Highway 7 Mission
Eastern Bypass
Concept Planning
and Design Study

Final Report

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1.0 INTRODUCTION

In 2006, the District of Mission embarked on the development of a preliminary land use concept for the waterfront area – referred to as Mission Landing. This area essentially extends along the waterfront from immediately west of Highway 11 through to the Canadian Pacific Railway (CPR) at the north-east edge of the community. Although initial plans have been developed, this stage essentially provided Council with a sense of the possibilities for the waterfront area, and brought forward discussions about the roles and responsibilities of the municipality in the development of the area. Further exploration and planning of alternative land use strategies are expected with extensive consultation with the Mission community.

Before undertaking further visioning and land use planning of the Mission Landing area however, the District of Mission and Ministry of Transportation want to confirm the conceptual route, alignment and configuration of the eastern leg of the Highway 7 Bypass to connect with Highway 11. This assessment would recognize the historical concepts that have been considered and where the highway rights-of-way have been preserved, as well as the District’s initial aspirations for a waterfront area for a vibrant community that is directly linked to the existing downtown area.

The overall purpose of this study is outlined as follows:

- To develop a set of guiding principles for the transportation system serving the provincial, regional and local goals for the Mission Landing area;
- To examine current and future base transportation conditions without any major changes to the roadway network within the District’s waterfront area;
- To identify all reasonable alternative routes and concepts for the eastern section of the Highway 7 Bypass and screen out those options which are inconsistent with the guiding principles for the transportation system;
- To undertake a preliminary evaluation of those remaining options using a multiple account evaluation framework that considers the project costs, transportation system, community and constructability criteria; and
- To confirm the configuration and alignment of the preferred concept to support long-term growth on the highway and local area network.
It should be recognized that possibilities regarding the local network serving the Mission Landing area are described in this document to assist in considering Highway 7 Bypass alternatives. However, these network improvement features should be confirmed through subsequent stages of planning the waterfront area land use and transportation system.

1.1 Background

Highway 7 is a secondary highway located on the north side of the Fraser Highway, connecting to Highway 1 at the Cape Horn Interchange in the west and Highway 9 in Agassiz. Within the District of Mission, Highway 7 runs through the downtown core via 1st and Railway Avenue. The concept of a bypass of Downtown Mission has existed since the late 1960s. In the early 2000s, the Ministry and District of Mission agreed that the existing connection with Highway 11 would remain unchanged and that the western bypass that would connect with Highway 7 to the west would not be preserved. East of Highway 11, the eastern segment of the bypass is incomplete. The Highway extends north into Downtown Mission along Horne Street and across the CPR corridor on the Murray Street Overpass, before continuing further east. The Murray Street Overpass is geometrically deficient with a steep grade on the south side, contributing toward delays, safety concerns, air emissions and difficulty for heavy trucks. Because of its location, this route serves downtown, local, regional and provincial traffic.

In the late 1990s, the Ministry of Transportation examined alternatives for the eastern Highway 7 Bypass. Although the Ministry has not committed to constructing a bypass, an 80 to 120 metre right-of-way has been preserved east of the existing segment that ends at Horne Street and continues over the CPR corridor to connect with Highway 7 east of Stave Lake Street. The preferred concept at the time (Figure 1.1 illustrated below) includes the provision of a grade-separated, half-diamond interchange and a two-lane extension on fill east of Horne Street and over the CPR tracks. The Bypass would then connect with the existing Highway 7 corridor with a grade-separated connection east of Stave Lake Street.
As previously described, the District of Mission began developing a vision for the waterfront area – also known as Mission Landing – over the last few years. Although the preliminary concept plan is expected to undergo further development with extensive community consultation, the preliminary concept is illustrated in Figure 1.2 below. This concept includes the development of five precincts, with civic uses occupying most of the eastern areas of the waterfront. As part of this concept, the eastern extension of the Highway 7 Bypass is oriented toward the north and across the existing Murray Street Overpass. Once again, this preliminary concept is only one of many options to be considered by the District through the development of subsequent stages of long-term plans.
1.2 Guiding Principles

Guiding principles for the transportation system are intended to define the needs and expectations for not only the Highway corridor, but the surrounding municipal roadway network, transit, bicycle and pedestrian facilities serving the Mission Landing area and other parts of Mission. In this regard, the guiding principles are used to identify, define and evaluate candidate options for the Highway 7 Eastern Bypass that ultimately support provincial and local area transportation goals.

The discussion below highlights the guiding principles for the transportation system developed through discussions with the Ministry of Transportation and District of Mission.
1. **Transportation & Land Use Integration**

Although the guiding principles for the transportation system largely speak to the desired directions for the Highway, roadway network, transit system as well as pedestrian and bicycle facilities, the integration of the transportation and planned land uses for the Mission Landing area is vitally important. Recognizing that the District of Mission will soon be starting a community-based process for planning land uses in the area, the following guiding principles are used to provide some general expectations for the successful integration of land use and transportation systems.

- Ensure that land uses within the Mission Landing area are supportive of transit, cycling and walking.
- Ensure an appropriate mix of land uses to support more local trips that are walkable or can be made by bike.
- Encourage a balance of residential and employment uses within the Mission Landing area that support two-way travel and provide opportunities to work within the Mission area.
- Discourage development of ‘highway’ oriented uses that will severely discourage people from using transit, cycling or walking within the Mission Landing area.
- Plan the alignment and configuration of the Highway 7 Eastern Bypass to be supportive of local land use patterns in the Mission Landing area, and to make efficient use of development opportunities adjacent to the corridor.

2. **Highway Corridor**

The following discussion highlights the guiding principles for the Highway 7 corridor in general and the Eastern Bypass through Mission specifically based on the overall expectations for the Secondary Highway system as outlined by the Ministry of Transportation.

