Waterfront Station
Transportation Hub
Station Assessment

Final Report
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Prepared for:
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1 Introduction & Overview

Introduction

1.1 The team of Steer Davies Gleave, Kasian Architecture and Glatting Jackson was retained by the South Coast British Columbia Transportation Authority (TransLink) to assess Waterfront Station in preparation for developing a Station Concept Plan.

1.2 This final report provides a summary of the process undertaken to assess the station and includes an overview of the technical assessments undertaken of the existing station facilities and layout and the evaluation process needed to review emerging options.

Station Context and Description

1.3 Over the past decade, the downtown Vancouver population has grown from 80,000 to 115,000 (44% increase) and employment has grown from 132,000 to 152,000 (15% increase). During that same time, annual transit ridership has increased in Metro Vancouver from 223 million to over 280 million passengers and the sustainable modes mode share (transit, pedestrian and bicycle) in the central business district has risen from 33% to 40% - the highest in the region.

1.4 Waterfront Station, at 601 West Cordova Street, was opened in 1914 as the Pacific terminus for the Canadian Pacific Railway. The station sits on the south shore of the Burrard Inlet and is a gateway to Vancouver’s Gastown district. The station building is classed by the City of Vancouver as heritage ‘A’, meaning it is a building of ‘Primary Significance’ that ‘represents the best examples of a style or type of building’.

Transit Services

1.5 In 1977, the SeaBus ferry commenced service to Waterfront Station while services from the SkyTrain Automated Light Rail Transit (ALRT) system began in 1985. In 1995, the West Coast Express commuter rail service was also added to the station and then in 2001, the Millennium Line SkyTrain services were extended to serve Waterfront. In August 2009, the Canada Line, connecting Vancouver to Richmond and the Vancouver International Airport (YVR), also began operating from the station.

1.6 Every day, over 57,000 transit passengers pass through Waterfront Station using combinations of SkyTrain, SeaBus, West Coast Express and local and regional bus services that serve the station. Non-TransLink transportation services, such as Helijet, float plane services and the Port of Vancouver cruise ship terminal are also located nearby. The station is a heavily used facility, particularly in peak periods when service arrival times overlap, and the projected ridership growth will only serve to exacerbate station congestion in the future.
Report Purpose & Structure

1.7 The nature of the developments at the station over long periods of time has meant that alterations and additional facilities have been added in a ‘piecemeal’ fashion with variations in architecture style, signage and branding. This study has examined this variation throughout the station with the concept plans looking to develop a more cohesive and ‘branded’ station environment.

1.8 As part of a parallel process, the City of Vancouver is undertaking a wider planning study examining the role and function of the ‘Central Waterfront Hub’ area including Waterfront Station in order to explore options for improving and developing the lands around the station. The main objectives of the Central Waterfront Hub Study are to:

- Explore the potential for creating a new transportation interchange which better integrates the many transit modes which converge in this area - SkyTrain, Canada Line, West Coast Express, SeaBus, Helijet and numerous bus lines.

- Examine opportunities for the introduction of high density, mixed use development integrated with the transportation hub in order to physically reconnect the city to the waterfront and expand downtown ‘job space’ capacity in an area of excellent transit accessibility. This would include improved linkages to and between the transit function and the new development, the creation of plazas and open space, and the strengthening of the station area as a destination.

1.9 TransLink, as part of that planning process, is undertaking this Waterfront Station Transportation Hub Conceptual Plan to ensure that the transportation elements and requirements for the long-term needs of the station are understood and that these functional requirements are incorporated into the City’s planning efforts. In addition to this long-term planning, the study addresses some existing issues at Waterfront Station that can be addressed through shorter-term solutions.

1.10 Following this introduction, this report is structured as follows:

- Chapter Two details the Study Vision, Aims and Objectives;
- Chapter Three summarizes the existing conditions at Waterfront Station including details of pedestrian and passenger assessments carried out at the station;
- Chapter Four provides details of future transport proposals and considerations directly affecting the station;
- Chapter Five summarizes the assessments carried out on the existing station layout based on a series of future service provision scenarios;
- Chapter Six outlines the emerging options for improvements and developments at the station, both as a long-term vision and shorter-term immediate needs; and
- Chapter Seven provides a conclusion and summary.

