10% in areas sensitive to traffic flow) on severance, driver stress and delay, pedestrian and cyclist amenity, fear and intimidation and accidents and safety and exceptional loads during the construction and operational phases.

3.34 Using these terms Table D2 below will be used to determine the significance of effects.

		Sensitivity of Receptor/Receiving Environment to Change/Effect			
		High	**Medium**	**Low**	**Negligible**
Magnitude of Change /Effect	**High**	Major	Moderate to Major	Minor to Moderate	Negligible
	Medium	Moderate to Major	Moderate	Minor	Negligible
	Low	Minor to Moderate	Minor	Negligible to Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Table D2 Matrix for Determining Significance of Effects

3.35 This framework of impacts will be used for the purposes of the Environmental Assessment however they do not directly correspond to the detailed analysis documented in Chapter 7 and Appendix G of the TA to allow comparison with other effects. The magnitude of change will generally be considered as the increase in traffic flows whilst the sensitivity will be considered the baseline operating conditions and the scope for mitigation works.

3.36 In assessing the effect of the Barry Waterfront development it is important to compare with the existing situation and that of the baseline conditions in future years, it will not be reasonable for the developers of Barry Waterfront to solve existing or future year issues that occur irrespective of the development, therefore a 'Nil Detriment' impact over these baseline conditions is appropriate.

4.0 Baseline Conditions

Site Location and Highway Network

4.1 The proposed development site consists of previously developed land, covering a total area of approximately 43 hectares. The area is split into the following site character areas situated around the former No.1 Dock in Barry:

- South Quay Waterside;
- South Quay Parkside;
- West Pond;
- East Quay;
- Arno Quay; and
- District Centre

4.2 Barry Town Centre is situated approximately 1km north of the former No.1 Dock. The development sites are therefore within a convenient distance of the town centre. The town centre is separated from the waterfront area by the Vale of Glamorgan Railway Line, and the existing waterfront retail area which was constructed during the early stages of the waterfront regeneration in around 2002.

4.3 There is a well established highway network surrounding the development sites. However, there is currently no highway infrastructure within the sites.

4.4 The A4055, Broad Street, provides a northeast-southwest route through Barry Town linking up with Harbour Road to the southwest of the town, ultimately leading to Barry Island. Urban in nature with on-street parking in places, the A4055 through Barry is a single carriageway road that is subject to a 30 mph speed limit.

4.5 Earl Crescent adjoins Harbour Road via a mini-roundabout in Barry Island, and provides a route to the southern boundary of the West Pond/South Quay site. To the east, the A4055 forms a district distributor road that links Barry, Dinas Powys and Penarth to Cardiff Bay, where the speed limit varies between 30, 40 and 60 mph.

4.6 Ffordd y Mileniwm forks off the A4055 at the Gladstone Road/Cardiff Road roundabout to form an east/west spine road through the waterfront area. The road is urban in nature, single carriageway and subject to a 30 mph speed limit. It provides the main vehicular route to the site, and is intersected by a number of roundabouts that serve the waterfront retail area and some residential clusters. Ffordd y Mileniwm provides the eastern approach of a 4 armed roundabout located on the north eastern boundary of the West Pond/South Quay part of site.

4.7 The A4055 provides access to Pontypridd Road to the north-west of the waterfront, which links onto Waycock Road and eventually the A48, which provides access to other parts of the Vale of Glamorgan and Bridgend.

4.8 The primary route to the north west of Barry is the A4050 which connects to the A4232 at Culverhouse Cross, providing a route to the M4 Motorway. The A4050 is good quality single carriageway that is subject to a 50 mph speed limit between Culverhouse Cross and the South Wales Golf Centre at Wenvoe. The road bounds the northern edge of Barry, where it is subject to a 40 mph limit and links to the A4226 which continues towards Cardiff Airport. The A4050 continues in a south westerly direction where it joins the A4055 at the Ship Gyratory adjacent to Barry Island.

4.9 The highway network around Barry is relatively busy and in some areas congestion can sometimes be observed. Particularly during network peak hours, congestion typically occurs at the Merrie Harrier junction, Biglis roundabout, Waycock Cross and Palmerston Road.

4.10 Baseline traffic conditions have been established by obtaining recent Manual Classified Counts detailing turning movements at all assessed junctions and several Automated Traffic Counts (ATC).

Public Transport

Rail

4.11 The existing provision of rail based public transport is described in detail in section 9.1 of the TA. The development site is within close proximity of three train stations in the Barry area: Barry Island, Barry and Barry Docks. Situated on the Vale of Glamorgan Line, Barry has good connections with Cardiff Central which forms a rail hub for the South Wales area.

4.12 Despite their close proximity, access to the stations is not direct, with the rail line itself creating a barrier to easy access.

4.13 Services for the centrally located Barry rail station are summarised in Table D3 below.

Route	Frequency			Journey Time
	Mon - Fri	Sat	Sun	
Barry – Cardiff Central	06:00 every 15 mins until 19:30 then 2 per hr until 23:36	06:00 every 15 mins until 19:30 then 2 per hr until 23:15	3 within 2 hr period from 09:19 until 23:25	24 minutes
Cardiff Central – Barry	05:25 every 15 mins until 19:41 then 2 per hr until 23:30	05:25 every 15 mins until 18:55 then 2 per hr until 23:20	3 within 2 hr period from 08:25 until 22:25	24 minutes
Barry – Bridgend	1 per hr from 06:05 until 23:05	1 per hr from 06:05 until 22:05	1 every 2 hrs from 09:05 until 21:05	34 minutes
Bridgend – Barry	1 per hr from 05:42 until 22:51	1 per hr from 05:42 until 22:42	1 every 2 hrs from 09:42 until 21:42	32 minutes

Table D3: Rail services at Barry station

Bus

4.14 The existing provision of bus based public transport is described in detail in section 10.1 of the TA. Barry is well connected to areas within South East Wales by a substantial network of bus services. A number of bus services currently operate on Ffordd y Mileniwm and there are a number of stops within close proximity of the site.

4.15 The majority of existing bus services serve the town itself and destinations towards Cardiff. There are relatively few services to rural areas west of Barry. Details of bus services in the Barry area are contained within Table D4 below.