- Maintain Highway 7 as a Secondary Highway designed to serve inter and intra-provincial travel between the Northeast Sector of the Lower Mainland, Mission and Hope.
- Maintain the eastern section of the Highway 7 corridor as an arterial standard roadway that is designed to support the long-term mobility of through traffic as well as regional trips entering and leaving Mission (potential operating speed of 50 to 60 km/hr). Although the functional classification does not necessarily determine the form on Secondary Highways, it is recognized that the western section of the Highway 7 corridor
through Mission, Maple Ridge and Pitt Meadows is being planned as an expressway standard facility.

- No significant changes to the Highway 7 corridor east of Mission beyond the two-lane cross-section area should be anticipated within this long-term strategy. In fact, the Ministry would not be considering changes to the Highway 7 Eastern Bypass without the need to identify possible alignments and configurations of the Highway as part of the Mission Landing area plans.

- As a secondary connection to the Mission area and east through to Hope, this route should remain a safe and reliable route for tourists and weekend traffic.

- Plan and design the Highway 7 corridor to support goods movement north of the Fraser River as well as tourists as a secondary alternative to the Highway 1 corridor.

- Support the movement of pedestrians and cyclists along and crossing the Highway 7 Eastern Bypass within the built up areas of the community.

- Plan the alignment and configuration of the Highway 7 Eastern Bypass to support the transportation and land use concepts for the Mission Landing area and to minimize impacts on the development of a “waterfront community.”

3. Urban Roadways

Through the planning of the Mission Landing area, the urban roadways surrounding and crossing the Highway will be significantly different in the future. The District of Mission wishes to promote a local roadway network that supports the guiding principles highlighted below.

- Plan for a network of roads with multiple crossings of the Highway 7 Bypass that will ultimately serve to enhance connections between Mission’s waterfront and the rest of the Mission Landing area and Downtown Mission.

- Plan for an enhanced north-south system that includes an additional crossing of the CPR line that will serve to minimize barriers to the Mission Landing area and enhance access for all modes of travel, including driving, transit, walking and cycling. No additional crossing has been examined at this time.

- Develop a complete system of municipal streets surrounding the Highway within the Mission Landing area to support access and circulation, and to provide connections to enhanced crossings of the CPR line that connect with Downtown Mission.

- Develop a multi-modal network of municipal streets that surround and cross the Highway 7 corridor to support the movement of people, goods and services to and from the Mission Landing area.
4. **Transit**

Today, the transit system in Mission consists of local serving bus routes, inter-municipal transit services connecting through to Abbotsford as well as the West Coast Express service to Downtown Vancouver from the Mission Station. The District of Mission wants to ensure that transit continues to play a growing role for the entire community and that the transportation system in the subject area will support the following guiding principles.

- Provide attractive local and regional access to the West Coast Express Mission Station for cars, buses, cyclists and pedestrians.
- Provide attractive and direct local area transit services connecting the Mission Landing area to other parts of the District as well as the City of Abbotsford.
- Plan for transit-supportive facilities, amenities and programs within the Mission Landing area to support the provision of attractive transit services.
- Ensure that local and regional services are integrated with the West Coast Express Mission Station and other major generators such as Downtown Mission.

5. **Pedestrians & Cyclists**

The District of Mission wants to develop the Mission Landing area as an accessible community in which people of all mobility levels can walk and bike to enjoy the amenities of the area and to access the planned residential, commercial and offices uses of the community. The following guiding principles will be used to plan the transportation system for the Mission Landing area and the Highway 7 Eastern Bypass.

- Provide bicycle facilities on all major roads and the Highway within the Mission Landing area.
- Provide attractive pedestrian facilities along all roadways within the Mission Landing area with specific attention given to safe and attractive crossings of major roadways.
- Integrate cycling and pedestrian facilities with new developments throughout the Mission Landing area.
- Design the pedestrian environment to be accessible for people of all abilities.
2.0 EXISTING CONDITIONS SUMMARY

2.1 Existing Land Use Patterns

The waterfront area provides for a mixture of waterfront and service industrial uses and accessory commercial uses. Many of the land uses illustrated below have been present for many years and are unlikely to change without public and private sector interests. The District of Mission Official Community Plan (OCP) recognizes the importance of the waterfront and need to protect the area as the best opportunity for increased community access to the river and for residential and commercial development in a waterfront setting. In fact, the District’s OCP outlines these objectives to transform the waterfront area in order to achieve the overall goal:

Figure 2.1: Existing Waterfront Area Uses

- Protect the opportunity for waterfront-oriented public and private development in the long-term.
- Encourage private development as a means of generating investment, employment and tax base in the community.
Increase community enjoyment of the river and awareness of Mission’s historical and current relationship with the river.

Reinforce efforts to strengthen Mission’s downtown and to strengthen the tourism sector.

2.2 Traffic Volumes and Conditions

This section of the Interim Report provides a summary of historical and existing traffic patterns and conditions in the study area. Because the Highway 11 Mission Bridge is the only permanent count station in the immediate area with updated traffic data, most historical patterns are derived from this location and assumed to be similar for the eastern section of Highway 7 in terms of daily, weekly and monthly traffic patterns. The following discussion highlights those key observations relative to historical and existing traffic patterns.

- **Historical highway traffic volumes have grown at approximately 1.5% per year over the last seven years.** Between 1999 and 2006, the daily traffic volumes at the permanent count station on Highway 11 at the Mission Bridge increased from approximately 33,500 to almost 38,500 vehicle trips per day. This increase of 5,000 trips represents a growth rate of approximately 1.5% per year.

![Highway 11 (Mission Bridge) - AADT](chart)

- **Monthly average daily traffic volumes do not vary dramatically between February and November each year.** The graph below illustrates the monthly average daily traffic volumes for 2005 and 2006. These patterns suggest that the monthly average daily traffic volumes vary by less than 5% throughout much of the year.
Although the two-way traffic volumes are almost 25% higher during the PM peak hour in comparison to the AM peak hour, the peak directional volumes for the morning and afternoon are very similar. Two-way and directional traffic volumes on the Mission Bridge are recorded from the permanent count station by hour and illustrated in the graph below. Not surprisingly, these patterns indicate that the peak travel demand patterns in the morning are from traffic leaving Mission and returning at the end of day. Additionally, the off-peak directional volumes in the afternoon are significantly higher than the morning period.
The northbound to eastbound traffic patterns on Highway 7 are most prominent during the PM peak hour. The existing PM peak hour turning movement volumes for key study area intersections are illustrated below. These patterns demonstrate that the traffic entering the Mission area along the Highway 7 Bypass is almost two times the amount of traffic exiting the area. Much of this traffic is turning right at 1st Avenue and continuing east along Highway 7 past Stave Lake Street.