1.11 In addition a number of appendices are included that provide the detail of the technical work undertaken.
2 Study Vision, Aims and Objectives

Introduction

2.1 As a key starting point to the project, the Steer Davies Gleave team developed a draft study Vision along with a set of Aims and Objectives. These were designed to provide the overall project with a clear focus and to establish the key success criteria for both TransLink and its stakeholders.

Vision, Aims & Objectives

2.2 The draft Vision and Aims and Objectives were first presented at a project workshop that included representatives from:

- TransLink
- Coast Mountain Bus Company / SeaBus
- BC Rapid Transit Corporation / SkyTrain
- City of Vancouver
- Steer Davies Gleave & Kasian Architecture (consultants)

2.3 The workshop provided an opportunity for the participants to discuss and agree on the project vision and objectives in an open forum and provided the consulting team with an efficient way of achieving consensus. A copy of these notes and the presentation are included in Appendix A.

2.4 For reference the adopted Vision is:

“To develop a concept plan that positions Waterfront Station as a world-class transportation facility that is highly functional, is accessible to a variety of modes and is a destination in itself.”

2.5 With the following supporting project Aims and Objectives:

- Provide sufficient capacity to cater for future projected transit demand;
- Develop a design that meets transportation functional requirements;
- Improve access to the station from the surrounding area; and
- Provide for non-transportation facilities in station design.
Issues and Opportunities

The first workshop also provided an opportunity to discuss and agree upon the key project issues and opportunities including those specific to the station as well as those related to the wider station area and neighbourhood. A comprehensive list of these issues and challenges is also included in the workshop summary materials in Appendix A. However, for reference, the key issues and challenges facing the station are outlined below:

**Issues**

- Future growth in ridership and additional transit services;
- Any proposed design needs to compliment the existing station context (as a heritage building next to Vancouver’s waterfront);
- Wayfinding and transportation information is poor and inconsistent;
- Underutilized retail and commercial opportunities (reducing passenger convenience and not maximizing potential rental revenue); and
- Need for provision of cyclist facilities.

**Opportunities**

- Development of a world class interchange facility;
- Retail and commercial space opportunities;
- Integration of multi-modal transit, including bus services;
- Design for an efficient and integrated pedestrian environment with connections to downtown and local attractions; and
- Heritage building to be enhanced.
3 Existing Station Conditions

Introduction

3.1 In order to gain a better understanding of the existing station area and context, two assessments on the existing station layout and conditions were completed. These were:

- A Pedestrian Environment Review System (PERS) audit of all facilities to provide a qualitative measure of the conditions for pedestrians; and a
- Pedestrian microsimulation modelling of the station to model the flow of passengers through and around the station, including the interchange between modes.

3.2 A summary of the findings of these assessments is provided below with the full details provided in Appendices B to F.

Pedestrian Environment Review System (PERS) Audit

3.3 In order to fully understand the existing conditions, an audit of the existing pedestrian and passenger facilities was completed. This included audits of the five main areas of the station:

- Main concourse (the main heritage building);
- Main interchange area (the area constructed ‘off the back’ of the main building);
- SkyTrain platforms;
- SeaBus terminal; and
- West Coast Express platforms.

3.4 The main findings of the audit are summarized below with full details provided in Appendix B.

Main Concourse and Interchange Area

3.5 The main concourse provides a range of good quality pedestrian facilities including seating, signage and automatic doors for mobility impaired users; however, there is limited use of this very large and impressive space with significant untapped retail potential.

3.6 The audit also noted that information provision in the main concourse area is very poor/non-existent with very little detail provided regarding the transportation services and that there is no real-time information provided. The audit also noted that the location of the ticket machines and information points appears inappropriate as they restrict the passenger flows between the main concourse and the interchange area;
3.7 It was noted that while the main interchange is well lit with natural light, it provides insufficient pedestrian facilities, with the very little signage, maps or wayfinding information provided. The audit noted that the area(s) that appear suitable for this type of information/pedestrian facility are currently dominated by newspapers and magazine stands.

*Rail Platforms and SeaBus Terminal*

3.8 In addition to auditing the main concourse and interchange areas, a review was also undertaken of the rail platforms (SkyTrain and West Coast Express) and the SeaBus terminal facilities.

