

# Integrated Plan for Phillimore Street and Access to Victoria Quay

TRAFFIC INVESTIGATION AND  
RECOMMENDED CONCEPT PLAN

Prepared for  
FREMANTLE PORTS

Prepared by  
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## **EXECUTIVE SUMMARY**

During the latter part of 2004, the City of Fremantle produced the Draft Phillimore Street Master Plan, with a view to improving the streetscape and urban design between Cliff Street and Market Street while also reinstating various architectural references to its historic past. A multi-disciplined team of consultants was then also appointed, to further investigate various issues and alternative solutions, and to develop the Integrated Phillimore Street and Victoria Quay Concept Plan.

This traffic report documents the background information within the overall study area, together with the traffic analysis carried out during the development of the integrated plan, to enable approval of the overall plan by the relevant authorities.

### EXISTING SITUATION

The existing access to Victoria Quay at Cliff Street is via a complex and often confusing arrangement of 1-way roads, with three individual railway crossings. Vehicles are regularly observed travelling the wrong way across the 1-way railway crossings and turning the wrong way into the various 1-way streets. There are also several uncontrolled pedestrian movements that currently occur at these railway crossings.

It is estimated that the existing developments within Victoria Quay currently generate a total of 6,600 vehicle trips per day on a Friday and 8,100 vehicle trips per day on a Sunday, with 580 vehicle trips and 1,130 vehicle trips during the Friday and Sunday peak hours, respectively.

Of this traffic generation, a total of 5,770 vehicles per Friday and 7,480 vehicles per Saturday currently enter and exit Victoria Quay at the Cliff Street railway crossings, while Phillimore Street currently carries approximately 10,200 vehicles per day east of Pakenham Street during both a Friday and Sunday.

### PROPOSED MODIFICATIONS WITHIN VICTORIA QUAY

In order to improve access to Victoria Quay from the north, and to encourage the increased use of Gate 2 by private vehicles, Fremantle Ports has re-constructed Victoria Quay Road on a new alignment that enables public access to/from Gate 2 to be maintained on a permanent basis. A new road link has also been constructed to the north of Gate 2, between Queen Victoria Street and Beach Street, approximately 200 metres south of Canning Highway.

Plans are also progressing for a proposed commercial precinct within Victoria Quay, which is expected to consist of approximately 13,000 square metres of retail floorspace and 4,000 square metres of offices during the initial stage, increasing to 25,000 square metres of offices in the longer term.

As part of this development, it is also proposed to extend Pakenham Street across the railway line and into Victoria Quay. This will provide improved accessibility for the existing activities on Victoria Quay, as well as the proposed commercial precinct, and will relieve some of the traffic pressure that would otherwise be placed on the existing Cliff Street access. However, this new rail crossing will only be possible if it is part of an overall plan that includes a rationalisation of the existing railway crossings at Cliff Street.

### PROPOSED MODIFICATIONS ALONG PHILLIMORE STREET

City of Fremantle has already resolved to convert Cliff Street to a 2-way road, in order to complete the 'ring road' formed by Elder Street, Phillimore Street, Cliff Street, Marine Terrace, Norfolk Street and Parry Street, and has sought approval from Main Roads WA.

As part of the Draft Phillimore Street Master Plan it was also proposed to extend Cliff Street as a direct 2-way access into Victoria Quay, in order to provide a clear, direct access to the various developments within Victoria Quay and to reinstate the historically significant alignment of Cliff Street as access to the waterfront.

Another major objective of the Draft Phillimore Street Master Plan was to create an improved pedestrian environment within the forecourt area of Fremantle Railway Station with traffic signals at the Phillimore Street - Market Street intersection. As well as providing a controlled crossing location for pedestrians accessing the Train Station, the signalised intersection would also allow pedestrians to cross to the eastern side of Market Street, and therefore continue through a new pedestrian plaza on the southern side of Phillimore Street towards Queen Street, in order to access the eastern parts of the City Centre.

In addition to the above proposals, the Draft Phillimore Street Master Plan also included the provision of on-street cycle lanes within Phillimore Street between Cliff Street and Queen Street, as proposed within the Fremantle Bikeplan.

### DEVELOPMENT OF INTEGRATED PLAN

As noted above, a multi-disciplined team of consultants was established to investigate the various issues raised in relation to the proposed commercial precinct within Victoria Quay and the integration of this proposal with the Draft Phillimore Street Master Plan.

As part of this process, a significant number of alternative solutions were developed and thoroughly investigated, with a primary focus on the following areas of concern:

- (i) Configuration of a 2-way access road to Victoria Quay at Phillimore Street - Cliff Street, with no turning movement restrictions to or from Fleet Street or the extension of Victoria Quay Road.
- (ii) Configuration and alignment of the new intersection of Victoria Quay Road with the proposed Pakenham Street extension.
- (iii) Configuration of the proposed signalised intersection at Phillimore Street - Market Street, including signalised access to the Bus Interchange.

No single option proved to be an ideal solution for every primary stakeholder. However, by each stakeholder representative agreeing to accept some level of compromise a preferred solution has now been developed.

It is therefore now proposed to extend Phillimore Street as a 2-way access into Victoria Quay, rationalising the three existing railway crossings into a single railway crossing. It is also planned to convert Cliff Street to a 2-way road, as currently proposed by City of Fremantle, and to construct an unsignalised junction at the resulting Phillimore Street - Cliff Street intersection.