Figure 2.2: Existing PM Peak Hour Traffic Volumes

The afternoon peak hour intersection levels of service indicate that most study area intersections are currently functioning with modest levels of delay. The intersection levels of service (LOS) provide a means of measuring delay at key study intersections as illustrated below for the afternoon peak hour. In general, an LOS A indicates that an intersection or movement is operating with minimal delay and an LOS F suggests that drivers are experiencing significant delay and that the intersection is failing. For the purpose of most planning studies, an LOS D or better is desired at signalized intersections. In this regard, the existing signalized intersections in the study area are all operating at LOS C or better during the afternoon peak hour and therefore functioning with modest levels of delay.
Figure 2.3: Existing PM Peak Hour Levels of Service
3.0 FUTURE BASE CONDITIONS

This section of the Interim Report summarizes forecast long-term traffic patterns on the Highway 7 corridor as a result of regional, municipal and local area growth in the Mission Landing area. This study examines demographic changes and resulting traffic growth for horizon year 2026 for the purpose of defining workable transportation route options for the eastern Highway 7 Bypass.

3.1 Planned Growth and Development

The Fraser Valley Regional District (FVRD) is experiencing significant growth and development for residential and employment uses. Although the District of Mission only accounts for 15% of the population of the FVRD, local area growth and development in the Downtown, Southwest Mission and Mission Landing will continue to place greater pressures on the local area roadway network. This section of the Interim Report highlights the planned growth and development that are included in the forecasts of long-term traffic patterns along the eastern section of the Highway 7 Bypass.

- The population of the FVRD is expected to grow by approximately 0.14 million people (or 1.7% per year) over the next 20 years, and by 0.02 million people in the District of Mission (or over 2% per year). This demonstrates strong continuous growth with a consistent average growth rate of approximately 2% per year (BC Stats, Population Projections, P.E.O.P.L.E. Projection 31).
Most growth in the District of Mission is expected to largely occur in three main areas. Of the projected 2% growth per year in Mission between now and 2026, 0.4% is anticipated for the Central Mission/Waterfront, 0.7% in Cedar Valley, 0.7% in Southwest Mission, and 0.2% in rural areas of Mission.

The Mission Landing area is expected to include a mixture of land uses, including residential apartments, neighbourhood commercial, and general industrial uses. Although the Mission Landing plan will undergo further development, the District of Mission has identified the potential development of approximately 1,400 multi-family dwelling units and over 90,000 m² of neighbourhood and mixed use commercial and residential development.

3.2 Forecast Traffic Patterns and Conditions

The growth and development within the Mission Landing area and changes in the surrounding areas of Mission and the FVRD will result in significant shifts in traffic patterns along the eastern section of the Highway 7 Bypass. The following discussion describes the projected changes resulting from the growth patterns highlighted in Section 3.1.

The Mission Landing area could generate approximately 3,700 to 4,100 vehicle trips during the afternoon peak period. The total PM peak hour trips generated by the Mission Landing area are estimated using the ITE Trip Generation Manual (7th Edition) to be approximately 4,150 vehicles, without any factors for mode choice. Using the distribution patterns described below, trip reduction factors have been applied to those trips that would remain within the waterfront area or destined to Downtown Mission. It is expected that walking, cycling and transit use would be made very desirable for many of these trips.

| Table 3.1: Mission Landing PM Peak Hour Vehicle Trip Generation |

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Trip Generation Rate</th>
<th>% Outbound</th>
<th>Vehicle Trips Generated</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#trips/ 1,000 sf or unit</td>
<td></td>
<td>Inbound</td>
</tr>
<tr>
<td>Commercial</td>
<td>2.71</td>
<td>56%</td>
<td>1,169</td>
</tr>
<tr>
<td>Business Park</td>
<td>1.29</td>
<td>77%</td>
<td>124</td>
</tr>
<tr>
<td>Apartments</td>
<td>0.69</td>
<td>39%</td>
<td>583</td>
</tr>
<tr>
<td><strong>Sub-total Trips (no mode split)</strong></td>
<td><strong>1,875</strong></td>
<td><strong>2,275</strong></td>
<td><strong>4,150</strong></td>
</tr>
<tr>
<td><strong>Total Trips (with mode split)</strong></td>
<td><strong>1,685</strong></td>
<td><strong>2,030</strong></td>
<td><strong>3,715</strong></td>
</tr>
</tbody>
</table>
Through traffic on the Highway 7 Bypass is projected to grow by 2% per year. Today, approximately 30% of the afternoon peak hour traffic on Highway 7 east of Highway 11 is generated to and from Highway 7 east of Stave Lake Street. The long-term demands for through traffic are expected to grow consistent with historical rates of change due to local and regional development patterns. Between the years 1999 and 2006, the AADT was approximately 36,000 vehicles on the Mission Bridge. The historical traffic growth patterns indicate a steady increase in traffic along this segment of the corridor with an average annual traffic growth of approximately 2.0 percent per year. This is consistent with the projected population growth of the area and regional district. Therefore, an annual growth rate of 2.0 percent was applied to the existing through traffic patterns in order to generate 2026 forecasts during the afternoon peak hour.

