TRANSPORTATION PLANNERS AND ENGINEERS

Oakridge Centre Rezoning
Transportation Assessment

Final

Prepared for

Ivanhoe Cambridge & Westbank Projects Corporation

Date

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Prepared by

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EXECUTIVE SUMMARY

1. Transportation Sustainable Development

Ivanhoe Cambridge, the owner of Oakridge Centre, and its residential partner Westbank Projects have conceived an ambitious and innovative master plan for Oakridge Centre. Driving the planning and scale of this mixed-use community is its designation within the Metro Region as a Municipal Town Center, the site's central location in the City of Vancouver and its direct connections to two major bicycle routes, the Canada Line and the broader public transit system including future rapid transit provision along the 41st Avenue corridor. The City of Vancouver, through the 2020 Greenest City Action Plan and Transportation 2040, has set a course towards a more sustainable and efficient transportation network over the next decade. Implementation of this vision requires bold decisions on land use and density to provide as many people as possible with the opportunity to choose transit, cycling or walking over the automobile as their primary mode of transportation. Oakridge Centre presents a pivotal opportunity to place significant commercial and residential density in a location that will encourage multiple alternative modes of transportation.

Among the specific transportation initiatives proposed in the Oakridge Centre master plan:

- Upgrades to the Canada Line station and plaza to ensure the design of the new Oakridge Centre encourages and optimizes transit use of both Skytrain and buses;
- Reduced parking for the residential component compared to conventional developments and a one-third lower commercial parking ratio than exists today;
- A "Car Club" to provide Oakridge residents with access to vehicles when needed;
- A bike share program for residents, a bike valet for visitors and significant improvements to the designated bike routes that pass by or through Oakridge Centre;
- Traffic calming measures in the surrounding neighbourhood, including a new local street along the edge of the master plan, designed to serve as a buffer between some of the new residential units and the existing residential neighbourhood;
- An efficient, high-ceilinged, and easily navigable parkade with improved all-movement access points off 41st Avenue and Cambie Street.

2. Cycling and Pedestrian Connections

Oakridge Centre with its expansive areas of surface parking separating buildings from the street edges has long presented a physical barrier to the continuity of walking and cycling routes in the

neighbourhood. With the relocation of this parking beneath the new buildings, these barriers are eliminated which enables the creation of new pedestrian and cycling and public realm connections to serve both the new and existing residents, employees and visitors in the area.

Separated two-way bicycle paths will be provided along both the Cambie Street and 41st Avenue frontages of the Oakridge Centre site. In addition, a new bicycle path will be constructed on the western portion of the site, providing a continuation of the Heather Street bike route north-south across the development.

A total of 4,310 bicycle parking spaces will be provided including over 3,600 for the new residents and 570 for customers and employees of the commercial and community uses. A bike share program with space for 100 bicycles complete with high-speed elevators from the P4 level to grade will also be in place, providing access to a bicycle whenever required by residents. In addition, an innovative bike valet drop-off service accessed from Cambie Street will provide a convenient option for cyclists visiting the area to store their bicycles securely while spending time shopping, dining or visiting the park or community centre.

3. Public Transit

Transit access is a key element of the Oakridge master plan. Prior to the introduction of the Canada Line in September 2009, transit accounted for about 12% of trips to Oakridge. That figure has increased nearly threefold to 33%, and is anticipated to further increase over time with increased service frequency added to the Canada Line and the anticipated future introduction of a B-Line bus transit operation on 41st Avenue.

Presently up to 1,600 transit passengers (per hour, during the weekday afternoon) access the Canada Line at the Oakridge Station. This is anticipated to increase by 2,300 passengers within the next five years with initial phase redevelopment at Oakridge and ultimately reach 2,900 – 3,000 passengers at project completion in 2025.

TransLink has confirmed that the Canada Line can serve more than double the passengers it presently does by:

- Increasing frequency of service (e.g. service every 2 minutes vs. every 3 minutes);
- Adding trains that have greater carrying capacity; and
- Ultimately extending station platforms.

Just as the demand for transit on the Canada Line can build over time with the phased development at Oakridge and elsewhere along the system, potential capacity increases are possible with the measures outlined above and can be achieved incrementally over time.

Being located outside of the Downtown and Broadway Corridor areas, development at Oakridge Centre will permit a better balance at the peak rush hour periods with travel demand; i.e. the mix of land uses allows for a more efficient use of surplus transit capacity in off peak directions.

The Oakridge master plan also identifies increased bus stop dwelling space along the increasingly popular 41st Avenue transit corridor. Public realm enhancements at the plaza at 41st Avenue and Cambie Street will deliver a gateway treatment that embraces and stimulates how people enter the centre and this will extend along Cambie and 41st Avenue.

4. Parking

Residential Parking

Auto ownership levels are trending lower in Vancouver and most new residential developments in the City are being built with parking that is underutilized. The Transportation 2040 plan acknowledges this and seeks to develop lower parking ratios around transit stations as a means of encouraging more sustainable travel modes, as well as reducing housing costs.

Oakridge Centre's residential will be served by less than 50% of the parking capacity of a typical project in the City and support reduced vehicle trips to and from Oakridge Centre.

A total of 1,400 resident use parking spaces are planned for the proposed 2,914 residential units. To help new residents make the choice to live car-free, up to 100 spaces will be provided for an Oakridge-specific car share program that will go beyond the offerings of existing public car share operators in Vancouver.

Commercial Parking

Compared to today, commercial parking ratios at Oakridge Centre will reduce by one-third. This reduction is facilitated by improved transit ridership to the Centre, expected increases in 'walk-up' traffic by on-site and local area residents, and the sharing of parking with office tenants, the community centre and retail.

Broader trends support a reduced commercial parking ratio as customer and staff parking demand at Oakridge during the pre-Christmas period has decreased by over 25% in the past 10 years. This trend is expected to continue.

A total of nearly 5,400 spaces are planned for customers and employees in support of the 2 million square feet of commercial retail, community and office uses. This parking will also be available for use by visitors to the residential buildings as the peak visitor demand typically occurs in the evening period when commercial parking activity is lower.

The underground parkade system will be thoughtfully designed with ample lighting, high ceilings and clear directional signage to allow easier navigation than what exists today.

5. Traffic

Oakridge Centre presently generates approximately 50 vehicle trips per minute on the area road system during both the weekday and Saturday afternoon peak periods.

Redevelopment is anticipated to increase vehicle trips to approximately 80 vehicles per minute during the weekday PM peak period, and 85 vehicles per minute during the Saturday afternoon peak period. Approximately one-quarter of the increase is associated with the proposed new residential development and three-quarters with new commercial and community development.