Service	Route	Direction	Frequency of Service		
			Morning	Daytime	Evening
93	Cardiff – Penarth – Dinas Powys – Barry	Cardiff - Barry	2 per hr	2 per hr	1 per hr
		Barry - Cardiff	1 per hr	90 mins	1 per hr
94	Cardiff –Penarth – Sully – Barry	Cardiff - Barry	2 per hr	2 per hr	1 per hr
		Barry - Cardiff	2 per hr	2 per hr	1 per hr
95	Cardiff – Dinas Powys – Barry – Barry Island	Cardiff - Barry	1 per hr	3 per hour	-
		Barry - Cardiff	1 per hr	3 per hour	
96	Cardiff – Culverhouse Cross – Barry	Cardiff - Barry	1 per hr	2 per hr	1 per hr
		Barry - Cardiff	1 per hr	2 per hr	1 per hr
97	Barry Town Circular (Via Gibbonstown – King Square – Barry Hospital)	Clockwise	1 per hr	2 per hr	-
		Anticlockwise	2 per hr	2 per hr	-
98	Barry Town Circular (Via King Square – Morrisons – Barry Hotel)	Anticlockwise	2 per hr	2 per hr	-
X91	Cardiff – Barry – Cardiff International Airport – St Athan – Llantwit Major)	Cardiff – Llantwit Major	1 per hr	1 per hr	1 per hr
		Llantwit Major – Cardiff	2		1 per hr
88	Barry – Sully – Penarth – Llandough Hospital	Clockwise	1 per hr	1 per 1.5hr	-
B1	Barry Town Circular (Via Garden Suburb – Waterfront – Town Centre)	Clockwise	1 per hr	1 per hr	-
B3	Barry Island Circular (Via Garden Suburb – The Knap – Waterfront)	Anticlockwise	1 per hr	1 per hr	
X45	Cardiff to Llantwit Major (via Barry)	Cardiff to Llantwit Major	1 per hr	1 per hr	
		Llantwit Major to Cardiff	1 per hr	1 per hr	

Table D4: Bus services in the Barry area

Pedestrians and Cyclists

4.16 The existing provision of pedestrian and cycle facilities is described in detail in Section 11 of the TA. Changes in the levels of movement, in particular that of vehicular movement will impact on the ease of movement and level of delay experienced by pedestrians and cyclists. The level of pedestrians and cyclists can be assessed by consideration and grading of the following factors: amenity of provided routes, attractiveness, lighting, surface quality and maintenance, gradients and steps, crossings, personal security and route barriers.

Pedestrians

4.17 Pedestrian facilities in the waterfront area have been improved during the previous waterfront regeneration schemes. Consistent footway links are provided around the area, providing a network of well lit paths. Pedestrians are afforded pelican and zebra crossings towards the eastern end of the waterfront area, but there is a lack of formalised crossings in the waterfront itself.

4.18 The development site is linked to Barry Island via a surfaced footpath and a set of relatively steep steps through West Pond/South Quay. There is no lighting provided along the footpath, and the surfacing is in poor condition.

4.19 Elsewhere, Barry has a well established network of footways of varying width and quality that follow the alignment of existing highways.

4.20 This existing network of pedestrian facilities is linked to the more recent waterfront network via a series of bridges and subways, and will be further improved with the construction (by the Vale of Glamorgan Council) of a footbridge off Thomson Street crossing the railway line.

Cyclists

4.21 Cycle conditions within the immediate vicinity of the development have benefited from the previous waterfront regeneration scheme.

4.22 A segregated cycle/footway is provided along the majority of Ffordd y Mileniwm, running along the northern side of the road from the roundabout situated at the north eastern corner of the application site to the Ffordd y Mileniwm/Cardiff Road roundabout. This link forms part of the proposed National Cycle Network (NCN) Route 88. When fully completed, this route will link NCN Route 4 at Margam Park near Bridgend, through the Vale of Glamorgan to NCN Route 8 in Cardiff Bay.

4.23 There are no cycleways or other notable cycle facilities extending beyond the Ffordd y Mileniwm/Cardiff Road roundabout, with the exception of advanced cycle stop lines at the Palmerston Road/Cardiff Road signalised junction.

4.24 There is a lack of convenient and safe cycle storage in the Barry area, which is evidenced in the limited provision of essential cycle storage facilities at the three Barry train stations.

4.25 The level of cycle infrastructure provision reduces with distance from the waterfront area, with much of the existing infrastructure in Barry providing no dedicated facilities for cyclists.

Fear and Intimidation

4.26 The site itself is currently vacant land with little activity. There is an informal route across the site which connects Ffordd y Mileniwm and Clive Street on

Barry Island. However, this is largely unlit, poorly surfaced and includes steps. The existing situation is therefore considered to be poor in terms of fear and intimidation.

4.27 Beyond the site boundaries the main road in the Waterfront area, Ffordd y Mileniwm, is lit with a wide segregated footway/cycleway adjacent to the carriage. The route overlooks the No. 1 dock and there is a reasonable amount of pedestrian activity during the day especially around the Morrisons store. Previous phases of the Waterfront development have resulted in minimal natural surveillance of the route, with little active frontage onto Ffordd y Mileniwm. Routes in the completed waterfront area are therefore considered to be average in terms of fear and intimidation.

4.28 On Barry Island and in Barry Town centre pedestrian routes are narrow in many places and of a variable quality however they are active communities with active frontage adjacent to most routes. Routes in these areas are therefore considered to be average in terms of fear and intimidation.

Severance

4.29 The Design Manual for Roads and Bridges (DMRB) defines severance as *"the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows".*

4.30 DMRB also provides thresholds of community severance based on either the Annual Average Daily Traffic (AADT) or the length of diversion to cross a road; these are summarised in table D5 below.

Severance Level	Traffic Flow (AADT)	Length of Diversion
Slight	<8,000	<250m
Moderate	8-16,000	250-500m
Significant	>16,000	>500m

Table D5: DMRB severance criteria

4.31 DMRB states that pedestrian severance may be reduced by up to 90% by the provision of pedestrian crossings which accommodate desire lines.

4.32 Severance at Barry Waterfront occurs largely as a result of the rail lines which bound the site to the north, west and south, and the No. 1 Dock to the east. There are currently only very lightly trafficked no-through roads in the vicinity of the site. Beyond the immediate site areas, the urban roads of Barry have traffic flows, which from DMRB guidance, would be classified as having a slight or moderate severance effect.