Trips generated by the Mission Landing area during the PM peak hour are projected to connect with several areas within the District as well as areas south of the Fraser River such as Abbotsford. The trips generated by the Mission Landing area are forecast using the EMME/2 regional model to determine the distribution of traffic. Based on this assessment, the 3,700 trips generated by the area during the afternoon peak hour are likely to be generated from several areas of Mission (including the Mission Landing area), as well as areas to the south such as Chilliwack and Abbotsford and to the west as illustrated below.
- **Local, municipal and regional growth will result in an increase of over 100% in traffic on the eastern Highway 7 Bypass during the PM peak hour.** Without the extension of the Highway 7 Bypass or expansion of the municipal roadway network to accommodate growth of the Mission Landing area, many of the existing roadways are projected to support over twice the traffic in comparison to today. The two-way PM peak hour traffic volumes on the section of Highway 7 immediately east of Highway 11 is expected to increase by almost 2,000 vehicle trips. Similarly, the two-way traffic demands on the Murray Street Overpass are projected to increase from 1,870 vehicles to over 5,000 vehicles. Meanwhile, the Highway 7 traffic volumes east of Stave Lake Street are projected to increase by slightly more than 50%, from 1,750 to 2,700 vehicles.

**Figure 3.1: Forecast 2026 PM Peak Hour Traffic Volumes**
The delays experienced at each of the primary signalized intersections along the Highway 7 corridor will increase dramatically without significant changes to the local area network or the Highway. The levels of service at each of the primary signalized intersections along Highway 7 are projected to increase from LOS B/C to E/F. This is a significant increase to the overall delays and indicates that the existing network could not support the forecast growth in local, regional and provincial traffic.

Figure 3.2: Forecast 2026 PM Peak Hour Levels of Service
4.0 CANDIDATE OPTIONS IDENTIFICATION AND SCREENING

This section of the Interim Report describes the candidate range of improvement strategies initially identified to address the significant growth in traffic patterns described in Section 3. It should be recognized at this stage that the local roadway network within the Mission Landing area will dramatically influence the performance and configuration of the eastern Highway 7 Bypass options described in this section. For the purpose of this study, an alternate crossing of the CPR corridor to connect Downtown Mission with the waterfront area is identified and should be examined in greater detail through the planning for the Mission Landing area with input from public stakeholders and key agencies, particularly CPR.

The range of improvement strategies described in this section of the report include grade-separated, arterial and one-way couplet options for the Highway 7 corridor as highlighted below and described in Sections 4.1 through 4.3.

### 4.1 Grade-Separated Bypass
As previously described, the concept of a grade-separated eastern bypass has been around for many years. In fact, the Ministry has accumulated the rights-of-way required for the elevated highway traversing the waterfront area and across the CPR corridor before connecting again with
the existing Highway 7 section east of Stave Lake Street. The following discussion highlights the main features of the grade-separated concepts examined in this study.

1. **Horne Street Partial Diamond**

The Horne Street interchange concept was developed as part of previous planning and functional design assignments undertaken for the Ministry. In order to accommodate the forecast travel demands, the concept would include the following primary features.

- Four-lane Bypass from existing Highway to Horne Street.
- On- and off-ramps at Horne Street to and from the west only.
- Two-lane Bypass east of Horne Street over the CPR tracks and a grade-separated connection with existing Highway 7 with appropriate ramp system and merge areas.
- Horne Street serves as the primary north-south south connection between waterfront and Downtown Mission.
- New bridge to downtown to accommodate forecast demands potentially located at Horne Street.
2. **Mershon Partial Diamond**

The Mershon Street provides a slight variation from the Horne Street concept with the explicit intent of providing another crossing of the CPR tracks further away from the Murray Street Overpass. In order to accommodate the forecast travel demands, the concept would include the following primary features.

- Four-lane Bypass from existing Highway to Mershon Street.
- On- and off-ramps with overpass at Mershon Street to and from the west only.
- Two-lane Bypass east of Mershon Street over the CPR tracks and a grade-separated connection with existing Highway 7 with appropriate ramp system and merge areas.
- Mershon Street serves as the primary north-south south connection between waterfront and downtown Mission.
- New bridge to downtown to accommodate forecast demands potentially located at Mershon Street.

4.2 **Arterial Bypass**

Although the grade-separated concepts will support highway traffic, the arterial bypass concepts described below can be developed to support forecast travel patterns at key intersections. In
In general, the northern and southern routes would include a four-lane cross-section with additional turn lanes at each primary intersection. The preliminary operational analysis indicates that all intersections could be designed to operate with reasonable levels of delay. The following discussion highlights the candidate arterial highway concepts and the other potential network improvements.

1. **Southern Route - Mershon & Horne Overpass Connections**

The southern route would be aligned along the northern edge of the existing right-of-way for the Highway 7 Bypass as follows:

- Four-lane extension of Bypass to Horne Street along the northern side of existing right-of-way.
- Signalized intersections at Mershon and Horne Streets with two eastbound left-turn lanes at Mershon.
- Horne and Mershon serving north-south traffic for District connection to Highway and Mission Landing area, connecting with existing Murray Street and new Horne Street Overpasses.
- East of Horne Street, four-lane bypass with right-in/right-out connections to local street system.
- Three-lane overpass of CPR tracks through to new signalized intersection with Stave Lake Street.
- Two lanes east of Stave Lake Street.
2. **Southern Route - Mershon Overpass & Horne Connections**

This southern concept is similar to the previous, with a realigned Horne Street intersection with the Bypass as well as a CPR crossing at Mershon. This option provides the necessary spacing between Horne Street and Mershon Street for left-turn vehicle storage at the signalized intersections.

![Southern Route Concept Diagram](image)

3. **Northern Route - James/Welton Overpass & New Murray Overpass & Highway 7 Overpass**

The northern alignments are designed to preserve more waterfront area for development and the local serving transportation system. This concept includes a new four-lane overpass of the CPR tracks at either James or Welton, reconstruction of a new Murray Street Overpass as well as a new Highway 7 Overpass. The primary features of this concept are highlighted as follows:

- Extend four-lane Bypass northward toward Glasgow Avenue to connect with Durieu Street. This new intersection with the Highway Bypass is signalized with eastbound double left-turn lanes.
- Four-lane Bypass continues toward signalized intersections at new Murray Street Overpass with two eastbound left-turn lanes. The new Murray Street Overpass would be designed as a four-lane connection. The intersection with the Bypass would be elevated to connect with the Murray Street Overpass as well as the extension of the Bypass over the CPR tracks.
Three-lane Bypass over the CPR tracks and through to a new Stave Lake Street signalized intersection.