Existing traffic-calming measures in neighbourhoods adjacent to Oakridge Centre have contributed to lowering the amount of Oakridge Centre traffic travelling residential streets and the Oakridge transportation plan will continue with this strategy.

Truck access will be exclusively from Cambie St. and almost all vehicular traffic will access the site from either 41st Ave. or Cambie St. A new residential street proposed on the west and south edge of the Oakridge site is being designed specifically to limit new traffic movements through existing residential neighbourhoods, and will not allow shortcutting from 41st to 45th Avenue. Other traffic calming measures on existing neighbourhood streets may also be implemented as needed to ensure that Oakridge Centre's local traffic impacts are minimized.

Primary vehicle access points to Oakridge will continue to be on Cambie Street and 41st Avenue, while the vehicle access at 45th Avenue will be more limited compared to the existing arrangement.

A comprehensive traffic impact assessment of existing and projected future traffic volume conditions on the area road system has been undertaken. Additional vehicle movements associated with the Oakridge master plan are expected to be largely offset by anticipated continuing decrease in longer distance vehicle trips that use the Cambie Street and 41st Avenue corridors away to other corridors, retiming journeys and switching to other modes, in particular transit.

Many of the transportation items outlined above are illustrated in **Exhibit ES 1**, as an overview of the transportation components of the site plan.

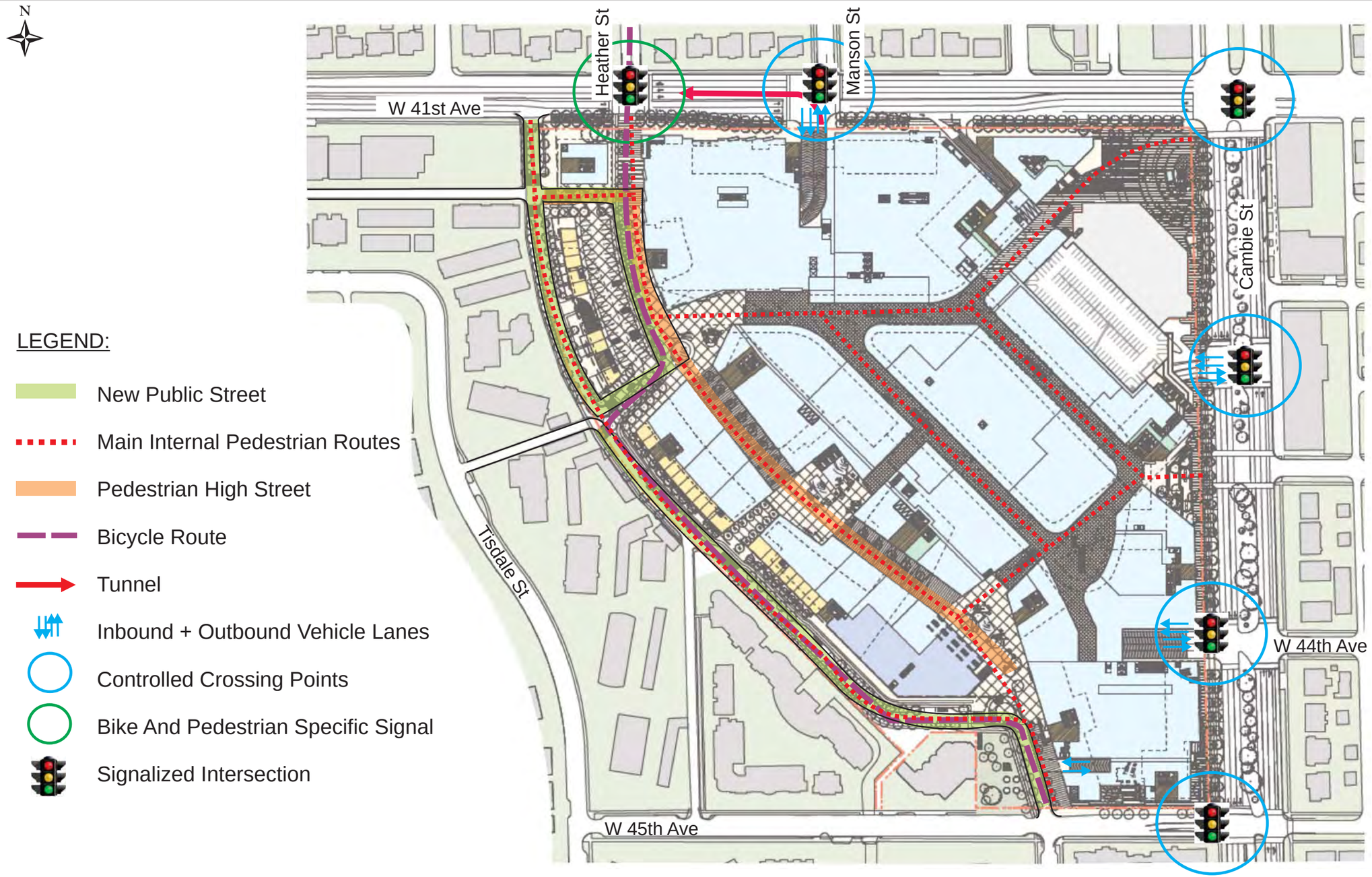

Exhibit ES 1

Site Plan and Key Transportation Features

Oakridge Centre Rezoning TA Draft Report
4241.26 October, 2013 Scale NTS

bunt & associates

1. INTRODUCTION

1.1 Purpose of Report

Ivanhoe Cambridge and Westbank Projects Corporation are planning on a major redevelopment of the existing Oakridge Mall, located at 41st Avenue and Cambie Street in Vancouver, BC. Oakridge is currently dominated by commercial use, with some supporting office and very limited residential. Redevelopment would increase the both density and the mix of uses to maximize the benefits of the site's location adjacent to a rapid transit station.

This Transport Assessment supports of the Rezoning Application and covers many transportation related issues that are critical to the success of the site, such as travel demand forecasting, expected increases in transit use, bicycle connectivity within and to/ from the site, parking demand and supply, vehicular access points and traffic impacts.

An innovative movement and access strategy will contribute greatly towards a high quality, landmark development that is seeking to place sustainability at its heart. This is critical as the project is aiming to achieve LEED ND Platinum status. In terms of transportation and access, this involves ensuring that the inclusion of more sustainable forms of transportation into the fabric of the site is maximised while creating an extremely high quality pedestrian experience within the development itself. The volume of density proposed is such that the site will inevitably still be required to accommodate a high number of vehicles, both in terms of access and parking. Exhibit ES1 highlights the key transportation features of the development.