4.33 All roads close to the site have a 30 mph speed limit and crossings (a mixture of controlled and uncontrolled) at frequent intervals.

4.34 Severance as a result of the rail line is minimised by crossings at several points in north, west, south order along the rail line from the East Quay site are:

- A pedestrian subway at Barry Docks rail station
- Subway Road
- Thompson Street Footbridge (under construction)
- Gladstone Bridge
- Hood Road
- Paget Road

4.35 Where these crossings of the rail line are by road there are adequate footways on either side of the road.

Accident Analysis

4.36 Personal Injury Accident (PIA) records were obtained from the Vale of Glamorgan council for the most recent five year period available (2002-2006 inclusive).

4.37 This information was input into a GIS database and filtered for the junctions and links which have been considered in the TA. The accidents were then graded by severity: slight, severe and fatal and plotted by location on a map of Barry.

4.38 Accidents occurring within the area, but not on junctions or links considered in the capacity analysis, have been plotted as black dots. The resulting plot is included as Figure D3, full records of the accidents are included as Appendix C of the TA.

4.39 From this figure it is apparent that over the five year period the distribution of accidents is generally even over the study area, with the majority of accidents clustering around junctions, a further accident summary in Table D6 below and graphically represented as Figure D3.

Location	Severity			Causes
	Slight	Serious	Fatal	
Biglis Roundabout	4	1		2 x failed to give way 2 x rear shunts
Sycamore Cross roundabout	7			5 x failed to give way 2 x rear shunts
Ship Gyratory, southern mini roundabout with harbour road	4	1		
Gladstone Bridge roundabout	6	1		2 x rear shunts
Buttrills Road / Barry Road Junction	3	1	1	3 x pedestrian crossing
Gladstone Road / Cardiff Road / Ffordd y Mileniwm (RA to south of rail line)	4	3		3 x failed to give way
Vere Street / Hillary Rise / Gladstone Rise	4			
Hood Road / Broad Street junction	3			
Barry Docks Link Road / Palmerston Road junction	5		2	2 x lost control 5 x failed to give way
Port Road, west of Barry Docks Link Road and east of Merthyr Dyfan Road	6			4 x rear shunts
Port Road / Merthyr Dyfan Road junction	4	1		3 x lost control of vehicle
Port Road, west Merthyr Dyfan Road and east of Colcot Road	6	2		2 x lost control of vehicle 2 x minor junction 2 x overtaking 2 x rear shunts
Colcot Road / Port Road junction	4			
Port Road, west of Colcot Road East of Waycock Cross	6	2		4 x rear shunts
Gladstone Road, west of Vere Street and east of Court Road	5	1		2 x lost control of vehicle 2 x minor junction
Gladstone Road / Court Road Roundabout	14			5 x failed to give way 2 x pedestrian crossing
Broad Street east of Hood Road west of Gladstone Bridge	9	1		3 x drive way / minor junction 3 x involving parallel parking 3 x pedestrian crossing

Along Pontypridd Road, south of Sycamore Cross and north of Jenner road	13			4 x lost control of vehicle 6 x drive way / minor junction 2 x pedestrian crossing
St Nicholas Avenue, south of Jenner Road and north of Broad Street	6	2		5 x pedestrian crossing 3 x at minor roundabout
St Nicholas Avenue / Jenner Road roundabout	12	1		4 x rear shunts 2 x lost control of vehicle 4 x pedestrian crossing
Broad Street, west of Island Road / Hood Road junction	11			3 x minor junction 6 x pedestrian crossing
Ffordd y Mileniwm, west of Gladstone road and east of Wimbourne Road	4			2 x minor junction 2 x lost control of vehicle
Buttrills Road / Gladstone Road Roundabout	7			4 x failed to giveway 2 x rear shunts
Cardiff Road, west of Biglis Roundabout and east of Palmerston Road	9			3 x minor junction 3 x rear shunt
TOTALS	156	17	3	

Table D6: Accident summary

4.40 The majority of accidents were classified as “slight” with only 17 “serious” accidents and three “fatal” accidents, two of which were at a junction which has subsequently been altered.

4.41 Two junctions display clear clusters of accidents:

- Gladstone Road / Court Road Roundabout
- St Nicholas Avenue / Jenner Road roundabout

4.42 Two links also display clear clusters of accidents:

- Pontypridd Road, south of Waycock Cross and north of Jenner road
- Broad Street, west of Island Road / Hood Road junction

Junction Operation

4.43 As described in Section 3 above, an extensive network of highway junctions has been tested in relation to the proposed development. Comprehensive discussion of the assessment is contained within Chapter 7 of the TA.

4.44 Table D7 below provides a summary of the junction capacity for the assessed junctions in the AM and PM peak hours of the 2008 Base situation which represents existing conditions.

	AM	PM
Merrie Harrier Signals Junction	3	3
Murch Crossroads	1	1
Biglis Roundabout	1	3
Port Road/Barry Docks Link Road Roundabout	1	2
Waycock Cross Roundabout	3	1
Harbour Road/Station Approach/Paget Road Roundabout	1	1
Harbour Road/Earl Crescent Priority	1	1
Harbour Road/Nicholas Road (Ship gyratory) Priority	1	1
Harbour Road/Broad Street (Ship gyratory) Priority	1	1
The Parade/Harbour Road Mini Roundabout	1	1
Gladstone Bridge Roundabout	1	1
Dock View Road Gyratory	1	2
Buttrills Road/Barry Road Staggered Junction	1	1
Barry Road/Ty Newydd Road/Cemetery Road Roundabout	1	1
Gladstone Road/Cardiff Road/Ffordd Y Milemiwm	1	1
Palmerston Road/Cardiff Road Signals Junction	4	2
Vere Street/Hillary Rise/Gladstone Road - Mini Roundabout	1	1
Vere Street/Hillary Rise/Gladstone Rise - Priority T-junction	1	1
Wimbourne Road/Ffordd Y Mileniwm Priority T-junction	1	1
Cory Way/Ffordd Y Mileniwm Roundabout	1	1
Subway Road/Ffordd Y Mileniwm Priority left in / left out	1	1
Y Rhodfa/Ffordd Y Mileniwm/Clos Tynaid Glo Roundabout	1	1
Retail/Morrisons/Ffordd Y Mileniwm Roundabout	1	1
Gladstone Bridge/Ffordd Y Mileniwm Roundabout	1	1
Plymouth Road/Earl Crescent Roundabout	1	1
Broad Street/Hood Road Signals	1	2