It is recommended to extend Pakenham Street north of Phillimore Street and across the railway line, as a new access road for Victoria Quay, and to provide traffic signals at the Phillimore Street - Pakenham Street intersection, linked with the new railway crossing. An unsignalised 3-way junction should then be constructed at Pakenham Street extension and Victoria Quay Road, giving right-of-way for all vehicles travelling into Victoria Quay across the railway crossing.

Although it is not possible to extend Cliff Street as a 2-way access to Victoria Quay, as was proposed under the Draft Phillimore Street Master Plan, it is now proposed to construct a strong pedestrian route and railway crossing along the historical Cliff Street alignment.

As part of the development of the commercial precinct within Victoria Quay it is also proposed to provide a new pedestrian rail crossing between Victoria Quay Road and Phillimore Street, as close as possible to Fremantle Train Station.

It is recommended to install traffic signals at Phillimore Street - Market Street, in order to provide a signalised pedestrian crossing facility in place of the existing Zebra crossing. It is therefore recommended to also combine the Bus Entry to Fremantle Train Station as part of the signalised intersection, in order to include all pedestrian and vehicle conflicts within one controlled intersection.

In conjunction with the various modifications discussed above, it is also proposed to upgrade Phillimore Street between Cliff Street and Queen Street, as proposed within the Draft Phillimore Street Master Plan. In addition to various intersection modifications, the proposals consist of a formalisation of on-street parking areas, the introduction of kerb extensions to reduce crossing distances for pedestrians and to provide a narrower street environment, and the inclusion of on-street cycle lanes as proposed within the Fremantle Bikeplan.

The Integrated Phillimore Street and Victoria Quay Concept Plan is shown in Figures 2 and 3 in Chapter 3 Recommendations, while detailed layouts for typical situations along Phillimore Street are shown in Figures 4 and 5.

Figures 6 and 7 show the recommended traffic signal phasing at Pakenham Street and Market Street, respectively, while Figures 8 and 9 show the proposed pedestrian/cyclist facilities.

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## 1. INTRODUCTION

During the latter part of 2004, the City of Fremantle (through Donaldson & Warn and Uloth & Associates) produced the Draft Phillimore Street Master Plan, with a view to improving the streetscape and urban design between Cliff Street and Market Street while also reinstating various architectural references to its historic past.

This work also coincided with planning for a commercial precinct within Victoria Quay, which includes improvements to vehicular access via a realignment of Victoria Quay Road, improved access via Gate 2, a proposed new access road at Pakenham Street, and a proposed new pedestrian railway crossing just west of Fremantle Train Station.

The Draft Phillimore Street Master Plan was adopted by the City's Strategic Planning Committee during November 2004. However, because of subsequent issues arising in relation to the proposed commercial precinct within Victoria Quay and detailed operational concerns regarding bus operations at the Train Station forecourt, a steering committee was formed (with representatives from each of the major stakeholders), to oversee the development of an integrated plan.

The steering committee then appointed a multi-disciplined team of consultants to further investigate the various issues and alternative solutions, and to develop the Integrated Phillimore Street and Victoria Quay Concept Plan.

### 1.1 STUDY AREA

The overall study area for the development of the Integrated Phillimore Street and Victoria Quay Concept Plan is shown in Figure 1.

### 1.2 STUDY OBJECTIVES

The objective of this study is to document the background information within the overall study area, together with the traffic analyses carried out during the development of the integrated plan, to enable approval of the overall plan by the relevant authorities.

The specific study objectives are as follows:

- Document the existing situation within the overall study area.
- Estimate future traffic flows within the study area, taking into account the proposed commercial development within Victoria Quay as well as other development sited identified within the Fremantle Waterfront Masterplan.
- Discuss the issues and alternative solutions identified and analysed throughout the study period.
- Identify the compromises made by the various major stakeholders in the development of the recommended plan.
- Document the traffic flows and traffic operational analyses in support of the recommended plan, together with the proposed cross-sections, traffic signal phasing and pedestrian/cyclist facilities.



## 2. STUDY FINDINGS AND CONCLUSIONS

The study findings and conclusions relating to the Integrated Phillimore Street and Victoria Quay Concept Plan are presented in this chapter. Additional information is provided within the Technical Appendix.

### 2.1 EXISTING SITUATION

#### 2.1.1 Existing Roads and Access

- Figure A.1 in the Technical Appendix shows the existing situation within Phillimore Street and Victoria Quay between Cliff Street and Pakenham Street, while Figure A.2 shows the existing situation north of Pakenham Street.
- It can be seen in Figure A.1 that the existing access to Victoria Quay at Cliff Street is via a complex and often confusing arrangement of 1-way roads, with three individual railway crossings. Vehicles are regularly observed travelling the wrong way across the 1-way railway crossings and turning the wrong way into the various 1-way streets.
- Figure A.2 shows the existing one-way entry and exit to the Bus Interchange at Fremantle Train Station, together with the existing Phillimore Street junctions at Market Street and Queen Street. The proposed commercial precinct within Victoria Quay is also shown.