1.2 Policy Background to Rezoning

The Oakridge Policy Statement was completed in 2007, envisioning higher densities than at present and a higher degree of mixed use. In terms of design, one of the key features proposed was the creation of a new street through the site, along with a high degree of pedestrian mobility. Subsequent to this, the Cambie Corridor Plan (2011) envisages higher densities along the Cambie Corridor in general as a result of the Canada Line, while aiming to promote the neighbourhood as a walkable mixed-use urban centre. Oakridge is envisioned to be one of the densest communities along the corridor.

A Rezoning application for the site was submitted in Autumn 2012 and responded to this previous planning work. Since then, extensive public consultation has occurred, along with significant input from the City. As a result, the amended Rezoning Application submitted in September 2013 differs from the 2012 submission in many ways with regard to transportation and these changes are reflected in this report.

1.3 Proposed Development

The current Oakridge site is approximately 706,350 sq ft in size (GFA). **Table 1.1** outlines the estimated statistics for the redeveloped site.

Table 1.1: Development Statistics

Use	GFA (SQ FT)
Retail	1,470,000 (1.2m GLA)
Office	420,000
Community	70,000
Sub-Total	*1,960,000 (1.6m GLA)*
Residential	2,700,000 (2,914 units)
Total	**4,660,000**

Note: Rounded to nearest 10,000 sq ft.

A total of nearly 4.7m sq ft of development is proposed on the site and is almost seven times the size of the current development on site. Retail alone is approximately twice what is currently provided and the residential component represents nearly 60% of the new density on the site with office at 10% and retail and amenity areas approximately 30%. Office and community facilities will include a library, a senior's centre and a daycare.

Density proposed is significantly higher than that contained in the 2007 Oakridge Centre Policy Statement and this report demonstrates an access strategy to fully support this change.

Proposed parking supply is summarized in **Table 1.2** and it confirms that around 6,900 spaces are planned with about 20% allocated to residential and the remaining ones for commercial activities.

Table 1.2: Proposed Parking Supply

Use	Number of stalls
Non Residential	5,399
Residential	1,400
Car Co-op	100
Total	**6,899**

Sections 8 and 9 outline the proposed parking supply and estimated demand in more detail.

1.4 Report Outline

In order to provide an effective transportation assessment, many different aspects have been considered, including policy context, site plan review, transit integration, pedestrian and bicycle planning, parking policy, trip generation, traffic operations and internal site circulation. Each Section of the report is briefly summarised below.

1.4.1 Policy Review

Outlines the policy background to the site, reviewing the Oakridge Policy Statement, Cambie Corridor Plan and Transportation 2040 as they relate to Oakridge.

1.4.2 Travel Demand Forecasting

Estimates the number of new person trips to and from the Oakridge site once it redevelops and includes estimates for three critical time periods: the weekday AM peak-hour, PM peak-hour and Saturday peak-hour. Person trips are broken down by transportation mode to project future pedestrian, bicycle, transit and vehicle trips.

1.4.3 Transportation Demand Management

Sets out various TDM measures proposed to promote sustainable forms of transportation and make most efficient use of the parking supply, as well as the access and egress points. Measures will be tailored to appeal to residents, employees and shoppers.

1.4.4 Street Plan and Access Review

Reviews key elements of the site plan as they relate to access and movement and includes the pedestrian street, New Street, on-site bicycle connections, access points, transit plaza, and underground parking and loading access.

1.4.5 Pedestrian and Bicycle Connectivity

Outlines how travelling to and from the site by foot or by bicycle will be made as convenient as possible. In particular, connections to the Heather Street and 45th Avenue bikeways are reviewed, as well as connections to and from the New Street. Connections from the surrounding community are also highlighted and how they will improve on the current situation.

1.4.6 Transit Capacity

Current and future demand for transit at Oakridge is covered, both for the Canada Line and by bus transit. Capacity at Oakridge Canada Station, including line capacity is reviewed within the context of the expected future volumes.

1.4.7 Retail, Office and Community Use Parking

Current and future parking supply and demand for the non-residential components of the future Oakridge site is presented along with context of the bylaw requirements and leasing requirements from anchors.

1.4.8 Residential Parking

Anticipated demand and supply of residential parking is outlined for the different housing types, each with their own ratio of parking. Overall the ratio is relatively low compared to the bylaw and the proposed car club will be described and how it can offset demand for residential parking.

1.4.9 Existing Traffic Operations

Current traffic operations at the site driveways and surrounding intersections are presented, including intersection laning and controls.

1.4.10 Trip Generation

Future vehicle trip generation for the site is developed, including internal trips, pass-by and linked trips.

1.4.11 Future Vehicle Access and Laning

Vehicular access strategy for the site in terms of number, location and type of access are articulated along with a review of traffic distribution and assignment.

1.4.12 Future Traffic Analysis

The future Oakridge site is still anticipated to generate more traffic than the current site does today. This section outlines the future traffic operations at the access points and surrounding intersections. It considers what has to happen to background traffic in order to accommodate the additional site trips.

1.4.13 Internal Vehicular Site Circulation

Briefly outlines the underground parking circulation, retail and residential loading and valet parking operations.

1.4.14 Phasing

Outlines the proposed development phasing and the impacts on the site accesses and circulation. More information on traffic operations and circulation for each phase will be provided in a timely manner as the plan moves forward.

1.4.15 Conclusion and Next Steps

The final section summarizes key aspects of the report and highlights what transportation related work is still required to be completed, outside of this Transportation Assessment.

1.4.16 Appendices

Appendices contain the following:

- The Green Mobility Strategy: Highlights elements of the Transportation Assessment to promote sustainable forms of transportation beyond what is required by the bylaw. It is split into two sections, design elements and policy elements.

- Traffic Operations Output: Covers existing and future conditions in more detail that contained in the main report.

2. POLICY REVIEW

2.1 Introduction

This section briefly reviews the Oakridge Centre Policy Statement (March 2007) and the Cambie Corridor Plan (2011) as they relate to transportation issues for the Oakridge development. For a wider more policy focused context, the City of Vancouver's Transportation 2040 Plan is also reviewed, along with TransLink's Regional Transportation Strategy.

2.2 2007 Oakridge Centre Policy Statement

Material changes have been made to the development plan since the Oakridge Policy Statement was established six years ago in respect to overall density and specific site plan elements. This review serves as a check on see how the new plan meets the objectives of the Policy Statement in relation to transportation and access.