3.9 The audit noted that the SkyTrain platforms generally provide good quality passenger information with maps, security information and signage, but while escalators are provided, step-free access to the concourse area is not.

3.10 The West Coast Express platforms were noted as providing high quality passenger facilities including seating, a refreshment kiosk, CCTV and ramps along the platform to aid mobility-impaired passengers. The audit did note, however, that there appears to be potential to provide more facilities including greater weather protection, additional wayfinding information to other services in the station and additional service/timetable information.

3.11 The audit commented that the raised walkway access to the SeaBus terminal provides only very limited seating for passengers and that the SeaBus terminal waiting area provides a range of facilities including seating, drinking fountains, maps, bins, as well as real-time information about SeaBus services. While the addition of seating along the walkway would slightly reduce the total capacity of the walkway, due to the nature of SeaBus arrivals and departures, this is not an area that experiences congestion and it is not viewed as a potential issue.

3.12 In summary, the audit found that while the station provides relatively good pedestrian facilities, there is limited continuity in style and branding. The audit also found that there are areas of the station where the location of pedestrian facilities (e.g. ticket vending machines) conflicts with the through-flow of passengers.
PERS Assessment

3.13 Further to the pedestrian audit, an assessment has been carried out to measure the quality of the pedestrian environment. This is based on PERS methodology developed by the Transport Research Laboratory (TRL) in the UK, a tool that measures the quality of the pedestrian environment through subjective review, and provides an objective measure of pedestrian quality. The auditing process allows for an overall review of pedestrian accessibility to and from the site. PERS is produced by the Transport Research Laboratory (TRL) in the United Kingdom and is described as:

“a systematic [computer programme] process designed to assess the quality of the pedestrian environment within a framework that promotes objectivity”

3.14 The system is recognized by Transport for London as an appropriate tool to fully evaluate the pedestrian environment. It offers a useful method of assessing the existing Waterfront Station environment which will provide a useful baseline upon which to develop concepts for the new Transportation Hub.

3.15 The basis for the evaluation begins with an assessment against the ‘5Cs’ of well designed interchanges and walkable places. These are:

- **Connected** - routes should link origins and destinations;
- **Convenient** - routes should facilitate the desired journey without undue deviation or difficulty;
- **Conspicuous** - route design should allow the user to be seen by, and to see, other pedestrians and vehicles to promote personal security and road safety;
- **Coherence** - routes should be continuous; and
- **Convivial** - routes should be pleasant to use.

3.16 PERS takes into consideration the 5Cs and works on a simple scoring method that breaks down various auditing criteria based on the pedestrian environment. Each characteristic is scored on a range from -3 to +3, where +3 is the highest score and -3 the lowest.

<table>
<thead>
<tr>
<th>VERY POOR</th>
<th>POOR</th>
<th>AVERAGE</th>
<th>GOOD</th>
<th>VERY GOOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3</td>
<td>-2</td>
<td>-1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>-2</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

3.17 Each characteristic is given a score and then an overall score is calculated using the overall station or area total. This can either be expressed as a total number or with a ‘Red-Amber-Green’ rating.

3.18 As part of the PERS assessments two assessments were completed, one which covered the interchange spaces within the station and the other examining the transit waiting areas. The full details of the PERS Assessment are provided in Appendix B and a summary of the main findings are presented below.
**Interchange Spaces**

3.19 The interchange spaces assessed included: the main station concourse, the SkyTrain/SeaBus/West Coast Express interchange area, SkyTrain access points and ticket hall, SeaBus access ramp and the West Coast Express ticket hall.

3.20 The results of the assessment are shown in Table 3.1 followed by a summary explanation of the findings. Refer to paragraph 3.16-3.17 for more details about the ‘Red, Amber, Green’ rating system.