Two-lane Highway 7 east of Stave Lake Street to connect with North Railway Avenue and 1st Avenue.

4. Northern Route - James/Welton Overpass & Parallel Murray Overpass

This northern route concept includes the same four lane overpass of the CPR tracks at either James or Welton and a new parallel structure to the existing Murray Street Overpass. In this regard, all Highway traffic and heavy vehicles would continue to utilize the same route through the eastern edge of Downtown Mission. The primary features of this concept are highlighted as follows:

- Four-lane extension of the Bypass to Durieu Street which is signalized and supported with double left-turn lanes in both the eastbound, westbound and northbound directions. It should be noted that this intersection would support all traffic generated by the Highway as well as the waterfront area.
- New four-lane Overpass of the CPR tracks parallel to the existing Murray Street Overpass in order to serve northbound traffic.
- Dedicated right-turn lane over the bridge and significant modifications to the intersection with 1st Avenue.
4.3 One-Way Couplet

The one-way couplet bypass concepts essentially separate out the eastbound and westbound traffic on two parallel routes located within 100 metres apart. In general, one-way couplet systems are safer and experience fewer delays than standard two-way street systems. Most importantly, they can reduce the need for wider roadways which can create barriers to pedestrians and cyclists. The following discussion briefly describes the one-way couplet options.

1. Mershon Overpass & Horne Connections & Single Highway Structure

The first one-way couplet would include signalized intersections at Mershon and Horne Streets. Right-in / right-out connections would be provided at other side streets along the Bypass and in some cases, through traffic may be permitted east of Horne Street. The specific features of this option are described as follows:

- Three lanes per direction on the Bypass forming one-way couplet through Waterfront area.
- Signalized intersections at Horne Street and Mershon Street, with right-in/right-out movement only intersections at immediate locations.
- Mershon & Horne Streets as two primary north-south roads, both four lanes.
- Single, two-lane Bypass over CPR tracks to a modified Stave Lake Street signalized intersection.
- Two-lane Bypass east of Stave Lake intersection.
- New Mershon Street overpass to connect with downtown.

2. **Mershon & Horne Overpass Connections & Parallel Highway Structures**

This one-way couplet option is similar to the previous concept except that the Bypass overpass of the CPR tracks occurs on two separate structures to maximize developable lands between the eastbound and westbound roadways that form the couplet.
4.4 Screening Assessment

Rather than examine all candidate concepts using a multiple account evaluation, the suitability of each option was assessed by the Study Steering Committee based on the guiding principles for the transportation system established at the outset of the assignment and described in Section 1.2. Through this process, several options are screened out from further review since they did not meet the fundamental vision for the area. The results of this assessment and recommendations are summarized in Table 4.1 and briefly described below.

- **Grade-separated concepts.** Preliminary discussion with Steering Committee members indicates that all grade-separated concepts would negatively impact many of the community-oriented guiding principles. The elevated Highway 7 corridor identified for both candidate concepts would create a barrier for the planned Mission Landing community, the majority of which would be located north of the highway and away from the waterfront area. With potential crossings of the highway limited to either Mershon or Horne, the local area roadway network would be concentrated on one north-south route serving all vehicle trips generated by the waterfront as well as the Highway. Further, the limited north-south network would also constrain access and circulation for other modes of travel such as transit, pedestrians and cyclists. In this regard, the grade-separated concepts are generally not consistent with the guiding principles for the local area land use and transportation systems, and are therefore eliminated from further consideration in this study.
Arterial Concepts. In general, the arterial concepts are considered by the Steering Committee to be more consistent with the guiding principles for land use and transportation systems. Although the arterial concepts include a Highway 7 corridor without any direct access to adjacent properties, the at-grade highway throughout much of the Mission Landing area ensures that these concepts can be more integrated with the planned community. The full-movement, at-grade intersections at two locations in both the northern and southern concepts provides for multiple crossing locations for the local area roadway network and would also serve access for transit, pedestrians and cyclists. Although the provision of a new local crossing of the CPR corridor can not be determined at this stage, two northern and one southern arterial route concepts with a James or Welton overpass are carried forward for further review and preliminary evaluation.

One-Way Couplet. Similar to the arterial concepts, the one-way couplet concepts would include an at-grade Highway 7 corridor with multiple signalized crossings at two key north-south corridors and direct access to adjacent properties within the centre blocks. Although the transportation benefits of the one-way couplet system - including mobility, safety and accessibility for all modes is recognized, the concept does not adequately support land use goals. The Steering Committee representatives considered that the one-way couplet increases the influence of the Highway 7 corridor on the waterfront community and would make it more difficult to access properties throughout the area. Therefore, both one-way couplet concepts are eliminated from further consideration in this study.
### Table 4.1: Preliminary Agency Screening of Candidate Options

<table>
<thead>
<tr>
<th>CANDIDATE OPTIONS</th>
<th>CONSISTENCY WITH GUIDING PRINCIPLES</th>
<th>RECOMMENDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transportation &amp; Land Use Integration</td>
<td>Highway Corridor</td>
</tr>
<tr>
<td>Grade-separated Concepts</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>› Mershon Partial Diamond</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>› Horne Partial Diamond</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Arterial Concepts</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>› Southern Alignment - Mershon Overpass &amp; Horne Connections</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>› Southern Alignment - Mershon &amp; Horne Overpass Connections</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>› Northern Alignment - James/Welton Overpass &amp; New Murray Overpass &amp; Highway 7 Overpass</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>› Northern Alignment - James/Welton Overpass &amp; New Parallel Murray Overpass</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>One-Way Couplet Concepts</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>› Mershon Overpass and Horne Connections &amp; Single Highway Structure</td>
<td>X</td>
<td>√</td>
</tr>
<tr>
<td>› Mershon &amp; Horne Overpass &amp; Parallel Highway Structures</td>
<td>X</td>
<td>√</td>
</tr>
</tbody>
</table>

√ Positive — Neutral X Negative
5.0 OPTION DEVELOPMENT & EVALUATION

This section of the report examines the three arterial concepts previously described in slightly more detail in order to highlight any significant issues or challenges for each option, and to compare alternatives. The assessment begins with further development of the concepts to define the network and intersection geometry required to support the projected peak period traffic volumes. Consistent with a multiple account evaluation framework, arterial concepts are compared based on qualitative and quantitative criteria that are broadly used to assess each option in terms of the Capital cost, transportation system, community, finances, environment and constructability.