2.2.1 Overall Policy Direction

- The Policy states that it is designed to be flexible enough to accommodate a variety of detailed plans and options.
- The current plan calls for more density (and in turn more traffic and parking requirements) than the Policy proposes. This Transportation Assessment will show how this additional traffic and parking can be accommodated while meeting the other objectives.
- The Policy wishes to provide ease of access to groceries and shopping which the plan will do by providing a greater variety of stores, including an improved supermarket.

2.2.2 Vision and Key Principles

- The Policy calls for a parking plan which encompasses Transportation Demand Management (TDM) measures to promote transit orientated development, while respecting existing contractual and lease agreements. TDM forms a key component of this report and commercial lease requirements will be respected.
- The Policy states permeability and connectivity are very important to the neighbourhood and pedestrian mobility is a priority. The pedestrian only High Street, design of New Street to prevent shortcutting from 41st to 45th, and connections to the neighbourhood to the High Street plazas as well as pathways across the roof top commons to the Community Centre and internally through the reconfigured mall runs achieve this goal, promoting pedestrian mobility as a priority. Pedestrian linkages through the mall to the community centre and the neighbourhood will be open during transit operation hours while the anchor stores will have entry/ exit points onto Cambie Street and 41st Avenue.

- Under 'Street Network' the Policy asks for a public street to be dedicated through the site, which is also specifically mentioned later. New Street on the western edge of the site will be dedicated to the City integrating the site with the surrounding neighbourhood and public access rights of way will be registered over the roof top commons and associated pathways to ensure public access rights. In addition, the main mall runs leading to the community centre and the neighbourhood from the Transit Plaza and Cambie Street will remain open to the public during the operating hours of Skytrain. We believe that this meets the broad objectives of promoting pedestrian mobility. The Policy expects Cambie Street to have street front retail to help animate the sidewalk. A pocket park has been created on Cambie with stores fronting directly onto the street between the two access driveways. The previously proposed additional Anchor fronting on Cambie has been split into a number of smaller junior anchors with the potential for both street front entries and internal mall access. In addition, the grocery store will have its main entrance fronting onto Cambie.

- The Policy expects Cambie Street to have street front retail to help animate the sidewalk. This will occur, with stores fronting directly onto the street between the two access driveways.

- The Policy wishes to reduce the number of vehicle crossings and accesses into the mall, especially on the 41st Street side. The 6 existing vehicular accesses onto 41st Avenue will be reduced to 3 by focusing vehicle traffic on fewer, higher capacity locations. The 4 existing access points onto Cambie will be reduced to 2..

- The Policy calls for the parks and open spaces to be connected via walking and cycling routes. There will be a high number of pedestrian connections to a green 'commons' on the roof of the existing mall which will be directly connected to the High Street and external points.

2.2.3 Land Uses

- Section 3.1.7 looks to secure through legal agreements a pedestrian route through the mall from the High Street to the Canada Line Station that should remain open during all hours of operation of the Canada Line. This is an important planning consideration and has been considered and agreed to in the master plan.

2.2.4 Transportation and Circulation

- This section aims to emphasise the transit oriented design, promoting access to the Canada Line Station and pedestrian mobility. Cambie Street and 41st Avenue are highlighted as important pedestrian routes and spaces.

- This section promotes better integration of the site with the Canada Line station to encourage pedestrian connections and mobility. An enhanced transit plaza incorporating public art will help to achieve this aim.

- Section 5.1.8 mentions improved pedestrian crossings on 41st Street and Cambie Street. This will be achieved through the signalisation of the key accesses for the site, creating more formalised, controlled and safer crossings on these two busy roads.

- Section 5.1.9 mentions the importance of connecting the Heather Bikeway through the site to the Ontario Bikeway via 44th or 45th Avenue. The bicycle route planned for New Street will achieve this goal supported by the bicycle and pedestrian only crossing of 41st Avenue at Heather Street. This is a strong design statement regarding the importance of bicycles and pedestrians.

- Section 5.1.11 mentions that a comprehensive TDM Plan will be required at Rezoning Stage. This is incorporated into this report.

- Section 5.2.1 calls attention to the Cambie Heritage Boulevard and the desire to preserve it if possible. New left outs are required from the Mall onto Cambie Street which will result in some loss of the boulevard. Offsetting this be opportunities to add boulevard at current 'gaps' which can be filled.

- Section 5.2.3 highlights the need for pedestrian friendly design of the High Street. As the current plan calls for a pedestrian only high street, this aim would be met in the strongest way as the removal of vehicles from the street will provide greater space, improved air quality and opportunities for enhanced public realm.

- Section 5.2.4 mentions that the City would allow parking under the new street, under certain parameters. This reflects the current design and creates a more efficient parking arrangement.

- Section 5.2.5 suggests making the 41st Avenue exit tunnel two way. However another right-in movement travelling eastbound, in addition to the two main accesses provided from 41st Avenue is not warranted to meet the projected movements from this direction.

- Section 5.2.9 mentions that vehicular entry points should be contained within buildings. The new main accesses on Cambie Street and 41st Avenue enter into ramps situated directly beneath buildings. Other access points are modifications to existing accesses.

- Section 5.2.11 says there should be no commercial parking access off 45th Avenue. The plan has removed all access to commercial parking from 45th Avenue onto New Street and Cambie Street. The grocery store access is located on New Street.

2.2.5 Image and Character

This section also refers to improved pedestrian crossings on Cambie Street, including consolidated pedestrian, vehicle and bicycle crossings, all of which are being provided.

2.3 Cambie Corridor Plan

2.3.1 Overview

The Cambie Corridor Plan focuses on the implementation of policies that will support a greener and more liveable future along the corridor and neighbouring communities. The Cambie corridor, along with Broadway and the downtown core, has the opportunity to become one of the key areas to develop true urban street fronts within the Vancouver region. The plan focuses on prioritizing walking and cycling, and the integration of energy, transportation and land use concepts for the future communities; these elements refer to:

- Neighbourhood character;
- Environmental components;
- Sustainability Initiatives and population growth;
- Energy and utilities; and,
- Growing economy along the Cambie Street.

The geographic scope of the plan is centered along Cambie Street from the Fraser River to the south, up to 16th Avenue to the north. It comprises four existing Canada Line Stations, including the Oakridge / 41st Avenue Station which is located adjacent to the Oakridge Centre.

2.3.2 Oakridge Town Centre

Along Cambie Street, the Oakridge Town Centre is a lively urban neighbourhood with local shops that serve the community. The plan for this area is to enhance the design of pedestrian and bicycle facilities in order to promote the neighbourhood as a walkable mix-use urban centre. As a town centre, Oakridge is envisioned to be one of the most dense communities and urbanized areas along the corridor with significant concentration of commercial, office and residential uses.