#### 2.1.2 Existing Traffic

- In order to identify the existing traffic situation, Uloth and Associates carried out a series of peak period traffic surveys at various locations during Friday 18 June, Friday 9 July, Sunday 11 July, and Friday 6 August 2004. Additional surveys were then also carried out on Friday 17 December, and Sunday 19 December 2004. The peak period traffic counts were factored up to daily traffic flows on the basis of hourly traffic count data provided by Main Roads WA and City of Fremantle.
- The existing Friday daily traffic flows within Phillimore Street and Victoria Quay are shown in Figure A.3 in the Technical Appendix, while the existing Sunday daily traffic flows are shown in Figure A.4.
- The corresponding peak hour turning movements at each of the surveyed intersections are shown in Figures A.5 to A.9.
- It can be seen in Figures A.3 and A.4 that a total of 5,770 vehicles per day and 7,480 vehicles per day currently enter and exit Victoria Quay at the Cliff Street railway crossings during a Friday and a Sunday, respectively.
- It can also be seen that Phillimore Street currently carries approximately 10,200 vehicles per day east of Pakenham Street during both a Friday and Sunday.

#### 2.1.3 Existing Pedestrian/Cyclist Facilities

- Figures A.10 and A.11 in the Technical Appendix show the existing pedestrian/cyclist facilities, including railway crossings, within the overall study area.
- Figure A.10 shows the existing Regional Recreational Path which runs parallel to the railway line past the Cliff Street railway crossings, together with the extension of this route east of Cliff Street as a Shared Path. However, it is important to note that the design of the existing path through the Cliff Street railway crossings makes it unclear who has priority, and which way pedestrians and/or cyclists should look for oncoming traffic.

- Figure A.10 also shows the uncontrolled pedestrian movements that currently occur at the Cliff Street railway crossings.
- Figure A.11 shows the continuation of the Shared Path along the Victoria Quay side of the railway line, together with the existing crossing that links the path across the railway line to Phillimore Street, midway between Pakenham Street and the Train Station.
- Figure A.11 also shows the existing Zebra crossing through the Bus set-down area and across Phillimore Street, immediately west of Market Street. It is clear from observations that the existing Zebra crossing and its close proximity to the Train Station regularly results in significant delays and long queues for vehicles travelling along Phillimore Street.
- This is exacerbated by the fact that buses have to cross this pedestrian route twice to enter the Bus Interchange, sometimes giving way to the same pedestrians.

#### 2.1.4 Victoria Quay Traffic Generation

- On the basis of surveys carried out by Uloth and Associates and additional traffic surveys previously carried out by Arup Transportation Planning, as discussed in Section A.4.1 in the Technical Appendix, it is estimated that the existing developments within Victoria Quay currently generate a total of 6,600 vehicle trips per day on a Friday and 8,100 vehicle trips per day on a Sunday, with 580 vehicle trips and 1,130 vehicle trips during the Friday and Sunday peak hours, respectively.

#### 2.1.5 Pedestrian Movements at Fremantle Train Station

- In order to identify the existing pedestrian movements at Fremantle Train Station, Uloth and Associates carried out peak period pedestrian counts during November 2004.
- The surveyed pedestrian movements are documented in Tables A.1 to A.3 in Section A.3.2 in the Technical Appendix, while a summary of the overall pedestrian movements is shown in Figure A.12.
- It can be seen in Table A.1 that the pedestrian movements to and from the City Centre represent 62 percent of the total trips by Bus or Train, while the number of transfers between Bus and Train represents just 21 percent of the total trips.

#### 2.1.6 Phillimore Street Zebra Crossing

- Uloth and Associates also surveyed the number of pedestrians crossing Phillimore Street at the Zebra crossing immediately west of Market Street, as shown in Table A.4 in the Technical Appendix. The results in Table A.4 and the subsequent discussion in Section A.3.3 show that the existing pedestrian and vehicle numbers at this crossing already satisfy the warrants for a signalised pedestrian crossing, as specified in Australian Standard AS 1742.10.
- It is therefore suggested that intersection traffic signals should be installed at the Phillimore Street - Market Street intersection, and an exclusive pedestrian phase should be incorporated to replace the existing Zebra crossing. The traffic signals should operate with as short a cycle time as possible, in order to minimise delays to pedestrians.
- The introduction of traffic signals also creates an opportunity to provide a signalised entry to the Bus Interchange at Fremantle Train Station, which also allows improvements to be made to the existing pedestrian facilities within the Station forecourt.

## 2.2 PROPOSED MODIFICATIONS TO VICTORIA QUAY

Planning for a new commercial precinct within Victoria Quay includes improved access to Gate 2, a proposed new access road at Pakenham Street, and a possible new pedestrian rail crossing just west of Fremantle Train Station.

### 2.2.1 Improved Access to Gate 2

- Gate 2 provides access to Victoria Quay off Beach Street, approximately 150 metres north of James Street. However, since Gate 2 also provides access to the operational part of the Port, safety and security concerns have resulted in it being closed at various times when ships are loading and unloading at various berths.
- Fremantle Ports has therefore re-constructed Victoria Quay Road on a new alignment that enables public access to/from Gate 2 to be maintained on a permanent basis.
- A new road link has also been constructed to the north of Gate 2, between Queen Victoria Street and Beach Street, approximately 200 metres south of Canning Highway. This new connection improves truck access to Gate 3, and it will also further encourage the increased use of Gate 2 by private vehicles accessing Victoria Quay.