5.1 Traffic Volumes, Network Geometry and Conditions

The forecast traffic volumes for the three arterial concepts (Concepts 1 to 3) were developed for the Highway and interconnecting roadway network using the methodology described for the future base conditions in Section 3.2. Figures 5.1 through 5.3 below illustrate the forecast 2026 PM peak hour traffic volumes and intersection levels of services for each arterial concept. In general, the northern route concepts direct all highway, waterfront and Mission traffic to the Highway 7 corridor. The southern route concept for the Highway 7 corridor allows some waterfront and Mission area traffic to utilize other local roadways that may be planned and developed within the Mission Landing area. In this regard, local area traffic would not likely use the Highway 7 Bypass.

In support of the forecast traffic patterns, the proposed intersection and corridor geometrics for the Highway 7 corridor and interconnecting major roadways are presented in Figures 5.4 through 5.7. It should be recognized that the local area network options within the waterfront area and Downtown Mission should be examined in greater detail as part of a local area plan.
Figure 5.1: Concept 1 Forecast 2026 PM Peak Hour Volumes
(Northern Alignment - James/Welton Overpass & New Parallel Murray Overpass)

Figure 5.2: Concept 2 Forecast 2026 PM Peak Hour Volumes
(Northern Alignment - James/Welton Overpass & New Murray Overpass & New Highway 7 Overpass)
Figure 5.3: Concept 3 Forecast 2026 PM Peak Hour Volumes
(Southern Alignment - James/Welton Overpass & Murray Overpass & New Highway 7 Overpass)
Figure 5.4: Concept 1 Proposed Configuration

(Northern Alignment - James/Welton Overpass & New Parallel Murray Overpass)

- Reconfigure intersection to support new northbound structure
- 4-lane 1st Avenue
- New 4-lane Overpass to Mershon or James
- 4-lane Overpass for northbound traffic
- New signalized intersection with two eastbound and westbound left-turn lanes
- 4-lane extension of Highway 7 Bypass
Figure 5.5: Concept 2 Proposed Configuration

(Northern Alignment - James/Welton Overpass & New Murray Overpass & New Highway 7 Overpass)

- New 4-lane Overpass
- New 2-lane Overpass
- New signalized intersection
- New signalized intersection with two eastbound and westbound left-turn lanes
- New 4-lane Overpass to Mershon or James
Figure 5.6: Concept 3 Proposed Configuration

*(Southern Alignment - James/Welton Overpass & Murray Overpass & New Highway 7 Overpass)*

- New signalized intersection
- New 4-lane Overpass
- New 4-lane Overpass to Mershon or James
- 4-lane extension of Bypass
- New signalized intersection with two eastbound left-turn lanes
5.2 Preliminary Assessment

Each of the arterial concepts previously described in Section 5.1 are examined at a preliminary level using a simplified multiple account evaluation framework based on qualitative and quantitative criteria. The accounts examined at this stage of the review and the comparative assessments are summarized in Table 5.1 and briefly described below as follows:

Financial

- Conceptual costs (Class D) of the improvement concepts are summarized for the Highway portion of the project and other primary roadway improvements for the municipal street system. Because of the different local area network improvement strategies and relationship to a northern or southern route, the non-highway components of the cost estimates summarized in this review may not be directly comparable. For example, the southern route includes improvements to the network north of the Bypass (including the Glasgow Avenue connection), whereas the northern route concepts do not include any east-west network along the existing rights-of-way which would be needed as part of the area plan.

- Overall, the capital cost estimates of the Highway 7 corridor range anywhere from $30 million for the northern alignment that utilizes the existing Murray Street Overpass and Highway 7 corridor through to Stave Lake Street to as much as $37 million for the southern route and new Highway overpass of the CPR corridor.

Transportation Network

- The practical outcomes of each concept in terms of the overall performance of the Highway and connectivity of the municipal road system, as well as support for other modes such as transit, cycling and pedestrians are also examined. In general, the Highway will function suitably with any of the arterial options as described in Section 5.1. Assuming the network configurations illustrated in Figures 5.4 through 5.6, each intersection will operate at LOS C or better during the PM peak hour with 2026 traffic demands. Although the local area network can be made to work, the connectivity and the function of the local street system within the Mission Landing area can be made more effective with a southern route concept. In short, the northern routes mean that all local area traffic must use or cross the Bypass in order to travel between Downtown Mission and Mission Landing.

- In the same way that the local network connectivity and function is more effective with a southern route, transit access and circulation can also be more effective with better coverage on more local streets within Mission Landing and connections that do not
require operating along the Highway. For cyclists and pedestrians, the southern route also provides the greatest opportunity for desired local connections between Downtown Mission and Mission Landing. The northern routes would require all pedestrians and cyclists to either use the Highway Bypass or cross at some point in their journey to the waterfront area.

Community

- The impacts and potential benefits of each concept for the Mission Landing area plan in terms of property requirements, developable rights-of-way, aesthetics, noise, property access and overall land use plans in the area are compared for each route.

- Similar to the Capital costs for non-highway roads estimates, the property requirements are not directly comparable for each option. Without the development of a local area network for the northern route concepts, the existing right-of-way appears entirely as developable area in this analysis. For the purpose of comparing and assessing property impacts however; the property required to develop any of the northern route concepts for the Highway 7 Bypass are significantly greater than the concept for a southern route.