Mixed-use developments are planned for this area with an emphasis on mid to high-rise buildings and ground level retail, office and services uses. Landscape and streetscape elements have special considerations to enhance the walking environment and attractiveness of the site.

Walking and Cycling

The plan provides guidelines for long term improvements along the Cambie corridor with special emphasis on walking and cycling. In order to enhance the pedestrian and bicycle environments, improvements to the existing streetscape and connectivity to and from the site are required. Some of these improvements include:

- Wider sidewalks connecting shopping areas with rapid transit stations;

- Facilities such as bicycle lockers, parking, racks, benches, and lighting;
- Accessible public plazas and small spaces for pedestrians; and
- Connection to the city bike network and pedestrian pathways.

Traffic Management and Parking

The plan will continue to support traffic calming programs and reduction of parking requirements to support sustainable transportation modes. Implementation of parking reductions will be considered for sites in close proximity to rapid transit stations, given that the results will not increase on-street parking demand.

Transit

TransLink and City staff recognize that transit service upgrades are required to meet the demand of the corridor's future growth. Transit improvements along Cambie Street include increasing the capacity of the Canada Line, increasing east/west bus services, upgrading transit stop facilities, promoting safe and convenient routes, and developing efficient transit services and schedule coordination.

2.4 Greenest City Action Plan

The City of Vancouver's strategy to become the greenest city in the world by 2020, is outlined in the Greenest City Action Plan (GCAP). The plan's vision describes how sustainable opportunities will be created alongside the development of a strong local economy and inclusive neighbourhoods. A major component of the plan involves green transportation, via two targets:

- make the majority (over 50%) of trips by foot, bicycle, and public transit.
- reduce average Distance Driven per resident by 20% from 2007 levels.

Highest priority actions to achieve these targets include provision to develop and implement active transportation and pedestrian plans, supported through land use policies. Key strategies include the planning of complete communities, where goods and services are supplied within a 10-min walk from where people live and that encourage walking, cycling and transit. The target is to be supported through the avocation of policies that encourage lower auto ownership via support for car share and better management of street parking, among others.

2.5 Transportation 2040 (City of Vancouver)

The objective of the *Transportation 2040 Plan* (2012) is to support and facilitate a multi-modal city, by making a variety of choices available to residents and visitors of Vancouver. Included in the plan are a range of land use directions/ actions, which in summary, promote a dense and diverse land use mix, where the major trip generators are well located, near rapid transit stations and transit corridors. Additionally, the plan includes a host of actions to promote walking and cycling, via safe and well

designed, easily accessible and holistic networks for these modes, which are usable for all ages. Furthermore, specific actions call for the provision of abundant, high-security cycle parking and end-of-trip facilities.

Parking policy is the City's biggest opportunity to effect change, given it can influence many factors, including: travel choice and housing cost, and can significantly impact public realm. The plan outlines a policy to use off-street parking requirements to support lower auto ownership; in particular, to: "Develop and implement a strategy to: eliminate minimum parking requirements … near rapid transit stations, and for guaranteed rental residential developments".

Oakridge redevelopment includes low parking ratios for the residential units, a pedestrianised High Street, accessible and convenient bicycle routes to, from and within the site, high quality end-of-trip facilities for cyclists and of course the location itself adjacent to the Canada Line station all fully embrace this strategy.

2.6 Regional Transportation Strategy (TransLink)

The first component of TransLink's 30-year transportation strategy, the *Regional Transportation Strategy* (July, 2013) outlines how progress can be tracked via 'headline targets'. The first target (identified in transport 2040) is to" make it possible for half of all trips to be made by walking, cycling and transit".

Transportation strategies and actions summarized in the report outline a variety of strategic investments to the walk, bike and transit networks. Additionally, the report calls for the transportation system to be user-friendly, with provision for sufficient bicycle parking, and ensuring vehicle parking is not over supplied and frequently free.

Once again, by placing this much density adjacent to a rapid transit station, the new Oakridge development will make a critical contribution to toward the policy plans and targets.

3. TRAVEL DEMAND FORECASTING

3.1 Introduction

This section aims to estimate the future number of people travelling to and from the development during peak times and by different travel modes. This will be used to estimate the number of new transit trips and their impact on the Oakridge Canada Line Station, as well as the number of new vehicle trips and their impact on the site accesses and surrounding intersections.

Time periods considered are the weekday AM and PM peak-hours, alongside the Saturday peak-hour. Modal splits and person trips are estimated for each of the four main land uses planned on the Oakridge site: residential, retail, office and community use.

The following analysis is based on data collected by Bunt & Associates and Ivanhoe Cambridge, through on-site observations and surveys.

3.2 Current Peak-hours

The first step in this assessment is to establish the peak hour periods. The peak travel periods vary and are dependent of the mode and land-use considered. The peak-hours of various elements of the transportation system are compared in **Table 3.1**.

Table 3.1: Oakridge Transportation Networks and Nodes

Mode/ Element	Peak-hour		
	Weekday AM	Weekday PM	Saturday
Oakridge Mall (vehicle trips)	8:00-9:00am	3:30-4:30pm*	2:00-3:00pm
Road Network (41st Ave & Cambie St)	8:00-9:00am	3:00-4:00pm*	2:00-3:00pm
Oakridge Station	8:00-9:00am	5:00-6:00pm	3:15-4:15pm
Canada Line Train Demand (at Oakridge Station)	7:45-8:45am	4:30-5:30pm	NA
Oakridge Bus Stops (W 41st Ave	8:00-9:00am	5:00-6:00pm	4:00-5:00pm
Bus Network (W 41st Ave)	7:30-8:30am	5:00-6:00pm	4:00-5:00pm

**Friday PM Peak*

For the AM peak, the peak-hour times are generally consistent across the networks and transportation 'nodes'; with most nodes typically peaking between 8:00 and 9:00am. The bus network peaks earlier at 7:30am, which may be due to the 41 and 43 bus routes connecting to UBC (classes begin at 8:00am). The PM peak-hour is more varied, beginning at 3:00pm the vehicle traffic and concluding at 6:00pm for the bus network. Similarly, the Saturday peak is also varied, ranging from 2:00 to 5:00pm

Person trips generated by the future Oakridge development will be added to the peak-hour volumes of each node and network in the following analysis. It provides a conservative estimate for future capacity considerations.