### 2.2.2 Proposed Commercial Development

- The location of the proposed commercial precinct within Victoria Quay is shown in Figures A.1 and A.2 in Chapter A.1 in the Technical Appendix.
- The initial stage of the proposed development is expected to consist of approximately 13,000 square metres of retail floorspace and 4,000 square metres of offices. However, in the longer term the amount of office development is expected to increase to approximately 25,000 square metres.
- Table A.5 in Section A.4.2 in the Technical Appendix shows that the overall commercial development is estimated to generate a total of 7,650 vehicle trips during a Friday, with 825 vehicle trips during the Friday PM peak hour, and 3,900 vehicle trips during a Sunday, with 455 vehicle trips during the Sunday peak hour.
- It is assumed that the distribution of traffic to and from the proposed commercial development will coincide with the existing trip distribution percentages shown in Table A.6 in Section A.4.3 in the Technical Appendix. It is therefore estimated that approximately 39 percent of the total traffic generation of the new commercial development will travel to and from the north via Beach Street and Queen Victoria Street, while 18 percent will travel to and from the east via High Street and 43 percent will travel to and from the south via South Terrace and Marine Terrace.
- As also noted in Section A.4.3, it is anticipated that the amount of Victoria Quay traffic utilising Gate 2 could increase from the existing 40 percent to an estimated 80 percent of all traffic travelling to and from Beach Street and Queen Victoria Street north.

### 2.2.3 New Access Road at Pakenham Street

- As part of the development of the proposed commercial precinct, it is also proposed to extend Pakenham Street across the railway line and into Victoria Quay.
- The new railway crossing will provide improved accessibility for the existing activities on Victoria Quay, as well as the proposed commercial precinct, and will relieve some of the traffic pressure that would otherwise be placed on the existing Cliff Street access.

- However, it is understood from discussions with Public Transport Authority officers that this new rail crossing will only be possible as part of an overall plan that includes a rationalisation of the existing railway crossings at Cliff Street.
- Figures A.13 and A.14 in Chapter A.5 in the Technical Appendix show that the new Pakenham Street access is expected to carry 8,000 vehicles per day and 6,000 vehicles per day during a future Friday and Sunday, respectively.
- The corresponding peak hour traffic flows at critical intersections are also shown in Chapter A.5 while the intersection operational analyses are documented in Chapter A.6.

## 2.3 DRAFT PHILLIMORE STREET MASTER PLAN (AS PROPOSED BY CITY OF FREMANTLE)

From a traffic engineering perspective, the most significant changes proposed within the 2004 Draft Phillimore Street Master Plan were the extension of Cliff Street as a direct 2-way access to Victoria Quay, and the reconfiguration of the Bus Interchange at Fremantle Train Station to allow the development of a pedestrian-friendly forecourt.

### 2.3.1 Extension of Cliff Street into Victoria Quay

- City of Fremantle has already resolved to convert Cliff Street to a 2-way road, in order to complete the 'ring road' formed by Elder Street, Phillimore Street, Cliff Street, Marine Terrace, Norfolk Street and Parry Street, and has sought approval from Main Roads WA.
- As part of the Draft Phillimore Street Master Plan it was also proposed to extend Cliff Street as a direct 2-way access into Victoria Quay, in order to provide a clear, direct access to the various developments within Victoria Quay and to reinstate the historically significant alignment of Cliff Street as access to the waterfront.
- This proposal would allow the existing three railway crossings to be rationalised into a single crossing, together with well-defined pedestrian crossing facilities. However, because of the close proximity of the Fremantle Ports Administration Building to the Cliff Street railway crossing, the connection of Cliff Street to Fleet Street and Slip Street would require several turning movement restrictions, which would directly affect the available travel routes for vehicles accessing Victoria Quay via Gate 2 and the new Pakenham Street railway crossing.

### 2.3.2 Bus Access at Fremantle Train Station

- Another major objective of the Draft Phillimore Street Master Plan was to create an improved pedestrian environment within the forecourt area of Fremantle Railway Station. It was therefore proposed that the existing Bus Interchange facilities could be shifted towards the north, and a new signalised Bus Entry could be provided at the Phillimore Street - Market Street intersection.
- Other alternatives were also investigated, such as the provision of a roundabout with Bus access at Phillimore Street - Market Street, and/or traffic signals or a roundabout at the Phillimore Street - Queen Street intersection. However, because of the need to signalise the existing pedestrian crossing at Market Street (as discussed above in Section 2.1.6), and the close proximity of this intersection to the existing Bus Entry, the preferred solution was to provide traffic signals at Market Street with a full pedestrian phase and a one-way Bus Entry as the northern leg.
- As well as providing a controlled crossing location for pedestrians accessing the Train Station, the signalised intersection will also allow pedestrians to cross to the eastern side of Market Street, and therefore continue through a new pedestrian plaza on the southern side of Phillimore Street towards Queen Street, in order to access the eastern parts of the City Centre.

- The installation of traffic signals will also introduce gaps in the traffic flow along Phillimore Street. This, in turn, should improve the intersection operational characteristics of the unsignalised Phillimore Street - Queen Street intersection.
- Public Transport Authority officers agreed in-principle with the concept of providing signalised access to the Bus Interchange. However, the concept plan shown as part of the Draft Phillimore Street Master Plan was not acceptable, due to the significant relocation of Bus Stands toward the north – away from the main entry to the Train Station (which was proposed to be the only access to the Station following the introduction of the new ticketing system).

### 2.3.3 On-Street Cycle Lanes within Phillimore Street

- In addition to the above proposals, the Draft Phillimore Street Master Plan also included the provision of on-street cycle lanes within Phillimore Street between Cliff Street and Queen Street, as proposed within the Fremantle Bikeplan.
- The recommended plan therefore also showed the necessary modifications along Phillimore Street to incorporate the required cross-sections for on-street cycle lanes, together with the various other Master Plan proposals.