1 - Within Capacity	**2 -** Approaching Practical Capacity	**3 -** Over Practical Capacity, Approaching Theoretical Capacity	**4 -** Over Theoretical Capacity
Priority RFC <0.75 Signals RFC <0.80	Priority RFC >0.75, <0.85 Signals RFC >0.80, <0.90	Priority RFC >0.85, <1.00 Signals RFC >0.90, <1.00	Priority RFC >1.00 Signals RFC >1.00

Table D7: 2008 Base junction capacity assessment results

4.45 The results indicate that whilst the majority of junctions are operating within capacity several junctions have capacity issues irrespective of the Barry Waterfront proposals. In particular the signalised junction of Palmerston Road and Cardiff Road is extremely congested, these analysis results closely match the observed on site conditions.

4.46 Three further junctions have been assessed as operating over practical capacity:

- Merrie Harrier Signals;
- Biglis Roundabout;
- Waycock Cross Roundabout

Future Baseline

4.47 The approach detailed in paragraphs 3.13-3.21 was used to calculate future year traffic movements for the forecast year of 2020, the anticipated year of completion.

4.48 In the period between 2008 and 2020 significant traffic growth is anticipated in the vicinity of Barry, central growth estimates indicate a 16.5%/16.3% increase in background traffic flows in the AM and PM peaks respectively.

4.49 These increases are significant and if realised will result in congestion at several of the considered junctions. In order to isolate the effects of the development it is essential that the impact of baseline increases are understood. For this reason junction assessments were completed for 2020 baseline traffic, the results of this are summarised in Table D8 below and included in detail as Appendix I of the TA.

4.50 The following junctions are now forecast to operate over theoretical capacity:

- Merrie Harrier Signals
- Biglis Roundabout
- Waycock Cross Roundabout
- Dock View Road Gyratory
- Palmerston Road Signals
- Broad Street/Hood Road Signals

4.51 In addition the following junctions are now forecast to operate over practical capacity and approaching theoretical capacity:

- Murch Crossroads
- Port Road/Barry Docks Link Road Roundabout
- Vere Street/Hillary Rise/Gladstone Road - Mini Roundabout

4.52 The operation of these junctions in the future baseline (many of which are forecast to be over practical or theoretical capacity) is the comparison for the assessment of Barry Waterfront. The maintenance of this standard of operation with the addition of the Barry Waterfront development would therefore represent a 'Nil detriment' development.

	AM	PM
Merrie Harrier Signals Junction	4	4
Murch Crossroads	3	3
Biglis Roundabout	3	4
Port Road/Barry Docks Link Road Roundabout	1	3
Waycock Cross Roundabout	4	3
Harbour Road/Station Approach/Paget Road Roundabout	1	1
Harbour Road/Earl Crescent Priority	1	1
Harbour Road/Nicholas Road (Ship gyratory) Priority	1	1
Harbour Road/Broad Street (Ship gyratory) Priority	1	1
The Parade/Harbour Road Mini Roundabout	1	1
Gladstone Bridge Roundabout	1	1
Dock View Road Gyratory	3	4
Buttrills Road/Barry Road Staggered Junction	2	1
Barry Road/Ty Newydd Road/Cemetery Road Roundabout	1	1
Gladstone Road/Cardiff Road/Ffordd Y Mileniwm	1	2
Palmerston Road/Cardiff Road Signals Junction	4	4
Vere Street/Hillary Rise/Gladstone Road - Mini Roundabout	1	3
Vere Street/Hillary Rise/Gladstone Rise - Priority T-junction	1	1
Wimbourne Road/Ffordd Y Mileniwm Priority T-junction	1	1
Cory Way/Ffordd Y Mileniwm Roundabout	2	2
Subway Road/Ffordd Y Mileniwm Priority left in / left out	1	1
Y Rhodfa/Ffordd Y Mileniwm/Clos Tynaid Glo Roundabout	1	2
Retail/Morrisons/Ffordd Y Mileniwm Roundabout	2	1
Gladstone Bridge/Ffordd Y Mileniwm Roundabout	1	2
Plymouth Road/Earl Crescent Roundabout	1	1
Broad Street/Hood Road Signals	1	4

Table D8: 2020 Baseline junction capacity summary

5.0 Potential Impacts

Impacts during construction

5.1 It is anticipated that construction of the Waterfront development will commence in 2010 and works would proceed in a phased manner commencing with an initial phase of earthworks, infrastructure and remediation.

5.2 At times several areas will be progressed concurrently by different members of the consortium.

5.3 The approach route of construction traffic to the site has yet to be established by agreement with the local authority but the most appropriate routes would be those which are of an adequate standard for HGV's and ensure that they reach the strategic road network efficiently whilst minimising impact on the surrounding community. In the latter stages of construction this will include new residents of the Waterfront development.

5.4 It is suggested that three routes could be considered for construction traffic access to the site:

- To the A4232 at Culverhouse Cross via Ffordd y Mileniwm, Barry Docks Link Road and Wenvoe
- To the A4232 at Culverhouse Cross via Pontypridd Road, Waycock Cross, Port Road and Wenvoe
- To the A4232 at Ferry Road Interchange via Ffordd y Mileniwm, Cardiff Road and the A4055 through Dinas Powys

5.5 Each of these routes differ in impact, distance, congestion and access issues however it is suggested that dependant on the destinations of construction traffic the route which will have the lowest impact is to the A4232 at Culverhouse via Ffordd y Mileniwm, Cardiff Road, Barry Docks Link and the A4050 via Wenvoe.

5.6 It is considered that HGV construction traffic will peak in 2010, for a period of around ten months as a result of significant material import activities; during this period around 120 HGV deliveries a day (240 two way movements) are anticipated, however during these early phases light goods vehicle (LGV) traffic would be lighter at around 50 trips (100 two way movements).