3.3 Existing Travel Demand and Mode Split

Traffic volumes at the existing Oakridge site accesses, dominated by retail with some limited office, were taken from counts conducted on November 19th and 20th, 2010 for the Friday PM and Saturday mid-day peak periods, respectively. Although these counts were originally conducted for an earlier stage of the Oakridge Centre redevelopment study, the site trips are not expected to have changed materially since that time. Existing vehicle trips are summarized in **Table3.2**.

Table3.2: Existing vehicle Trip for Oakridge Centre

Vehicle Trips	In	Out	Total
PM Peak-hour	1,415	1,453	2,868
Saturday Peak-hour	1,570	1,539	3,109

To determine the existing modal split, and resultant trips by other modes, the data summarized in Table 3.2 was combined with the following information:

- Modal Split Questionnaire Survey undertaken by Bunt & Associates on 19th and 20th November 2010 and repeated again in May 2013 with similar results;
- Ivanhoé Cambridge(IC) modal split survey data collected annually in April for 2010, 2011 and 2012.

In/ out splits were assumed to be consistent across travel modes and person trip were estimated from the IC customer questionnaire and is summarized in **Table 3.3.**

Table 3.3: Existing Mode Split and Person Trips

Mode	PM Peak-hour Trips		Saturday Peak Hr Trips	
	Percentage	Total Trips	Percentage	Total Trips
Car (Driver or Passenger)	55%	3,429	66%	3,584
Transit – Canada Line	22%	1,183	14%	634
Transit –Bus	11%	662	7%	317
Walk & Bike	9%	341	10%	436
Other	3%	201	3%	139
Total	**100%**	**5,816**	**100%**	**5,109**

Interestingly, there are more person trips to the mall during the weekday PM peak-hour than there are during the Saturday peak-hour. However, more vehicle trips were observed during the Saturday peak-hour and the difference could be explained by significantly lower transit mode split on that day, 21% instead of 33% (on a weekday).

3.4 Future Mode Split

In developing a future mode split, two scenarios were developed. One assumed a transit mode split for retail similar to what is currently present. This is based on the fact that the modal split at Metrotown has similar residential densities around it to what Oakridge envisages, still has a similar mode split to what is currently observed at Oakridge. Another scenario assumes cultural, societal and economic changes will mean that in the future, a higher mode split towards transit, and a lower one toward vehicles.

Similarly, for the office and residential uses, two scenarios were developed with higher and lower transit mode splits at the expense of the vehicle mode. Percentages were based on future projected mode splits used by Bunt & Associates in other TOD master planning projects, together with taking account of local context.

Low and high transit mode splits are summarized in **Table 3.4** and **3.5** respectively. The AM mode split was estimated from the PM split, but without the retail component given that retail stores are not open at that hour.

Table 3.4: Oakridge 2023 Modal Split: Lower Transit Mode Share

Mode	Retail	Office	Community	Residential
2023 –AM Peak				
Car (driver or passenger)	55%	56%	55%	42%
Transit Canada Line	22%	25%	22%	35%
Transit-Bus	11%	10%	11%	10%
Walk & Bike	9%	9%	9%	13%
Other	3%	0%	3%	0%
2023 –PM Peak				
Car (driver or passenger)	55%	56%	55%	42%
Transit Canada Line	22%	25%	22%	35%
Transit-Bus	11%	10%	11%	10%
Walk & Bike	9%	9%	9%	13%
Other	3%	0%	3%	0%
2023 –Saturday Peak				
Car (driver or passenger)	66%	69%	66%	38%
Transit Canada Line	14%	15%	14%	20%
Transit-Bus	7%	7%	7%	12%
Walk & Bike	10%	9%	10%	30%
Other	3%	0%	3%	0%

Table 3.5 Oakridge 2023 Modal Split: Higher Transit Mode Share

Mode	Retail	Office	Community	Residential
2023 –AM Peak				
Car (driver or passenger)	40%	45%	40%	35%
Transit Canada Line	30%	30%	30%	38%
Transit-Bus	12%	15%	12%	12%
Walk & Bike	15%	10%	15%	15%
Other	3%	0%	3%	0%
2023 – High Range Modal Split PM Peak				
Car (driver or passenger)	40%	45%	40%	35%
Transit Canada Line	30%	30%	30%	38%
Transit-Bus	12%	15%	12%	12%
Walk & Bike	15%	10%	15%	15%
Other	3%	0%	3%	0%
2023 – High Range Modal Split Saturday Peak				
Car (driver or passenger)	55%	65%	55%	30%
Transit Canada Line	17%	17%	17%	25%
Transit-Bus	10%	8%	10%	15%
Walk & Bike	15%	10%	15%	30%
Other	3%	0%	3%	0%

3.5 Future Travel Demand

Trip Generation in this section is projected for vehicles, passengers, pedestrians, cyclists, and transit users. It takes into consideration local characteristics, internal trips, mode choice and, for the commercial uses, pass-by / diverted trips.

Preliminary vehicle trip rates were obtained from the Institute of Transportation Engineers (ITE) Trip Generation Manual. The commercial trip rate category reference used was '820' Shopping Centre (Gross Leasable Area - GLA); office reference was based on category '710' (Gross Floor Area - GFA); and, the residential rate category '232' (unit numbers).

It is noted that the ITE trip generation rate for Shopping Centres is a close match to the observed trip rate at Oakridge. However the ITE rate was used for consistency of approach. However, the Trip Generation

section estimates vehicle trips based on the observed rate and the two methodologies are compared in that section.

A summary of the rates are presented in **Table 3.6**, covering the three study time periods, the weekday morning and afternoon, and Saturday peak-hour periods.

Table 3.6: ITE Vehicle Trip Rates

Retail Land Use	AM Peak-hour			PM Peak-hour			Sat Peak-hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Commercial per 1000 sq ft GLA	0.61	0.39	1.00	1.83	1.90	3.73	2.54	2.35	4.89
Office per 1000 sq ft GFA	1.36	0.19	1.55	0.25	1.24	1.49	0.22	0.19	0.41
Residential per Units	0.06	0.28	0.34	0.24	0.14	0.38	0.15	0.20	0.35

ITE trip rates are essentially from auto-oriented developments, where the majority of trip movements in the database are 85% / 90% auto focused. With the mixed-use compact design planned, accessible by walking, cycling and transit, ITE trip rates are not considered representative of the expected demands. However, they provide a good basis for developing person trip rates, which can then be broken down by different travel mode splits. A person trip rate conversion is presented at **Table 3.7.**

Table 3.7: Person Trip Rate Conversion

Retail Land Use	AM Peak-Hour			PM Peak-Hour			Sat Peak-Hour		
	Auto	Occ.	Trips	Auto	Occ.	Trips	Auto	Occ.	Trips
Commercial ITE (820)	90%	1.3	1.44	90%	1.3	5.39	90%	1.4	7.61
Office ITE (710)	90%	1.1	1.89	90%	1.1	1.82	90%	1.1	.5
Residential ITE (232)	70%	1.1	0.53	70%	1.1	0.60	70%	1.1	.55

Note: 'Auto' is auto mode split; 'occ' is car occupancy; 'trips' is the person trip calculated from the proceeding factors, based on the base ITE rates presented in the earlier table.