## 2.4 INTEGRATED PHILLIMORE STREET AND VICTORIA QUAY CONCEPT PLAN

- As noted above in Chapter 1, a multi-disciplined team of consultants was established to investigate the various issues raised in relation to the proposed commercial precinct within Victoria Quay and the integration of this proposal with the Draft Phillimore Street Master Plan.
- As part of this process, a significant number of alternative solutions were developed and thoroughly investigated, with a primary focus on the following areas of concern:
  - (i) Configuration of a 2-way access road to Victoria Quay at Phillimore Street - Cliff Street, with no turning movement restrictions to or from Fleet Street or the extension of Victoria Quay Road.
  - (ii) Configuration and alignment of the new intersection of Victoria Quay Road with the proposed Pakenham Street extension.
  - (iii) Configuration of the proposed signalised intersection at Phillimore Street - Market Street, including signalised access to the Bus Interchange and the retention of Bus Stands as close as possible to the Train Station entry.
- Objectives and criteria relating to the various areas of concern were identified by each of the primary stakeholders represented on the steering committee, and a detailed evaluation process was carried out to assess every option and sub-option against the decision criteria.
- No single option proved to be an ideal solution for every primary stakeholder. However, by each stakeholder representative agreeing to accept some level of compromise a preferred solution has now been developed.
- The preferred plan was the subject of a comprehensive Risk Management Workshop held at Fremantle Ports on Tuesday 22 March 2005, and subject to modifications addressing safety issues raised, it was generally agreed that the plan should now proceed to a consultation stage, followed by detailed design.
- The Integrated Phillimore Street and Victoria Quay Concept Plan is shown in Figures 2 and 3 in Chapter 3 Recommendations. The key components of the integrated plan are as follows:
  1. Modification and extension of Phillimore Street west of Cliff Street to provide a single 2-way access road to Victoria Quay.

2. Provision of a strong pedestrian route and pedestrian rail crossing along the historical alignment of Cliff Street, from Phillimore Street into Victoria Quay.
  3. Extension of Pakenham Street across the railway as a new road access to Victoria Quay, with traffic signals at Phillimore Street and a Stop sign controlled T-junction at the new Victoria Quay Road, giving right-of-way to vehicles exiting the railway crossing.
  4. Possible introduction of a new pedestrian rail crossing just west of Fremantle Train Station (still being negotiated with PTA).
  5. Introduction of traffic signals at a new 4-leg intersection at Phillimore Street - Market Street, with a signalised Entry into the Bus Interchange.
  6. Upgrading of Phillimore Street between Cliff Street and Queen Street as previously indicated in the Draft Phillimore Street Master Plan, including provision of on-street cycle lanes.
- Each of these key components of the overall plan are discussed in the following sections, while the specific recommendations are documented in Chapter 3.

#### 2.4.1 Phillimore Street Extension

- As noted above in Section 2.3.1, the previously proposed extension of Cliff Street as a 2-way access to Victoria Quay resulted in a difficult intersection configuration at Fleet Street and the extension of Victoria Quay Road, which could only operate safely if right turn movements in and out of Victoria Quay Road were prohibited.
- This, in turn, created problems at the proposed intersection of Victoria Quay Road with Pakenham Street extension, as it meant that a 4-way intersection would be required in order to allow vehicles entering Victoria Quay via Pakenham Street or Gate 2 to access the various developments further west.
- Following the development and analysis of many alternative road and intersection configurations, it was agreed that the only way to achieve a single 2-way access road to Victoria Quay at the western end was to extend and modify Phillimore Street west of Cliff Street, and to construct a modified 4-way intersection at Phillimore Street - Fleet Street - Slip Street - Victoria Quay Road.
- However, in order to also reinstate the historically significant alignment of Cliff Street as the access to the waterfront, it is also proposed to create a wide pedestrianised extension of Cliff Street from Phillimore Street, across the railway line, and into Victoria Quay, as discussed below in Section 2.4.3.
- It is important to note that in order to avoid any queuing of vehicles across the Phillimore Street rail crossing, vehicles entering Victoria Quay must be given right of way at the intersection with Fleet Street, Slip Street and the extension of Victoria Quay Road. Stop sign control is therefore proposed within each of these 3 approach legs at the new 4-way intersection, as indicated in Figure 2 in Chapter 3 Recommendations.
- It is also proposed to modify access to Mrs Trivett Place and City of Fremantle Car Park No. 41, and to also retain the existing left-turn-only exit from Slip Street.
- Vehicles exiting Slip Street will therefore have to travel east along the new Victoria Quay Road, in order to exit Victoria Quay via the new Pakenham Street rail crossing (which is discussed in Section 2.4.5).
- Vehicles accessing Mrs Trivett Place and the City of Fremantle car park will all have to enter via a left turn off Phillimore Street extension. They will then have to turn left when exiting, and will therefore also have to travel via Victoria Quay Road in order to exit Victoria Quay at Pakenham Street.

- It is also important to note that the modifications to Mrs Trivett Place and the City of Fremantle car park will result in the loss of a number of parking spaces within the car park. However, this solution is the only way to achieve the required level of safety at the Phillimore Street rail crossing, while also maintaining the historically significant limestone wall and embankment providing access to Mrs Trivett Place.