5.7 Following the initial phase the following estimated numbers of movements are representative, the numbers of staff movements will vary significantly proportional to the level of construction activity:

<u>HGV movements</u>

30-35 deliveries a day (60-70 two way movements)

Staff/LGV movements

90-180 LGV's travelling to the site daily (180-360 two way movements)

5.8 It is anticipated that the site will be operational up to six days a week for typical construction hours, the exact operation of the site and construction hours is likely to vary over the construction period, working hours will also be required to but also adhere to any relevant conditions. Deliveries will generally be spread across the working day but the arrival and departure of staff is likely to have significant peaks at the beginning and end of the working day.

5.9 Whilst occurring over a protracted period this volume of traffic is low in comparison with the forecast 2020 baseline conditions, programming of works can further minimise this by careful timing of large loads and control of the routes used to access the site.

Impacts after Completion

5.10 To determine the impact of the complete Waterfront development the trip generation of each element of the development has been calculated using the methodology detailed in Paragraphs 3.13-3.21. Further details of this process and modal share split are detailed in Section 6 of the TA.

5.11 The resulting trip generations by mode and development area for the AM and PM peak hours are summarised in Tables D9 to D12 below.

	AM Peak Hour		**PM Peak Hour**	
	Arr	**Dep**	**Arr**	**Dep**
East Quay	30	90	78	47
Arno Quay	9	31	23	13
West Pond/South Quay	462	761	794	646
The Mole	30	42	57	47
Total	**531**	**925**	**952**	**752**

Table D9: Resultant Vehicle Trip Generation Summary

	AM Peak Hour		PM Peak Hour	
	Arr	**Dep**	**Arr**	**Dep**
East Quay	17	48	27	16
Arno Quay	7	24	18	10
West Pond/South Quay	304	431	256	188
The Mole	9	20	18	12
Total	**337**	**523**	**319**	**225**

Table D10: Pedestrian Generation Summary

	AM Peak Hour		PM Peak Hour	
	Arr	**Dep**	**Arr**	**Dep**
East Quay	1	4	4	2
Arno Quay	1	2	1	1
West Pond/South Quay	12	28	29	19
The Mole	1	2	2	1
Total	**14**	**35**	**36**	**23**

Table D11: Cycle Generation Summary

	AM Peak Hour		PM Peak Hour	
	Arr	**Dep**	**Arr**	**Dep**
East Quay	5	14	9	5
Arno Quay	2	5	4	2
West Pond/South Quay	44	98	66	48
The Mole	2	5	4	2
Total	**52**	**121**	**82**	**57**

Table D12: Public Transport Generation Summary

5.12 It is considered that the benefits of increased pedestrian and cyclist movements in the Waterfront area is positive and that these numbers will create a vibrant community. This level of movement can easily be accommodated on the combination of existing and proposed routes.

5.13 The routes through the site will not only benefit the new residents, employees and visitors but also to the existing residents of Barry and Barry Island. The development of the Waterfront area will provide improved routes for all modes but especially for pedestrians and cyclists for whom the route will be pleasant

and direct as opposed to Harbour Road which is circuitous and vehicle dominated.

5.14 Public transport demand will be split between the rail and bus services, including the diverted service which will operate through the West Pond area. Whilst certain peak hour rail services are busy there is generally adequate capacity, in future years additional rail capacity is likely to be provided as a result of improvement works. In the case of bus based public transport high demand for services would be likely to result in operators considering an increased service frequency.

5.15 The vehicular trips from Table D9 above were then distributed on the considered highway network according to the forecast gravity model percentages via the appropriate routes towards their destinations. In order to assess junction operation in the 2020 development scenario, junction capacity testing was repeated with the combined traffic flows. The results of the testing are detailed in Section 7 and Appendix I of the TA and summarised in Table D13 below.

	AM	PM
Merrie Harrier Signals Junction	4	4
Murch Crossroads	4	4
Biglis Roundabout	3	4
Port Road/Barry Docks Link Road Roundabout	3	4
Waycock Cross Roundabout	4	4
Harbour Road/Station Approach/Paget Road Roundabout	1	1
Harbour Road/Earl Crescent Priority	1	3
Harbour Road/Nicholas Road (Ship gyratory) Priority	1	1
Harbour Road/Broad Street (Ship gyratory) Priority	1	1
The Parade/Harbour Road Mini Roundabout	1	1
Gladstone Bridge Roundabout	1	1
Dock View Road Gyratory	3	4
Buttrills Road/Barry Road Staggered Junction	2	2
Barry Road/Ty Newydd Road/Cemetery Road Roundabout	1	1
Gladstone Road/Cardiff Road/Ffordd Y Mileniwm	3	3
Palmerston Road/Cardiff Road Signals Junction	4	4
Vere Street/Hillary Rise/Gladstone Road - Mini Roundabout	1	3
Vere Street/Hillary Rise/Gladstone Rise - Priority T-junction	1	1
Wimbourne Road/Ffordd Y Mileniwm Priority T-junction	1	4
Cory Way/Ffordd Y Mileniwm Roundabout	2	4
Subway Road/Ffordd Y Mileniwm Priority left in / left out	1	1
Y Rhodfa/Ffordd Y Mileniwm/Clos Tynaid Glo Roundabout	2	4
Retail/Morrisons/Ffordd Y Mileniwm Roundabout	4	4
Gladstone Bridge/Ffordd Y Mileniwm Roundabout	2	4
Plymouth Road/Earl Crescent Roundabout	1	1
Broad Street/Hood Road Signals	1	2

D13: 2020 with development junction capacity summary

5.16 It is found that the traffic generated by the development will exacerbate capacity problems, resulting in a number of junctions exceeding their theoretical capacity. Without mitigation this will result in long queues and delays to all road users. The development situation assessment for 2020 is summarised as follows:

5.17 The following junctions continue to operate within practical capacity:

- Harbour Road/Station Approach/Paget Road
- Harbour Road/Nicholas Road (Ship gyratory) Priority
- Harbour Road/Broad Sreet (Ship gyratory) Priority
- The Parade / Harbour Road Mini Roundabout
- Gladstone Bridge Roundabout
- Buttrills Road/Barry Road Staggered Junction
- Barry Road/Ty Newydd Road/Cemetery Road Roundabout
- Vere Street/Hillary Rise/Gladstone Rise - Priority T-junction
- Subway Road/Ffordd Y Mileniwm Priority left in / left out
- Plymouth Road/Earl Crescent Roundabout
- Broad Street / Hood Road Signals.