**TABLE 3.1 SUMMARY OF PERS ASSESSMENT - INTERCHANGE SPACES**

<table>
<thead>
<tr>
<th>Interchange Space</th>
<th>Moving between Modes</th>
<th>Identifying where to go</th>
<th>Personal safety</th>
<th>Feeling comfortable</th>
<th>Quality of the Environment</th>
<th>Maintenance</th>
<th>‘Red, Amber, Green’ Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Concourse</td>
<td>2</td>
<td>-1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>Green</td>
</tr>
<tr>
<td>Main Interchange Area</td>
<td>1</td>
<td>-1</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>1</td>
<td>Amber</td>
</tr>
<tr>
<td>SkyTrain Access</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Green</td>
</tr>
<tr>
<td>West Coast Express Access</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>Green</td>
</tr>
<tr>
<td>SeaBus Access</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>-1</td>
<td>1</td>
<td>Amber</td>
</tr>
</tbody>
</table>

3.21 The five interchange spaces assessed had a variation in scores with the West Coast Express ticket hall scoring highest and the main interchange area scoring lowest.

3.22 The main interchange area score reflects its poor signage, lack of information and lack of personnel to provide assistance. The space is currently purely transitory with the only travel information provided relating to SeaBus departures.

3.23 The Main Concourse area scores relatively better than the interchange area due to its higher scores for ‘Moving between Modes’, ‘Personal Safety’ and ‘Feeling Comfortable’. However, it does not score well on ‘Identifying where to go’ due to poor signage and travel information.
Transit Waiting Areas

Three transit waiting areas were assessed including the West Coast Express platforms, the SkyTrain platforms and the SeaBus waiting area. The results of the assessment are shown in Table 3.2 followed by a summary explanation of the findings.

TABLE 3.2 SUMMARY OF PERS ASSESSMENT - TRANSIT WAITING AREAS

<table>
<thead>
<tr>
<th>Transit Waiting Area</th>
<th>Information to the waiting area</th>
<th>Infrastructure to the waiting area</th>
<th>Boarding public transit</th>
<th>Information at the waiting area</th>
<th>Safety Perceptions</th>
<th>Security Measures</th>
<th>Lighting</th>
<th>Quality of the Environment</th>
<th>Maintenance and Cleanliness</th>
<th>Waiting Area Comfort</th>
<th>‘Red Amber Green’ Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCE Platforms</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>2 (Green)</td>
</tr>
<tr>
<td>SkyTrain Platforms</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>-1</td>
<td>2</td>
<td>2</td>
<td>2 (Green)</td>
</tr>
<tr>
<td>SeaBus Waiting Area</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>-1</td>
<td>2</td>
<td>1</td>
<td>1 (Green)</td>
</tr>
</tbody>
</table>

Again, the West Coast Express facilities scored highest, reflecting the fact that they are the newest facilities within the station. The SeaBus waiting area scores lowest, in particular for Quality of Environment and Information in the waiting area. Although the waiting area provides a range of facilities, much of the waiting area is dark, with a dated décor.

PERS Assessment - Summary Findings

Overall, the majority of areas within the station scored average or above average with only the Main Interchange area and the SeaBus waiting area scoring an ‘amber’ overall.

The West Coast Express platforms score higher than other modes in terms of the quality of the environment reflecting the more modern facilities and the more obvious branding. The information provided within the West Coast Express area is also better than for other parts of the station.

A key element in need of improvement across the station is signage and wayfinding information which was observed to have a lack of continuity and consistency in the physical signage as well as signage branding. The overall quality of the environment scores relatively lower than other parameters. This reflects the age of some of the facilities and the nature of them being constructed at different periods, creating a lack of continuity within the station as a whole.
Pedestrian Microsimulation Modelling

3.29 While the PERS audit provided a useful and defined process for assessing the pedestrian ‘experience’ in the station, further work was undertaken to better understand the physical constraints of the existing layout and facilities.

3.30 To support this assessment, a pedestrian microsimulation model was developed using Simul8. The model was able to examine existing pedestrian movements through the station and then predict how these would change over time as ridership and station throughput increased. The outputs of the model provided a valuable input to the design team as it helped to quantitatively identify the pinch points (or problems) with the existing layout and develop options to resolve these issues.

3.31 The baseline model (i.e. with the current layout and existing services) identified a number of areas with existing congestion issues:

- During the morning peak, passengers may stand in line for over a minute on the western escalators from the West Coast Express platforms following the arrival of a train;
- At the busiest time during the morning peak, passengers may spend over a minute waiting to proceed from the SeaBus arrivals platform to the ramp to the SeaBus escalators;
- Small queues form around the doors to the main concourse in the morning as large numbers arrive from the West Coast Express coinciding with arrivals from the SeaBus and SkyTrain;
- During the evening peak period, the largest queues build up from the SkyTrain arrivals platform to the escalators up to the main terminal, exacerbated by the location of the ancillary room on the SkyTrain platform and the restrictive nature of the fire doors; and
- Passengers may wait over two minutes to buy tickets at the West Coast Express ticket machines, due to the large numbers arriving at once for a West Coast Express departure in the evening.