Future person trips were then calculated for each land use. It is assumed that the community use will have the same trip rate as retail and that AM trips could be estimated from PM rates. The person trips, by land use, are illustrated in **Table 3.8**.

Table 3.8: Future Person Trips

Peak Period	Retail	Office	Community	Residential	TOTAL
AM Peak-hour	1,728	794	101	1,544	4,166
PM Peak-hour	6,468	764	377	1,748	9,358
SAT Peak-hour	9,132	210	533	1,602	11,477

Finally, using the two mode splits described previously, the future person trips were split between travel modes. The low and high transit use scenarios are illustrated in **Table 3.9** and **3.10** respectively.

Table 3.9 Future Oakridge person trips by Mode (Low Transit Mode Share)

Mode	Retail	Office	Community	Residential	Total
2023 – Low Range Modal Split AM Peak					
Car (driver or passenger)	950	445	55	648	2,099
Transit Canada Line	380	198	22	540	1,141
Transit-Bus	190	79	11	154	435
Walk & Bike	156	71	9	201	437
Other	52	0	3	0	55
Total	**1728**	**794**	**101**	**1,748**	**4,166**
2023 – Low Range Modal Split PM Peak					
Car (driver or passenger)	3,557	428	208	734	4,927
Transit Canada Line	1,423	191	83	612	2,309
Transit-Bus	711	76	42	175	1,004
Walk & Bike	582	69	34	227	912
Other	194	0	11	0	205
Total	**6,468**	**764**	**377**	**1,748**	**9,358**
2023 – Low Modal Split Saturday Peak					
Car (driver or passenger)	6,027	145	352	609	7,132
Transit Canada Line	1,278	32	75	320	1,705
Transit-Bus	639	15	37	192	883
Walk & Bike	913	19	53	481	1,466
Other	274	0	16	0	290
Total	**9,132**	**210**	**533**	**1,602**	**11,477**

Table 3.10 Future Oakridge person trips by Mode (High Transit Mode Share)

Mode	Retail	Office	Community	Residential	Total
2023 – High Range Modal Split AM Peak					
Car (driver or passenger)	691	357	40	540	1,629
Transit Canada Line	518	238	30	587	1,373
Transit-Bus	207	119	12	185	524
Walk & Bike	259	79	15	232	585
Other	52	0	3	0	55
Total	**1,728**	**794**	**101**	**1,544**	**4,166**
2023 – High Range Modal Split PM Peak REPEAT OF AM					
Car (driver or passenger)	2,587	344	151	612	3,694
Transit Canada Line	1,940	229	113	664	2,947
Transit-Bus	776	115	45	210	1,146
Walk & Bike	970	76	57	262	1,365
Other	194	0	11	0	205
Total	**6,468**	**764**	**377**	**1,748**	**9,358**
2023 – High Modal Split Saturday Peak					
Car (driver or passenger)	5,023	137	293	481	5,933
Transit Canada Line	1,552	36	91	401	2,079
Transit-Bus	913	17	53	240	1,224
Walk & Bike	1,370	21	80	481	1,951
Other	274	0	16	0	290
Total	**9,132**	**210**	**533**	**1,602**	**11,477**

Exhibit 3.1 graphically illustrates the high transit mode split scenario in bar chart form.

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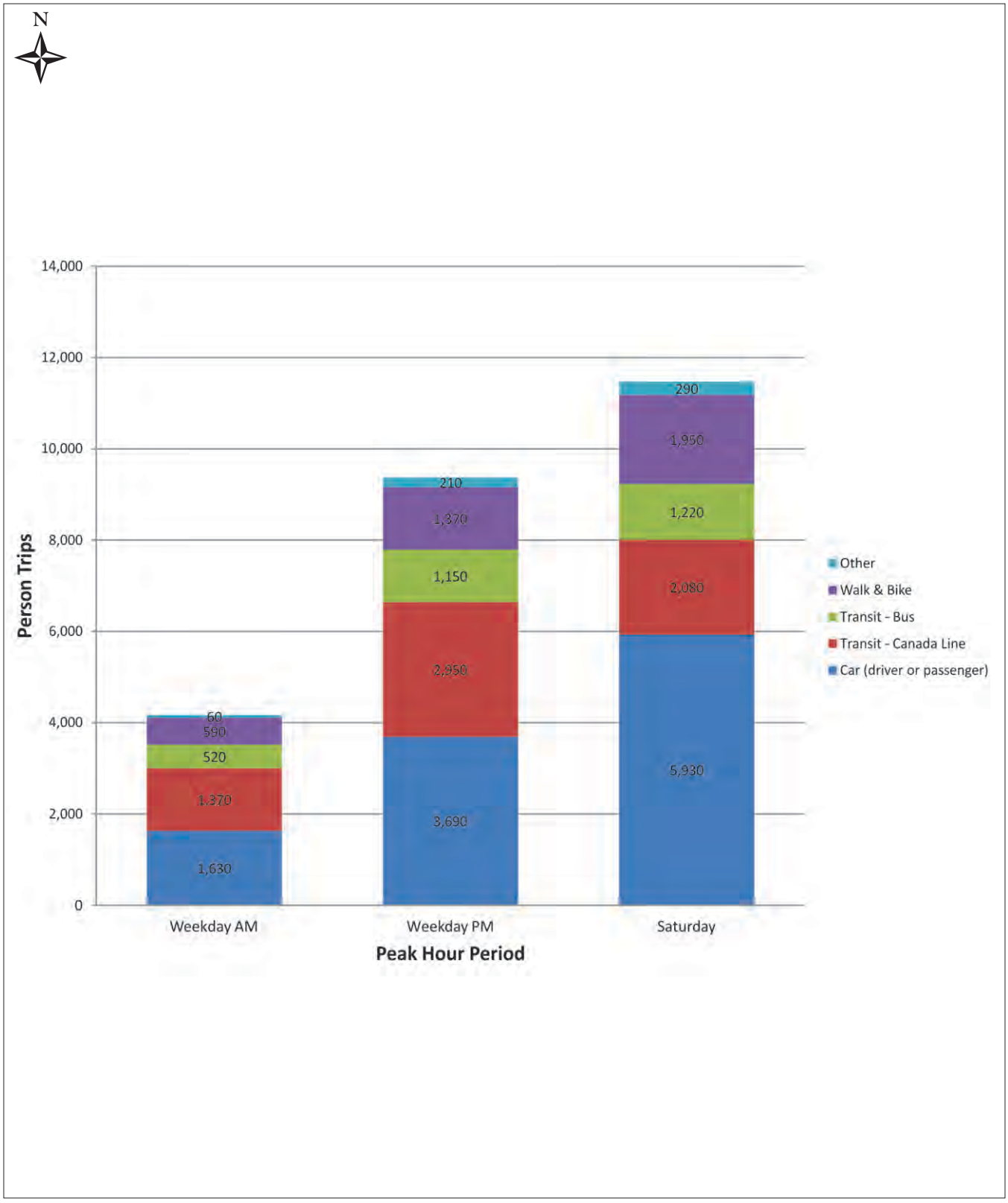