#### 2.4.2 Phillimore Street - Cliff Street Junction, and Access to Adjacent Properties

- Figure 2 in Chapter 3 Recommendations also shows the recommended layout of the Phillimore Street - Cliff Street junction, taking into account the City of Fremantle plans to convert Cliff Street to 2-way, together with the required access arrangements to the adjacent properties.
- In order to minimise the chance of queuing extending west from Cliff Street across the Phillimore Street rail crossing, it is proposed to provide a right turn lane plus an adjacent through lane for eastbound traffic, as shown in Figure 2.
- It is also necessary to install a raised median within Phillimore Street between Cliff Street and the rail crossing, in order to prevent right turns to and from the access driveway serving properties on the south west corner of the Phillimore Street - Cliff Street junction.
- Vehicles accessing these properties will therefore be able to enter via a left-turn off Phillimore Street, as under the existing situation. However, when exiting, they will have to turn left across the railway and into Victoria Quay, and then travel along Victoria Quay Road to the new Pakenham Street crossing.
- Table A.11 in Section A.6.3 in the Technical Appendix shows that the proposed Phillimore Street - Cliff Street junction will operate at high Levels of Service A and B during both the future Friday and future Sunday peak hours, indicating good operating conditions with short traffic delays. Table A.11 also shows that the 95th percentile queue length within Cliff Street will only reach approximately 25 metres.
- Figure 2 also shows that access to properties on the northern side of Phillimore Street, east of Cliff Street, will be provided via a left-in left-out driveway off Phillimore Street, just east of Cliff Street. This means that vehicles entering these developments will have to turn right from Cliff Street into Phillimore Street, in order to turn left into the proposed access driveway. Alternatively, it will also be possible to travel via Victoria Quay Road, turn left across the railway line into Phillimore Street extension, and then turn left into the proposed driveway. Exiting vehicles will all have to turn left into Phillimore Street eastbound, as they do under the existing situation.

#### 2.4.3 Cliff Street Pedestrian Route and Pedestrian Rail Crossing

- Although it is not possible to extend Cliff Street as a 2-way access to Victoria Quay, as was proposed under the Draft Phillimore Street Master Plan, it is now proposed to construct a strong pedestrian route and railway crossing along the historical Cliff Street alignment.
- The proposed pedestrian route is indicated in the draft engineering design shown in Figure 2 in Chapter 3 Recommendations. However, more information regarding pavement treatments and urban design is provided within the overall concept plan prepared by Donaldson and Warn.

#### 2.4.4 Extension of Pakenham Street into Victoria Quay

- The proposed extension of Pakenham Street as a new access to Victoria Quay results in the creation of a 4-way signalised intersection at Phillimore Street, which must be linked to the operation of the new railway crossing.

- The recommended layout of the signalised Phillimore Street - Pakenham Street intersection is shown in Figures 2 and 3 in Chapter 3 Recommendations. The traffic signal phasing is shown in Figure 6, and the intersection operational characteristics are shown in Table A.9 in the Technical Appendix.
- It can be seen in Table A.9 that the signalised intersection will operate at an overall Levels of Service C and D during the future Friday and Sunday peak hours, respectively. However, it is important to note that Phillimore Street will require 2 approach lanes in each direction.
- The recommended plan shows the road widening required to accommodate these 2 approach lanes within Phillimore Street. However, it is important to note that the plan assumes that traffic signals will be mounted on overhead mast arms, and that central islands within Phillimore Street are therefore not required.
- This assumed use of traffic signal mast arms will have to be confirmed as part of the detailed design stage, and it should be acknowledged that if they are not utilised then additional widening of Phillimore Street will be required, in order to install standard traffic signal poles within central islands.

#### 2.4.5 Pakenham Street Extension and Victoria Quay Road

- As noted above in Section 2.2.3, the proposed new railway crossing at Pakenham Street extension can only be constructed if it is part of an overall project that includes the rationalisation and improvement of the existing railway crossings at Cliff Street.
- However, in order to provide good access to all areas of Victoria Quay from each of the proposed access roads, the initial proposals within the Draft Phillimore Street Master Plan would have required the construction of a 4-way signalised intersection at Victoria Quay Road - Pakenham Street extension, which Main Roads WA officers would not support due to the difficulties of linking this to the other 4-way signalised intersection at Phillimore Street.
- As discussed above in Section 2.4.1, the now proposed extension of Phillimore Street as a 2-way access to Victoria Quay does not require any turning movement restrictions at Fleet Street or Victoria Quay Road. The proposed plan therefore provides good access to all areas of Victoria Quay from each of the proposed access roads, without the need for a 4-way intersection at Victoria Quay Road - Pakenham Street extension.
- This means that traffic signals are not required. Instead, it is proposed to construct a Stop sign controlled T-junction that gives right-of-way to vehicles entering Victoria Quay, so that no queuing will occur over the railway crossing.
- The recommended concept plan for the Victoria Quay Road - Pakenham Street junction is shown in Figures 2 and 3 in Chapter 3 Recommendations, while the corresponding intersection operational characteristics are shown in Table A.10 in the Technical Appendix.
- It can be seen in Table A.10 that the unsignalised junction will operate at acceptable Levels of Service B and C during the future Friday and Sunday peak hours, indicating good and satisfactory operating conditions with average traffic delays.
- It is also important to note in Figure 2 that the extension of Victoria Quay Road west of Pakenham Street is proposed to occur within residual railway reserve land, to the south of the existing E Shed parking areas, in order to remove the conflict that would otherwise occur between vehicles accessing the various parking spaces and vehicles travelling along Victoria Quay Road.