5.18 The following additional junctions are forecast to exceed practical capacity but operate within theoretical capacity:

- Harbour Road / Earl Crescent Priority
- Gladstone Road/Cardiff Road/Ffordd Y Mileniwm
- Vere Street/Hillary Rise/Gladstone Road - Mini Roundabout.

5.19 Those junctions forecast to exceed the theoretical capacity are:

- Merrie Harrier Signals
- Murch Crossroads
- Biglis Roundabout
- Port Road/Barry Docks Link Road Roundabout
- Waycock Cross Roundabout
- Dock View Road Gyratory
- Palmerston Road/Cardiff Road Signals
- Wimbourne Road/Ffordd Y Mileniwm Priority T-junction
- Cory Way/Ffordd Y Mileniwm Roundabout
- Y Rhodfa/Ffordd Y Mileniwm/Clos Tynaid Glo Roundabout
- Retail/Morrisons/Ffordd Y Mileniwm Roundabout
- Gladstone Bridge/Ffordd Y Mileniwm Roundabout.

5.20 It is notable that the majority of the impacts lie close to the site where the impact of the additional traffic is focussed.

5.21 As discussed in paragraph 3.16 of this chapter these results are for the tests requested by the local authority to include development on the Mole and the education use within the District Centre area of the site. They are therefore cumulative effects representing a worst case scenario with a fully developed waterfront area.

6.0 Mitigation Measures

Introduction

6.1 This section outlines the measures that are proposed in order to minimise the impact of the development as identified in Section 5 above.

Mitigation – Construction Period

6.2 Measures will be implemented to ensure that the impact resulting from construction traffic is minimised. Central to this will be the establishment of approved route(s) to the site selected from one or more of the routes outlined in paragraph 5.9. These will be used for all HGV and hazardous loads (cranes etc.) required for the site.

6.3 At the site area, disruption to members of the public or the public highway will be minimal as the large site area will easily be able to accommodate a large number of construction vehicles for all but the final phase.

6.4 Construction hours will be regulated and depending on the prevailing conditions at the time of construction it may be necessary during peak periods of activity for the developer to programme vehicular movements, in particular the movement of any abnormal loads, in order to avoid impact on the wider road network.

6.5 As the population of the development increases in later phases the developer will consider establishing a residents forum/website to publicise the ongoing works and for residents to communicate any concerns over construction impacts.

6.6 During some phases of the work the informal pedestrian route from Clive Road on Barry Island to the South Quay area may be closed, however the eventual improved route will be a facility of a far higher standard.

6.7 The construction works on site will be subject to a Construction Environmental Management Plan. Further to this the construction site will be registered with Considerate Constructors to ensure the site minimises impacts on the local community.

Mitigation - After Completion

Highway measures

6.8 In order to minimise the impact of the development on the highway network a number of possible junction improvement schemes have been identified and assessed. These junctions operate over capacity either as a result of increased

traffic resulting from growth in base traffic, increased traffic related to Waterfront Barry traffic or a combination of both.

6.9 These measures and associated sketch proposals are detailed in Section 7.6 of the TA. The following is a summary of the affected junctions, those which are already programmed for improvement by the local authority, those which it is possible to re-model the existing junction and those for which major works would be required.

6.10 The progression of any of these schemes would be the subject of negotiation between the consortium and the Vale of Glamorgan Council.

Junctions with pre-existing programmed improvement works

6.11 There are programmed improvements to two of the tested junctions:

- Merrie Harrier: The proposed works to the Merrie Harrier signalised junction are aimed at providing improved facilities for buses, cyclists and pedestrians whilst increasing available capacity through the installation of new signal equipment.
- Waycock Cross: The proposed works to the junction involve and enlargement and re-siting of the roundabout to the north. The revised junction will have a significantly larger diameter gyratory with improved capacity on all approach arms. The improvement proposals arise from existing traffic conditions and proposals for the Metrix development at RAF St. Athan to the west of Barry.

Remodelling of existing junctions

6.12 It is possible to remodel seven of the existing junctions in order to improve junction capacity and traffic control with the new development. The works involve a range of measures targeted increasing traffic capacity within available highway land:

- Port Road/Barry Docks Link Road*;
  - junction relocation with provision of dedicated left turn lanes
- Gladstone Road/Cardiff Road/Ffordd y Mileniwm;
  - junction realignment with dedicated straight ahead on Ffordd y Mileniwm
- Palmerston Road Signals*;
  - provision of additional through lanes on Cardiff Road
- Cory Way/Ffordd y Mileniwm;
  - realignment of eastern Ffordd y Mileniwm arm
- Y Rhodfa/Ffordd y Mileniwm/Clos Tynaid Glo;
  - realignment of eastern Ffordd y Mileniwm arm

- Retail/Morrisons/Ffordd y Mileniwm; and
  - realignment of both Ffordd y Mileniwm arms
- Gladstone Bridge/Ffordd y Mileniwm.
  - modest increase in central island and realignment of all arms

6.13 Those junctions marked * were noted in the future baseline capacity assessment, i.e. without the Barry Waterfront development, as operating over practical capacity.

Replacement of existing junctions

6.14 For a further four junctions it is anticipated that improvement works would require major upgrading works in order to alter the form of the junctions within the available highway land:

- Biglis Roundabout*;
  - altered to signalised crossroads
- Harbour Road/Station Approach Road/Paget Road;
  - altered to a signalised junction
- Plymouth Road/Earl Crescent; and
  - altered to a signalised junction linked to Harbour Road/Station approach
- Wimbourne Road/Ffordd y Mileniwm
  - altered to a roundabout junction with appropriated geometry for Docks traffic

6.15 Those junctions marked * were noted in the future baseline capacity assessment, i.e. without the Barry Waterfront development, as operating over practical capacity.

6.16 The timing, funding and form of junction works will be the subject of discussion between the development consortium and the local authority. With regard to timing it is likely that works will be triggered by events such as construction works and occupation of constructed accommodation.