3.32 In addition, the model was used to help TransLink understand the shorter term requirements for vertical circulation at the SeaBus terminal given the upcoming need for the significant upgrade and/or maintenance required to the existing escalators. This maintenance program will require the removal of one escalator from service and the model was adapted to test the impacts on passenger flow and movement through the terminal. The results of the testing demonstrated that:

- During the morning peak period, the maximum queue size increases from 56 people with both up escalators from the SeaBus terminal to 194 people with only one up escalator in operation; and
- The maximum queuing time has increased significantly from 19 seconds to 2 minutes and 9 seconds.
3.33 The full details of the model approach and development are provided in Appendix C and D and the baseline simulation model results are provided in Appendix E and F.

Summary of the Existing Station Conditions

3.34 The work undertaken to examine the existing station conditions showed that, while there are a number of issues with the current station layout and design including poor signage, insufficient information and localized queuing at peak periods, the station is able to accommodate the existing passenger throughput.
4 Future Transit Proposals & Considerations

Introduction

4.1 As noted in the previous chapter, the existing station with its existing levels of demand functions at an acceptable level. However, through discussions with TransLink staff, it was identified that throughput levels at the station were likely to increase over time due to a combination of network-wide increases in transit ridership, service frequency and service capacity (through train lengthening).

4.2 This chapter, therefore, provides a brief description of the likely transit developments that will impact the level of passengers using Waterfront Station over the next five to ten years.

SkyTrain

4.3 SkyTrain services from Waterfront Station currently run on two lines - the Expo Line and the Millennium Line. Presently, services run with headways of 108 seconds and trains are made up of four cars, having a total capacity of 320 passengers.

4.4 Over the coming years, TransLink will introduce the new Mark II cars providing increased capacity for each train. It is expected that these cars will begin to be introduced by 2011, with a full transfer to Mark II cars by 2020.

4.5 Each Mark II car has a capacity of 130 passengers compared with 80 passenger capacity on existing Mark I cars. This increases a 4-car train's capacity from 320 to 520 passengers.

4.6 In addition to the higher capacity cars, some trains are to be lengthened due to the increased levels of rolling stock. By 2011, trains will be with made up of six Mark I cars or four Mark II cars. This will increase train capacity to between 480 and 520 passengers.

4.7 By 2020, it is expected that all trains will be five-car Mark II with a capacity of 650 per train. An increased frequency is also proposed for this stage, with a headway reduced from 108 seconds to 95 seconds.

SeaBus

4.8 The SeaBus currently runs two vessels between Waterfront Station and North Vancouver, providing passengers with 15 minute headways.

4.9 It is proposed that a third SeaBus vessel will eventually be introduced on the service, reducing the headway to 10 minutes.
Canada Line

4.10 The Canada Line opened in mid-August 2009 and operates between Waterfront Station and Richmond or the Vancouver International Airport. The service uses two-car trains, providing a planned headway of 3 minutes and 10 seconds with a capacity of 334 passengers.

West Coast Express

4.11 The West Coast Express currently operates five trains westbound in the AM peak and westbound in the PM peak using 37 passenger coaches (with the longest train consisting of eight coaches). Current plans include purchasing up to nine additional coaches to enable TransLink to operate all five AM and PM services with nine passenger coaches.

Additional Rail Services

4.12 While there are no firm proposals for other rail services to serve or terminate at Waterfront Station, there are several possibilities that were identified including (high speed) rail services to Seattle and Portland, services east of Vancouver (either intra- or inter-regional) or services north to Squamish, Whistler and beyond. It was agreed that if possible, some provision for a platform(s) at an expanded station would be desirable.
5 Station Assessment

Introduction

5.1 As noted in Chapter 3, the existing station facilities and layout are functioning at an acceptable level with the existing levels of passenger throughput. However, given the increases in transit service planned for the station (as outlined in Chapter 4) and additional forecasted background growth regionally in transit ridership, a series of assessments were completed to determine how the station may perform in the future under a range of different scenarios.