- A comparison between the alternative route concepts that do not go through Downtown Mission would suggest that the noise and aesthetic impacts are not significantly different. Concept 1 however, would continue to attract more traffic through the downtown area and along a widened 1st Avenue. For these reasons, development of a bypass route which diverts traffic away from downtown core is perceived by the local community as being very desirable.

- Access and connectivity between Downtown Mission and Mission Landing is a central theme in creating a vibrant core area where people can live, work and play. Although each of the concepts can be designed to minimize the impacts on these vital connections, the location and scale of a northern route will generally result in a greater barrier between these two communities.

Environmental:

- Although this conceptual level review should be confirmed through subsequent stages of design, the potential environmental impacts are generally consistent with each of the candidate options. Within the immediate area, there are no sensitive watercourses crossed by any of the options. Depending on the extents of the improvements to merge the existing and new Highway 7 Bypass in the eastern area, the potential impacts on the D’Herbomez Creek could arise in terms of elimination of instream habitat and potential restriction of access further upstream of the crossing location. Any potential impacts on
this watercourse are mitigable. In the immediate area of the Creek, there is also a registered archaeological site that would need to be addressed in the eastern areas of the Bypass. This may or may not be impacted depending on the extents of the merge areas between the Overpass and North Railway Avenue. Further, the forested areas between 1st Avenue and North Railway Avenue are likely impacted with Concept 2 and Concept 3 to a lesser degree.

**Constructability**

- The degree of difficulty to construct the project is identified along with the relative impact on existing community and management of traffic during construction. Overall, Concept 3 is likely the easiest to construct because of the location of the CPR Overpass, and can evolve with the growth and development of the Mission Landing area by simply protecting and building on the right-of-way as development occurs. The northern route Concept 1 and Concept 2 would be more difficult to construct because of impacts on the existing roadway system and would need to be partially or completely constructed early in the redevelopment process because of its location within the planned community.

Based on this preliminary technical evaluation, it would appear that a southern route would be more favourable. In particular, the criteria supporting transportation, community, environmental and constructability accounts all suggest that Concept 3 along the existing right-of-way is more suitable than any of the northern routes. This assessment will be examined with the Steering Committee, so that the preferred concept can be developed further to confirm the configuration, general cross-section and right-of-way requirements that should be preserved as part of the planning for Mission Landing.

**Table 5.1: Preliminary Evaluation of Arterial Concepts**

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Concept 1 North with Parallel Murray</th>
<th>Concept 2 North with New Murray Overpass</th>
<th>Concept 3 South Concept</th>
</tr>
</thead>
<tbody>
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<td>Financial Account</td>
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<tr>
<td>Capital Costs (Class D)</td>
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<td>$18</td>
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<td>Durieu James/Welton</td>
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<td>$4</td>
</tr>
<tr>
<td>Murray Overpass</td>
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<td>-</td>
<td>$1</td>
</tr>
<tr>
<td>Horne Street</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Evaluation Criteria</td>
<td>Concept 1 North with Parallel Murray</td>
<td>Concept 2 North with New Murray Overpass</td>
<td>Concept 3 South Concept</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td><strong>Transportation Account</strong></td>
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<tr>
<td>Highway Operation</td>
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<td>Local Area Network Connectivity and Function</td>
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<td>Transit Access &amp; Circulation</td>
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<td>Bicycle Connectivity</td>
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<td>42</td>
</tr>
<tr>
<td>Horne Street</td>
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<td>-</td>
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<td>Area Impacted Properties (m²)</td>
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<td>Highway 7</td>
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<td>(75,400)</td>
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<td>(45,600)</td>
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<td>Developable Area</td>
<td>16,750</td>
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<tr>
<td>Murray Overpass</td>
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<td></td>
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</tr>
<tr>
<td>Horne Street</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Noise Impacts on Mission Landing / Downtown</td>
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<tr>
<td>Aesthetic (Visual) Impacts on Mission Landing / Downtown</td>
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<tr>
<td>Impacts to Access</td>
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<td>Supportive of Land Use Plans</td>
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<tr>
<td><strong>Environmental</strong></td>
<td></td>
<td></td>
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<tr>
<td>Vegetation</td>
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<td>⬤</td>
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<td><strong>Constructability Account</strong></td>
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<td>Construction Staging</td>
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<td>Network Evolution with Community Plan</td>
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<td>⬤</td>
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<td><strong>Technical Ranking</strong></td>
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<td>Summary Ranking</td>
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<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

- ⬤ Good/Favourable/Better
- ⬤ Fair/Neutral
- ⬤ Poor/Unfavourable/Worse
6.0 PREFERRED SOUTH ROUTE BASE CONCEPT

The preferred South Route base concept would be aligned along the northern edge of the existing right-of-way with a four-lane extension of the Highway 7 Eastern Bypass to Horne Street. East of Horne Street, the 4-lane bypass would include right-in/right-out connections to the local street system. The four-lane bypass would transition to an overpass of the CPR tracks through to a new signalized intersection at Stave Lake Street. East of Stave Lake Street, the bypass would be two lanes. New signalized intersections along the bypass would be located at Durieu Street (with two eastbound left-turn lanes) and Horne Street (realigned intersection). Durieu Street and Horne Street would serve north-south traffic connecting District traffic to the Highway and the Mission Landing area via the existing Murray Street and a new James Street overpass.

It should be recognized that the configuration of the local area network serving the Mission Landing area should be refined through subsequent stages of planning the waterfront area’s land use and transportation system.

Figure 6.1 presents the forecast 2026 PM peak hour traffic volumes and intersection levels of service (LOS) for the preferred South Route base concept. In general, each intersection will operate at a LOS ‘C’ or better.