#### 2.4.6 Proposed Pedestrian Rail Crossing just west of Fremantle Train Station

- As part of the development of the commercial precinct within Victoria Quay it is also proposed to provide a new pedestrian rail crossing between Victoria Quay Road and Phillimore Street, as close as possible to Fremantle Train Station.
- This pedestrian crossing is considered to be a vital link between the proposed commercial development, the Train Station, and Fremantle City Centre. It is therefore important that it should be located in front of the access to the proposed development, and as close as possible to the Train Station entry and the proposed signalised intersection at Phillimore Street - Market Street.
- The pedestrian crossing location shown in Figure 3 in Chapter 3 Recommendations is considered (by the likely developers of the commercial precinct) to be a compromise, since it is located slightly west of the pedestrian entry (when the desire line of travel is to and from the east). However, it is acknowledged that this location is as far east as possible, due to heritage issues in the area closer to the Train Station.
- The currently proposed rail crossing and the corresponding pedestrian/cyclist facilities within the surrounding areas are shown in Figure 9 in Chapter 3 Recommendations.
- It can be seen in Figure 9 that the proposed crossing is well placed to accommodate pedestrian movements to and from the Train Station and the City Centre. However, it is also important to note that a new pedestrian crossing in this location raises some rail safety concerns that are still being discussed separately between Fremantle Ports and the Public Transport Authority.

#### 2.4.7 Traffic Signals at Phillimore Street - Market Street

- As noted above in Section 2.1.6, it is recommended to install traffic signals at Phillimore Street - Market Street, in order to provide a signalised pedestrian crossing facility in place of the existing zebra crossing.
- It is therefore recommended to also combine the Bus Entry to Fremantle Train Station as part of the signalised intersection, in order to include all pedestrian and vehicle conflicts within one controlled intersection.
- The Draft Phillimore Street Master Plan therefore suggested that the Bus Entry should be relocated opposite the existing Market Street junction, and that the Bus Interchange facilities could be shifted further north. However, as discussed in Section 2.3.2, the concept plan shown in the Draft Master Plan was not considered acceptable by Public Transport Authority officers, because it would result in significantly increased transfer times between Bus and Train, and would therefore reduce the effectiveness of this important Bus/Rail interchange.
- It was therefore necessary to investigate possible alternative solutions, which would allow the introduction of a signalised access with improved pedestrian facilities, but would maintain Bus Stands as close as possible to the Station entry.
- One such alternative included a slight realignment of Market Street into Pioneer Reserve, and the construction of an off-set 4-way intersection with the Bus Entry. However, this raised several safety concerns regarding traffic movements through the resultant intersection. It also raised heritage issues regarding changes to Pioneer Reserve.
- Further investigation and analysis relating to the new public transport ticketing system has now resulted in a decision to operate 2 pedestrian access points to and from Fremantle Station during peak periods. This means that the previous issue relating to the relocation of Bus Stands is not as much of a concern as it was initially.

- Public Transport Authority officers have therefore now agreed to the construction of a 4-way signalised intersection at Market Street, and have commissioned a separate study to resolve the internal layout of the Bus Interchange.
- This may also require a relocation toward the north of the existing signalised exit from the Bus Interchange.
- Table A.7 in the Technical Appendix shows that the proposed signalised intersection at Phillimore Street - Market Street and the Bus Entry will operate at an overall Level of Service C during both the future Friday and Sunday peak hours, indicating satisfactory operating conditions with average traffic delays.
- However, it is important to note that 2 approach lanes will be required in both directions along Phillimore Street, and that the required road widening shown in the recommended plan assumes that traffic signals can be installed on overhead mast arms, instead of on standard traffic signal poles within central median islands.

#### 2.4.8 Upgrading of Phillimore Street between Cliff Street and Queen Street

- In conjunction with the various modifications discussed above, it is also proposed to upgrade Phillimore Street between Cliff Street and Queen Street, as proposed within the Draft Phillimore Street Master Plan.
- In addition to the various intersection modifications, the proposals consist of a formalisation of on-street parking areas, the introduction of kerb extensions to reduce crossing distances for pedestrians and to provide a narrower street environment, and the inclusion of on-street cycle lanes as proposed within the Fremantle Bikeplan.
- The modifications shown in Figures 2 and 3 in Chapter 3 Recommendations are consistent with the plans developed for the Draft Phillimore Street Master Plan. Detailed layouts for typical situations along Phillimore Street are shown in Figures 4 and 5, while the rationale behind the recommendations is provided in Chapter A.7 in the Technical Appendix.
- It is important to note that at peak times it will be necessary to provide 2 clear traffic lanes in each direction along Phillimore Street between Pakenham Street and the existing signalised Bus Exit, due to queuing at the various traffic signals and insufficient separation between signals for merging and diverging.
- It was previously suggested that the kerbside lanes between Pakenham Street and Market Street could be utilised as off-peak parking lanes with peak period clearway restrictions. However, the introduction of on-street cycle lanes makes this difficult to achieve.
- It is therefore recommended to remove the on-street parking within this section of Phillimore Street, and to provide 2 clear traffic lanes in each direction at all times, in accordance with the recommended cross-section shown in Figure 5.

### 3. RECOMMENDATIONS

The recommendations regarding the Integrated Plan for Phillimore Street and Access to Victoria Quay are based on the Study Findings and Conclusions presented in Chapter 2, and the additional information provided within the Technical Appendix.

The Integrated Phillimore Street and Victoria Quay Concept Plan is shown in Figures 2 and 3, while detailed layouts for typical situations are shown in Figures 4 and 5.