5.2 These assessments tested a series of future demand scenarios and included both quantitative assessment, using the pedestrian microsimulation model, and qualitative pedestrian assessments. For reference, the full details of the various demand scenarios and the results of the modelling are included in Appendix E, F and B, respectively.

5.3 The demand scenarios tested are summarized in Table 5.1. Each scenario was first modelled using the existing station and then again with the addition of fare gates in two locations being considered by TransLink – either between the Main Concourse and Interchange Area, or at the western access to the SkyTrain platforms.

5.4 The fare gate tests were undertaken to assist TransLink in their network wide planning for the introduction of fare gates across the SkyTrain network. The initial modelling undertaken as part of this project was carried out to help identify the optimum location for these gates at Waterfront Station.

5.5 The purpose of the assessment was to further identify issues with the current station layout once additional passenger flows were introduced. The issues identified have been summarized into the following categories:

- Passenger Circulation Issues;
- Passenger Capacity Issues;
- Passenger/Pedestrian Access Issues; and
- Wayfinding.
### TABLE 5.1 FUTURE DEMAND SCENARIOS

<table>
<thead>
<tr>
<th>Service and Capacity</th>
<th>Demand Scenario</th>
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<tbody>
<tr>
<td><strong>SeaBus</strong></td>
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</tr>
<tr>
<td>400 capacity per vessel</td>
<td>2 vessels</td>
<td>3 vessels</td>
<td>3 vessels</td>
<td>3 vessels</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 minute headway</td>
<td>10 minute headway</td>
<td>10 minute headway</td>
<td>10 minute headway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demand as per 2008 count data</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand at 100% capacity</td>
<td>Demand at 100% capacity</td>
<td></td>
</tr>
<tr>
<td><strong>West Coast Express</strong></td>
<td></td>
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<td>----------</td>
</tr>
<tr>
<td>200 capacity per car</td>
<td>9 cars</td>
<td>9 cars</td>
<td>9 cars</td>
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</tr>
<tr>
<td></td>
<td>Total 1800 capacity per train</td>
<td>Total 1800 capacity per train</td>
<td>Total 1800 capacity per train</td>
<td>Total 1800 capacity per train</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demand as per 2008 count data</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand at 100% capacity</td>
<td>Demand at 100% capacity</td>
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<tr>
<td><strong>SkyTrain -</strong></td>
<td></td>
<td></td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Mark I cars: 80 capacity</td>
<td>4 Mark I cars / 4 Mark II Cars</td>
<td>6 Mark I cars / 4 Mark II cars</td>
<td>6 Mark I cars / 4 Mark II cars</td>
<td>5 Mark II cars</td>
<td></td>
</tr>
<tr>
<td>Mark II cars: 130 capacity</td>
<td>Total 320 or 520 capacity per train</td>
<td>Total 480 or 520 capacity per train</td>
<td>Total 480 or 520 capacity per train</td>
<td>Total 650 capacity per train</td>
<td></td>
</tr>
<tr>
<td></td>
<td>108 s headway</td>
<td>108 s headway</td>
<td>108 s headway</td>
<td>95 s headway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demand as per 2008 count data</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand at 60% capacity</td>
<td>Demand at 60% capacity</td>
<td></td>
</tr>
<tr>
<td><strong>Canada Line</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>167 capacity per car</td>
<td>Not Included</td>
<td>2 cars</td>
<td>2 cars</td>
<td>2 cars</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total 334 capacity</td>
<td>Total 334 capacity</td>
<td>Total 334 capacity</td>
<td>Total 334 capacity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3m 10s headway</td>
<td>3m 10s headway</td>
<td>3m 10s headway</td>
<td>3m 10s headway</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Demand as per 2008 count data</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand at 50% capacity</td>
<td>Demand at 50% capacity</td>
<td></td>
</tr>
<tr>
<td><strong>Walk-ins (AM) / Walk-outs (PM)</strong></td>
<td>Demand as per 2008 count data</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand as per 2011 forecasts</td>
<td>Demand as per 2011 forecasts</td>
<td></td>
</tr>
</tbody>
</table>

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**Assessment Results**

**Circulation Issues**

5.6 Under existing conditions (Demand 1), minor circulation issues were identified at particular pinch points within the station during the busiest times of day. These included flows between the main concourse and interchange area and flows onto and from the SkyTrain platforms up to the main station area. However, these issues were all considered to be relatively minor with congestion clearing relatively quickly.