Figure 6.1: Forecast 2026 PM Peak Hour Traffic Volumes and Levels of Service (LOS)

(PREFERRED SOUTH ROUTE BASE CONCEPT)
6.1 Sensitivity Assessment of Second Downtown Crossing

Further development of the preferred South Route base concept was carried out to determine the sensitivity of the Highway 7 Eastern Bypass without the second crossing at James Street. Given that macro-level forecasts have not been considered in this analysis and that reliable transportation models have not been developed to determine the impacts of diverting vehicle traffic to other streets in Central Mission as well as the Cedar Valley Connector, a comprehensive assessment of how the broader area road network would respond to only one crossing at Murray Street was not conducted. However, a sensitivity assessment of the local area network was prepared – primarily along the Highway 7 Eastern Bypass (see Section 6.3) to assess the spare capacity of the intersection considering overall growth and development patterns. In this regard, the District and Ministry will want to consider alternative transportation improvements beyond this analysis to determine the need for the second crossing between the Waterfront and downtown Mission.

In order to provide some understanding of the general impacts of background growth in the area, a high-level review of the existing and long-term conditions at the intersection of Highway 7 with Cedar Valley Connector and Highway 11 was prepared.

The intersection of Highway 7 with Cedar Valley Connector and Highway 11 is currently signalized with double left turn lanes on westbound Highway 7 and northbound Highway 11. To analyze the existing traffic conditions at this intersection, traffic information was provided by the Ministry in October 2007. Figure 6.2 summarizes the existing PM peak hour traffic volumes at the intersection. In general, the predominant travel pattern is between Highway 7 (west) and Highway 11 as indicated by the traffic volumes for eastbound Highway 7 to southbound Highway 11 and from northbound Highway 11 to westbound Highway 7 (approximately 800 vehicles during the afternoon peak hour). Today, the overall intersection LOS is ‘D’ based on optimal signal timings.
Future background traffic volumes were forecast for horizon years 2011, 2016, 2021 and 2026 to evaluate future background traffic conditions. Consistent with the projected population growth in the District of Mission, an average annual growth rate of 2 percent was applied to the existing traffic volumes at the intersection to determine the future background traffic volumes for the future horizon years. Similar to existing conditions, the dominant travel pattern would continue to/from Highway 7 (west) and Highway 11 with afternoon peak hour traffic volumes ranging between 800 and 1,200 vehicles. Figure 6.3 summarizes the future background turning movement traffic volumes (2011, 2016, 2021, and 2026) and intersection LOS. Based on the high-level results, the intersection would experience significant delays by year 2021 (LOS ‘E’) and failing levels of service by 2026 (LOS ‘F’).
6.2 Preferred South Route Concept Development

Figure 6.4 summarizes the forecast 2026 PM peak hour traffic volumes and LOS for the preferred South Route concept without the James Street overpass. Travel between Central Mission and the Mission Landing area, as well as other municipalities west of Mission would alternatively use the Cedar Valley Connector at Highway 7 via Highway 11.

A sensitivity assessment of the preferred South Route concept without the James Street overpass when compared to the preferred South Route base concept indicates the following:

- Traffic would increase on the Murray Overpass (approximately 200 vehicles both directions);
- Traffic volume increase along the Highway 7 Eastern Bypass just west of Durieu Street (approximately 550 westbound and 200 eastbound);
- Similar to the preferred South Route base concept, all intersections would operate at LOS ‘C’ or better during the afternoon peak hour.

**Figure 6.4: Forecast 2026 PM Peak Hour Traffic Volumes and Levels of Service (LOS)**

*(Preferred South Route Concept)*
In support of the forecast traffic patterns without the James Street crossing, Figures 6.6a and 6.6b illustrate the proposed intersection and corridor geometrics for the Highway 7 corridor and interconnecting major roadways. In general, the preferred South Route concept is similar to the base concept (see Section 6.1) with the following key changes in the design concept:

- Provision of northbound double left-turn lanes on Durieu Street to westbound Highway 11;
- Provision of northbound double right-turn lanes on Durieu Street to eastbound Glasgow Avenue and only a single right-turn lane on northbound Horne Street to eastbound Glasgow Avenue.

Facilities such as bicycle lanes, sidewalks and boulevards are also provided to support transit, cycling and walking. Figure 6.5 presents the typical cross-sections of the main corridors (see Figures 6.6a and 6.6b for typical cross-section locations). In general, the typical cross-section ranges between 32 to 39 metres in width and consists of travel lanes (3.3 and 3.5 metres wide), a centre median (1.3 metres wide), bicycle lane and sidewalk (each 1.5 metres wide), and a boulevard (1.0 metres wide). An additional 2.0 metres of right-of-way is preserved from the sidewalk edge to accommodate utilities.

A variation of the preferred South Route concept may consider retaining the original alignment of Horne Street (see Section 4.2). The original alignment would have shorter intersection spacing between Horne Street and Durieu Street (approximately 175 metres) and limit the eastbound left-turn storage length at Horne Street. To reduce the potential queue impacts of the eastbound left turn movement at Horne Street, the eastbound left turn lane would be removed and the local road of Harbour Avenue via Durieu Street may be used as an alternative route. This alternative option of the preferred South Route concept will need to be examined in greater detail through the planning for the Mission Landing area to account for, but is not limited to, travel pattern changes, travel demands, potential impacts to local access and circulation and intersection performance.

6.3 Property Impacts and Requirements

Based on main corridor cross-sections and additional preservation of 2 and 5 metres right-of-way from the sidewalk edge, Figures 6.6 and 6.7 illustrate the property impacts and requirements. Table 6.1 provides a summary of the number of properties impacted, area of impacted properties and developable area.
### Table 6.1: Property Impacts and Developable Area

<table>
<thead>
<tr>
<th>Additional Right-of-Way Preservation¹</th>
<th># of Properties Impacted</th>
<th>Area Impacted Properties (m²)</th>
<th>Developable Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 metres</td>
<td>66</td>
<td>14,925</td>
<td>57,685</td>
</tr>
<tr>
<td>5 metres</td>
<td>95</td>
<td>20,740</td>
<td>51,280</td>
</tr>
</tbody>
</table>

¹ Distance from sidewalk edge of 2m if area properties were raised, or 5m from edge of sidewalk to toe of slope if adjacent properties remain at current levels.