Figures 6 and 7 show the recommended traffic signal phasing at Pakenham Street and Market Street, respectively, while Figures 8 and 9 show the proposed pedestrian/cyclist facilities.

#### 3.1 PHILLIMORE STREET EXTENSION

- It is recommended to extend Phillimore Street as a 2-way access into Victoria Quay, rationalising the three existing railway crossings into a single railway crossing, as shown in Figure 2.
- It is therefore recommended to modify the layout and control of the resulting Phillimore Street intersection with Fleet Street, Slip Street and Victoria Quay Road, as also shown in Figure 2.
- It is recommended to modify the access to Mrs Trivett Place and the adjacent Fremantle City Centre Car Park No.41, as shown in Figure 2, with only left-in left-out movements permitted.
- It is also recommended to provide a raised median island between Cliff Street and the railway crossing in order to prevent right turn movements in and out of the access driveway on the southern side.

#### 3.2 CLIFF STREET

- It is recommended to convert Cliff Street to a 2-way road, as currently proposed by City of Fremantle, and to construct an unsignalised junction at the resulting Phillimore Street - Cliff Street intersection.
- It is recommended to provide single approach lanes in Phillimore Street east and Cliff Street south. However, 2 approach lanes will be required in Phillimore Street west, as shown in Figure 2.
- In order to maintain vehicular access to the rear parking areas serving the existing lots along the northern side of Phillimore Street, east of Cliff Street, it is recommended to construct an access driveway just east of Cliff Street, with left-in left-out movements only, as shown in Figure 2.
- The recommended pedestrian route and rail crossing along the historical alignment at Cliff Street is also indicated in Figure 2. However, more information is provided within the plans prepared by Donaldson and Warn.

#### 3.3 PAKENHAM STREET EXTENSION AND VICTORIA QUAY ROAD

- It is recommended to extend Pakenham Street north of Phillimore Street and across the railway line, as a new access road for Victoria Quay, as shown in Figures 2 and 3.
- It is recommended to provide traffic signals at the Phillimore Street - Pakenham Street intersection, and to link these traffic signals with the new railway crossing.
- The recommended traffic signal phasing for the signalised Phillimore Street - Pakenham Street intersection is shown in Figure 6.

- It is recommended to construct an unsignalised 3-way junction at Pakenham Street extension and Victoria Quay Road, as shown in Figures 2 and 3, giving right-of-way for all vehicles travelling into Victoria Quay across the railway crossing.

#### 3.4 MARKET STREET AND FREMANTLE TRAIN STATION

- It is recommended to remove the existing Zebra crossing in Phillimore Street west of Market Street, and to replace it with traffic signals at the Phillimore Street - Market Street intersection, incorporating a full pedestrian phase.
- It is also recommended to close the existing Bus Entry to Fremantle Station and to replace it with a new signalised 1-way Bus Entry as a northern leg to the Phillimore Street - Market Street signalised intersection.
- The recommended concept plan for Market Street and Fremantle Station is shown in Figure 3, while the recommended traffic signal phasing for the Phillimore Street - Market Street - Bus Entry intersection is shown in Figure 7.
- Modifications to the internal layout of the Bus Interchange are being developed separately by Public Transport Authority. This may include relocation of the traffic signals at the existing Bus Exit further north.

#### 3.5 PEDESTRIAN/CYCLIST FACILITIES

- In conjunction with the rationalisation of the existing rail crossings at Phillimore Street - Cliff Street, and the proposed new crossing at Pakenham Street, it is recommended to provide 5 pedestrian rail crossings within the overall study area.
- The proposed rail crossings are indicated in Figures 8 and 9, together with the pedestrian/cyclist facilities within the overall study area.
- It is recommended to provide a standard pedestrian rail crossing on the south side of Phillimore Street, adjacent to the access to Mrs Trivett Place, in order to cater for pedestrians travelling between the City of Fremantle car park and the various developments along the southern side of Phillimore Street, and also to provide a connection to the Regional Recreational Path.
- A major pedestrian crossing is recommended to accommodate the proposed pedestrian route along the historical alignment of Cliff Street. A wide non-standard crossing is proposed, in order to maintain the appearance of a spacious and well-designed pedestrian environment.
- It is recommended to provide standard pedestrian rail crossings on each side of Pakenham Street extension, as shown in Figures 8 and 9, in order to prevent pedestrians from utilising the road pavement to cross the railway line.
- It is also recommended to provide a major pedestrian rail crossing as close as possible to Fremantle Station, as indicated in Figure 9, in order to provide a strong pedestrian link between the proposed Victoria Quay commercial precinct, Fremantle Train Station, and Fremantle City Centre.

#### 3.6 ON-STREET CYCLE LANES WITHIN PHILLIMORE STREET

- As already proposed in the Fremantle Bikeplan, it is recommended to provide on-street cycle lanes within Phillimore Street between Cliff Street and Queen Street.

- It is recommended that the minimum width for exclusive cycle lanes along Phillimore Street should be 1.2 metres. However, cycle lane widths of 1.5 metres should be provided where possible, as discussed in Section A.7.1 in the Technical Appendix.
- It is also recommended that all shared cycle/parking lanes along Phillimore Street should provide a minimum width of 3.7 metres, as discussed in Section A.7.2 in the Technical Appendix.
- The modifications required to incorporate on-street cycle lanes as part of the Integrated Concept Plan are shown in Figures 2 and 3. Detailed layouts of Phillimore Street under various typical situations are shown in Figures 4 and 5.