5.7 Under all future demand scenarios (Demand 2, 3 and 4), the main circulatory issues occur between areas of the station where fire doors cause the constriction of passenger routes.
In addition, the introduction of Canada Line services, accessible via the Main Concourse, creates further interchange problems between it and the other modes.

The key circulation issues identified by the pedestrian model with the existing station layout were:

- Interchange from Canada Line to other modes where queuing occurs, in both directions during peak hours, at the access points to the Canada Line platforms with delays of over one minute occurring at the exits to the platforms during some peak times in 2011;

- Wherever the modes were modelled at maximum capacity, all of the escalators serving that mode show increased queuing during the morning and evening peaks, with particular problems generated at both ends of the SkyTrain platform caused by excessive queuing (delays of up to 5 minutes during the morning peak);

- Particular physical elements within the station create restrictions in circulation which on their own are not necessarily problems but, with the introduction of greater volumes of people, are likely to create potentially unsafe conditions (in particular once Demand 3 or 4 is reached). These include the ancillary room at the eastern end of the SkyTrain platform and the fire doors between many of the modes which often get pushed closed; and

- Restrictions are caused by fire doors and constricted walkways throughout the station. This is exacerbated in the Main Concourse by the presence of information points and ticket machines in the centre of the main desire line for passengers.

**Capacity Issues**

There are particular areas of the station where capacity becomes an issue during peak times, mainly in areas where passengers are interchanging between different modes.

- The capacity for passengers waiting on platforms is, at times, restricted by arrival passengers taking significant time to exit the station. This is particularly the case on the SkyTrain platforms where passengers are waiting for different services;

- The capacity of the western concourse of the SkyTrain becomes a major problem in Demand Scenario 4 with the higher service frequencies causing excessive overcrowding on the stairs between the western concourse and the SkyTrain platforms during the evening peak;

- Queues for the ticket machines get very long where modes are modelled at maximum capacity. The main concourse ticket machine queue has a maximum queuing time of almost three minutes with the West Coast Express machines showing a maximum of nearly seven minutes. This suggests that both the location and the number of ticket machines need to be addressed in the future.
Access Issues

5.11 In general, the station is relatively accessible. Step-free access is provided to the majority of station areas via elevators and ramps. The main access issues are considered to be as follows:

- Access to the SkyTrain platforms is not step-free from the western concourse with only an elevator available at the eastern access;
- The SeaBus terminal and waiting areas are accessed via a long ramp with only very limited seating provided for those with mobility impairments;
- The access to the Canada Line platforms is relatively remote from the other modes creating a more difficult and lengthy interchange for passengers.

Wayfinding

5.12 As outlined in Chapter 3, the wayfinding throughout the station is inconsistent and is in need of upgrading. The PERS assessment highlighted deficiencies in both the main concourse and the main interchange area under the ‘Identifying Where to Go’ criteria.

5.13 The piecemeal nature of the station’s development over time has left a range of signage and wayfinding styles. In addition, there is very limited service information provided, particularly in the main concourse where one would expect to find arrival/departure boards.

Fare Gates

5.14 The introduction of fare gates has been modelled for all demand scenarios based on there being two fare gate locations – at the western SkyTrain entrance and between the Main Concourse and the Main Interchange area. Full details of the fare gates modelling are provided in Appendix J.

5.15 Inevitably, the introduction of fare gates slows down the movement of passengers through the station and between modes. It is clear from the results of the pedestrian modelling conducted so far, the location of the fare gates has a significant impact on queuing through the station. The locations modelled so far have shown significant impacts on the safe flow of passengers through the station, particularly at the western station access with dangerous levels of queuing shown to build up in this limited space. Clearly, further, more detailed modelling is required to be carried out before the optimum location for fare gates, in both the existing and future station layouts, is identified.