6.17 Table D14 below summarises the resulting operation of the assessed junctions with mitigation works. Full details and analysis of the resulting operation of each considered junction are detailed in section 7 of the Transport Assessment.

	AM	PM
Merrie Harrier Signals Junction	4	4
Murch Crossroads	4	4
Biglis Roundabout	4	4
Port Road/Barry Docks Link Road Roundabout	1	1
Waycock Cross Roundabout	4	4
Harbour Road/Station Approach/Paget Road Roundabout	1	1
Harbour Road/Earl Crescent Priority		
Harbour Road/Nicholas Road (Ship gyratory) Priority	1	1
Harbour Road/Broad Street (Ship gyratory) Priority	1	1
The Parade/Harbour Road Mini Roundabout	1	1
Gladstone Bridge Roundabout	1	1
Dock View Road Gyratory	3	4
Buttrils Road/Barry Road Staggered Junction	2	2
Barry Road/Ty Newydd Road/Cemetary Road Roundabout	1	1
Gladstone Road/Cardiff Road/Ffordd Y Milemiwm	2	1
Palmerston Road/Cardiff Road Signals Junction	4	4
Vere Street/Cardiff Road/Gladstone Road - Mini Roundabout	1	3
Cardiff Road/Holton Road/Gladstone Rise - Priority T-junction	1	1
Wimbourne Road/Ffordd Y Mileniwm Priority T-junction	1	2
Cory Way/Ffordd Y Mileniwm Roundabout	2	2
Subway Road/Ffordd Y Mileniwm Priority left in / left out	1	1
Y Rhodfa/Ffordd Y Mileniwm/Clos Tynaid Glo Roundabout	2	2
Retail/Morrisons/Ffordd Y Mileniwm Roundabout	3	3
Gladstone Bridge/Ffordd Y Mileniwm Roundabout	1	2
Plymouth Road/Earl Crescent Roundabout	1	1
Broad Street/Hood Road Signals	1	2

Junctions with Mitigation measures

Table D14: 2020 with Development and Mitigation Capacity Summary

Rail Measures

6.18 Pedestrian links with Barry and Barry Island rail stations will be improved. The consortium will enter into dialogue with the Vale of Glamorgan council, as land owner, to progress the provision of a cycleway/footway link across the existing railway sidings situated south of the Powell Duffryn Way/Hood Road junction. This would allow more direct pedestrian access from the development areas to the rail station via the Powell Duffryn Way underpass, and Broad Street. Improved access to the rail station would make rail travel to and from the development a more attractive way of travel, and help provide a genuine competitor to the private car. This approach is consistent with the development brief and a partnership approach to delivery will be pursued with the council.

Bus Measures

6.19 Diversion of the 95 bus route through the site to two way loop at Barry Island would be desirable, providing a 15 minute frequency service through the site. In addition, it may be possible to divert other existing services through the site, increasing service frequency further. Initial discussions with Cardiff Bus, the operator of this service, were positive.

6.20 The majority of the development site is within 5 minutes walking distance of a bus stop, with the rest being within 10 minutes. The location of the stops has been determined with consideration for the guidance set out in Manual for Streets.

6.21 The bus stops will be of high quality and provide travel information, lighting, shelter and signing to ensure a positive passenger experience. As the link road is being constructed as a single carriageway with dedicated on street parking, there is sufficient width for the installation of bus laybys to at each of the bus stops. This will allow buses to pull off the main link road to pick passengers, reducing the delay to vehicles during the pickup/drop off of passenger.

Travel Plan Measures

6.22 The transport vision for Waterfront Barry will be promoted through a Travel Plan, and outline version of which is provided as Section 13 of the TA. It will provide the framework within which a developer commits to providing a development that encourages modal shift towards sustainable transport.

- Car sharing: relieves congestion at peak hours.
- Encouraging walking: encouraging employees to walk to work
- Encourage cycling: cycling facilities, information and establishing a Bicycle User Group (BUG) within the proposed offices
- Encourage Public Transport

- Resident initiatives: Welcome pack, transport information, personalised travel planning

Severance

6.23 The presence of the rail line and No 1 Dock cannot be altered however the developer will minimise severance (whilst improving access to rail facilities) by creating a more direct route from the West Pond area to Broad Street and Barry train station.

Pedestrian Amenity

6.24 The masterplan has been developed with high priority afforded to pedestrian permeability. The newly constructed link road will include wide footways to cater for increased demand and frontage activity. Dedicated at-grade crossings will be provided at the proposed signalised junctions along the main link road.

6.25 Footways will share space with cyclists and motor vehicles within the housing areas to provide a 'street' feel, as advocated in the Department for Transport's Manual for Streets document. Pedestrian shortcuts will be provided between dead end streets, allowing local trips to be faster for pedestrians.

6.26 Uncontrolled crossings will be situated in convenient locations around the development sites, and will have dropped kerbs to cater for disabled users. Pedestrian desire lines have also been considered to ensure that safe convenient routes are available to pedestrians wanting to access the retail, school and office facilities.

6.27 An important aspect of the pedestrian facilities is the linkage to the external pedestrian facilities around the waterfront area. The segregated cycle/footway bordering Ffordd y Mileniwm has been integrated into the masterplan, to ensure seamless connections between existing facilities and the proposed development.

6.28 Connections will also be made to the existing footways that follow the alignment of Powell Duffryn Way that connects to the roundabout situated at the north eastern corner of West Pond. Direct pedestrian access to Barry Station would be improved by the provision of a footway crossing over the disused railway to the north of West Pond. This would connect to the existing underpass that currently provides a link between the waterfront and Broad Street. The progression of this link will require partnership with the council as landowner.

Cycle Amenity

6.29 It is envisaged that cycling will be a key mode for trips within the development and to other destinations in Barry. Much of Barry is within an acceptable cycling distance from the development sites.

Internal Links

6.30 The internal road network is designed in a way that facilitates cycle use and affords cyclists a similar level of accessibility to pedestrians.

6.31 In addition to the internal street design, there is a dedicated cycleway that will run along the western edge of the former No. 1 Dock to provide both commuter and leisure cyclists with an attractive alternative route to busy roads. The waterfront setting of this cycle route will provide a genuinely attractive link for cyclists wishing to access the dedicated cycleway along Ffordd y Mileniwm.