Amenities

5.16 The station suffers from a lack of consistent amenities with variations in quality across the different modes. The PERS assessment identified low scores throughout the station in relation to Quality of the Environment reflecting the lack of continuity of style through the station.
5.17 With a few small exceptions, there is a lack of retail or convenience facilities provided in the station, something that is a significant feature of most other major inner-city interchange stations. The retail provision is limited to small units selling refreshments and newspapers and though the station does provide links to the larger Waterfront and Sinclair Centres, these are accessed via long and unappealing corridors. The significant increase in passengers over coming years will only increase the value of any commercial space that can be made available within the station.

5.18 The large Main Concourse allows the immediate opportunity to provide improved retail and passenger amenities whilst maintaining the desire lines of passengers.

**Best Practice**

5.19 Steer Davies Gleave has recently completed the development of a quick reference guide for Transport for London (TfL) on Interchange Best Practice Guidelines. This work has identified a framework of parameters and criteria against which any interchange plans should be measured.

5.20 The detailed guide uses a question-based approach to achieving best practice. The framework is set out as four themes, each with four principles. Each principle includes one or more questions (criteria) that must be considered and addressed during the planning or design stage of an interchange.

5.21 Key design themes to achieve best practice were identified as:

- **Efficiency** - Best practice interchanges provide a seamless experience for passengers as they move between public transport services, complete their journey by a feeder mode, or take advantage of the facilities on offer within the interchange. Best practice interchanges allow for efficient movement of people and the public transport services they use, and are simple to manage and maintain;

  - Key example: **St Pancras International Station** (London, UK) has movement paths within the interchange facility that are largely direct and clear with good sight lines and little clutter. Spatial management is good with mixed use spaces arranged to either side of movement spaces, decision points are relatively clear with minimal advertising or other distractions. Much of the station environment is step free with elevators, where needed, located on desire lines.

- **Usability** - As well as providing for seamless and efficient movement of passengers and public transport vehicles, best practice interchange zones offer accessibility for all potential users and an environment which is safe, secure and comfortable. Not only are accidents and crime removed, but the fear of these unpleasant experiences is also removed, thereby increasing the usability of the interchange zone;

  - Key example: **Plaza Eliptica Station** (Madrid, Spain) offers a visible staff presence and clear lines of sight which provides a sense of security for passengers. Spatial management is excellent, with passenger facilities arranged around the perimeter of a central movement space. Buses drop off and pick up in separate locations minimizing passenger movement conflicts while automated
doors help to maintain air quality within the facility and manage access to bus boarding areas, both improving safety for passengers. Escalators and lifts provide direct access to the Metro station located within the same interchange facility.

**Understanding** - Understanding of an interchange zone covers more than information - adopting principles of legible design and interchange zone management from the outset will result in places that are intuitive for all users, requiring minimal signing and supporting information and well integrated with their surrounding urban context; and

- **Key example:** *Canary Wharf Station* (London, UK) The station makes extensive use of high quality materials in its construction and incorporates natural light visible at concourse level from the west and east entrances. This acts both as a wayfinding beacon and creates a perception of safety and reassurance. The internal space is simply laid out, with clear movement paths from entrance to platform. Its clear organization creates a legible design, resulting in a reassuring passenger experience with minimal signing. Access to surrounding office and retail amenities is integrated into the design of the station and the build and maintenance quality of the station, its cathedral like space and strong sense of place echoes that of its surrounding context.

**Quality** - Providing a high quality interchange environment will improve all aspects of a users’ experience. A high quality interchange will influence how it is perceived by its users, operators and providers; whether it has characteristics which give it a significant identity; whether its quality of design, configuration and facilities make it feel safe, give it a sense of place or make it a destination in its own right creating social, economic and environmental value and instilling a sense of civic pride in those who use it.

- **Key example:** *St Pancras International Station* (London, UK) is a landmark station, providing airport like facilities and a high quality built environment. The station design sensitively integrates heritage elements, such as the original barrel roof with a modern aesthetic. The open, bright design, general cleanliness and high-end retail outlets of St Pancras International create a positive sense of arrival for passengers and have resulted in the station acting as a destination in its own right. A visible staff presence, combined with pedestrian and retail activity promotes a sense of safety and security.

5.22 For more details, a draft copy of the guidelines is included in Appendix G.

5.23 These best practice design themes and evaluation approach were adopted by the team as concept plans from which options for the future Waterfront Station were developed. Further details of the Evaluation Framework developed are included in Appendix H.