External Links

6.32 The internal cycle infrastructure will be conveniently linked to the dedicated cycleway along Ffordd y Mileniwm allowing cyclists an uninterrupted route through West Pond/South Quay area onto Ffordd y Mileniwm. Cyclists will also benefit from the at-grade crossing of the disused rail line providing a more direct route to Barry Station.

Cycle Parking Provision

6.33 It is proposed that cycle parking provision be included within the site to ensure compliance with the Outline Travel Plan, which supports the ambitions set out within national planning policy to increase the use of the bicycle as an alterative mode of transport to the private car.

6.34 The proposed level of cycle parking is in excess of the CSS Wales Parking standard, it is proposed that houses will be constructed with dedicated secure cycle parking.

Safety

6.35 Safety has been a key consideration in the design of transport infrastructure. It is anticipated that the design will lead to appropriate vehicular speeds both on the main road and within residential areas.

6.36 Efforts have been made to accommodate pedestrian desire lines through routes which link origins and destinations.

6.37 Detailed design of road junctions will be completed in line with local and national design guidance and safety audits will be undertaken at appropriate stages to ensure the suitability of designs and identify any unforeseen site specific circumstances.

Fear and Intimidation

6.38 Upon completion of the development, activity and natural surveillance in the area will completely alter the Waterfront environment. It is considered that the combination of well designed infrastructure (routes, lighting, building design)

and activity will create an urban area that has characteristics far less likely to result incidents which give rise to fear and intimidation.

7.0 Residual Impact Assessment

Introduction

7.1 This section of the chapter summarises the impact of the development following the implementation of mitigation measures as outlined in Section 6.

Impacts during Construction

7.2 The residual impact of construction traffic associated with the development is summarised in Table D15 below.

Environmental Topic	Description of Impact		Description of Mitigation Measures	Description of Residual Impact	
	Description	Significance		Description	Significance
Severance	Increase in traffic flows	Minor, Direct, Medium Term, Temporary	Registration of the site with considerate constructors and implementation of Construction Environmental Management Plan	Increase in traffic flows	Negligible; Direct, Medium Term, Temporary
Pedestrian Amenity					
Cycle Amenity					
Personal Security					
Road Safety					
Junction Capacity	Increase in traffic flows	Minor; Direct, Medium Term, Temporary	Some junction mitigation works may be progressed during construction period easing existing congestion issues in the area.	Increase in traffic flows	Negligible; Direct, Medium Term Temporary

Table D15: Residual Impact – Construction Phase

Impacts after Completion

7.3 The residual impact of traffic associated with the development is summarised in Table D16.

Environmental Topic	Description of Impact		Description of Mitigation Measures	Description of Residual Impact	
	Description	Significance		Description	Significance
Severance	Increase in traffic flows	Moderate, Direct, Permanent, Long term	Direct footway/cycleway route to Hood Road rail underpass Provision of pedestrian crossings throughout site	Increase in Traffic Flows	Minor Beneficial Direct, Permanent, Long term
Pedestrian Amenity			Direct footway/cycleway route to Hood Road rail underpass Provision of pedestrian crossings throughout site	Increase in Traffic Flows but with improvements to pedestrian network	Minor Beneficial Direct, Permanent, Long term
Cycle Amenity			Waterside cycle route provision Secure covered cycle parking at all residential elements. Integration with existing surrounding cycle route network Cycle parking	Increase in Traffic Flows	Minor Beneficial Direct, Permanent, Long term
Public Transport			Improved access to public transport via direct routes Improved public transport services	Decreased highway demand Modal shift	Moderate Beneficial Direct Permanent Long term

Personal security	Increase in traffic flows	Moderate, Direct, Permanent, Long term	Increase in traffic likely to have a positive effect due to increased surveillance and activity Improved lighting and maintenance of pedestrian routes	Increase in Traffic Flows	Minor Beneficial Direct, permanent, long term
Road Safety			Construction of high quality crossing facilities Design of roads to national standards	Increase in Traffic Flows	Minor; Direct, Permanent, Long term
Highway junctions operating over capacity	Poor operational efficiency and increase in queue length Congestion and an increase in Traffic flows resulting in noise and air pollution	Moderate Adverse Direct Permanent Long-Term	Negotiation of funding for replacement of existing junctions with high capacity replacements. Several of the proposed junctions are signalised providing improved pedestrian facilities	Improved highway capacity, decreased queuing and associated environmental effects	Minor Beneficial Direct, Permanent Long-Term Local
			Negotiation of funding for remodelling of existing junctions alteration of lane numbers, geometry, introduction of traffic signals.	Improved highway capacity, decreased queuing and associated environmental effects	Minor Beneficial Direct, Permanent Long-Term Local

Table D16: Residual Impacts – Operational Phase

8.0 Summary and Conclusions

8.1 In summary the proposed development will benefit from high levels of public transport, accessibility, pedestrian and cycling provision. The provision of appropriate transport access and the minimisation of adverse impacts is a key element of the proposals; subsequently, mitigation measures have been recommended as part of the assessment process.

8.2 Encouraging sustainable travel habits from the outset is an integral part of the scheme. Emphasis has been placed on improved pedestrian access to the rail station and a frequent bus service which will operate through the site.

8.3 It is however also necessary to ensure that the surrounding highway network can accommodate the inevitable additional traffic likely as a result of the Barry Waterfront development at nil detriment or better to the forecast baseline conditions. Subsequently road improvement schemes have been suggested to ensure that additional traffic will not have a significant impact on the efficiency of the road network.

8.4 The outline Travel Plan for the development proposes initiatives to encourage sustainable transport on the site. It will also set targets including modal split for the site and will be a live document that reacts to the area, its residents, employers and employees.

8.5 It can be concluded that the Barry Waterfront scheme can be satisfactorily accommodated by the local transportation network, assuming that the various transportation measures discussed in the report are implemented prior to the completion of the development.

9.0 Abbreviations

- AADT - Annual Average Daily Traffic
- ATC -Automated Traffic Counts
- DMRB - Design Manual for Roads and Bridges
- NCN - National Cycle Network
- NRTF - National Road Traffic Forecast
- PIA - Personal Injury Accident
- SEWTA – South East Wales Transport Alliance
- TRICS - Trip Rate Information Computer Systems

10.0 References

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