Exhibit 3.1

Total Future Person Trips: High Transit Use Scenario

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As indicated in the table and exhibit, the AM period generates the fewest trips, mainly as the retail uses are not yet open. The highest number of transit trips are experienced in the weekday PM peak-hour, while the highest overall person trip volume would be on the Saturday given the increased vehicles trips and the increased numbers walking and cycling.

It should be noted that the 'car' trips encompasses drivers and passengers and therefore do not represent the number of vehicles entering and leaving the site.

4. TRANSPORTATION DEMAND MANAGEMENT SUMMARY

4.1 Introduction

This section outlines policies and programs to encourage residents, employees and visitors to consider more sustainable travel choices. Transportation Demand Management (TDM) can be thought of as, "the software that makes the hardware (bicycle routes, transit stops etc) work".

The following a summary of the TDM measures, and is not comprehensive in nature. A more detailed TDM plan will need to worked out for each stage of development, in conjunction with the City of Vancouver.

4.2 Purpose and Affect of TDM

TDM measures are intended to promote active transportation while reducing vehicle trips to support the overall sustainability vision for the redevelopment.

Strong TDM programs that have a good balance of 'carrots' and 'sticks' have been shown to have a positive impact on modal choice.

4.3 Existing TDM at Oakridge

Currently, parking for visitors is restricted to a 4 hour time limit and is enforced by parking security at the mall. Office and retail employees are provided with a no-cost parking pass that allows them to park beyond the 4 hour limit. Employees are also encouraged to park at the roof top and in the peripheral parking spaces to allow visitors access to the central and underground levels of parking.

4.4 TDM for Residents

As outlined in Section 9, the residential component of the project is planned to have a relatively low parking supply compared to 'conventional practices'. Although several different types of residential unit are planned, the overall parking ratio is planned to be 0.48 stalls per unit. Supporting this parking ratio across over 2,900 units, will be a strong TDM program and measures for consideration are outlined below.

4.4.1 Residential Car Club

The main TDM measure designed to enable the majority of households at Oakridge to live without a private vehicle is the creation of a residential 'car club'. This car sharing concept is similar to commercial car share programs but is limited to only residents of Oakridge and not for members of the public. Up to 100 vehicles could be included in the car club, dependant on demand, offering a much higher ratio between vehicles and potential users than would be found with a typical car share organisation.

A range of high quality vehicles would be offered with possible valet service to bring a vehicle to an individual's residential lobby area. The higher ratio of vehicles to users means there should be no problem securing a vehicle even at the busiest of times. These features go beyond the operation of a typical car share organisation and are aimed to appeal to those who may not previously have considered car sharing.

4.4.2 Public Car Share

Currently offered by Modo, Zipcar and Car2Go in Vancouver who provide a fleet of vehicles at various locations for individuals registered in the program at an hourly or daily rate. Car sharing has been shown to reduce the demand for ownership of private vehicles. A number of these vehicles are likely to be located at Oakridge in prominent, easily accessible locations and will be for the benefit of the community as a whole. Details regarding the number and location of vehicles are anticipated to occur at the Development Permit stage of each build-out phase.

4.4.3 Bicycle Coop

To complement the bicycle parking provision for the site, residents will also have access to a bicycle cooperative which will store and maintain approximately 100 bicycles for residents to use. One of the advantages of this system is that a high number of bicycles can be stored in a relatively small space. For those residents with their own bicycle, the bike coop will also act as an on-site bicycle repair shop and be a general community benefit.

4.4.4 Transit Passes

Subsidised transit passes could be provided as part of a 'welcome pack' when residents move in. Other parts of the welcome pack could include outlining to them transit services and schedules, bicycle routes in the area, local services within walking distance, and discount coupons for bicycle or walking stores.

TransLink's new Compass Card offers opportunities through advanced technology to offer specific rewards for transit travel behaviour. Opportunities for this, as well as limits of the technology are still being discussed with TransLink but there would appear to be potential in the future to go beyond a simple monthly discount system and offer specific rewards (credit at Oakridge stores, for example) for specific transit behaviour (travelling early in the morning before peak-hours, for example).

4.4.5 TravelSmart

This is a division of TransLink which focuses on travel demand management measures and reducing the need to travel. The size and characteristics of the Oakridge development would make it an attractive target for TravelSmart. Programs could include individualised travel planning, an on-site 'welcome' person and work place travel plans.

TravelSmart would need to be engaged as individual residential phases are progressed, as to whether and to what degree they can become involved. They could also need funding to do this.

4.5 TDM for Office and Mall Employees

A wide range of policies, services and programs are available to influence the transportation mode of Oakridge employees. This would include both officer workers and retail employees. The following lists some examples that could be implemented for the future site:

4.5.1 Travel Plan

For larger office employers, TravelSmart may be interested in working on a Work Place Travel Plan. This would look at maximising the benefits of the site with regards to transit and other more sustainable modes.

4.5.2 Parking Pricing

Parking management, including pricing, is the biggest influence on travel behaviour. Currently, employees park for free all day with an employee pass. In the future, consideration should be given for instigating more active management of the parking supply. For example, vehicles could be parking for free for up to four hours, but paid parking would be required if you stay any longer than this. Employees should also have their own designated parking areas to ensure the most popular areas remain available to shoppers. It will be important that monthly or weekly parking passes are not made available and that employees have to pay on a daily basis. This incentivises the use of alternative modes when the use of a vehicle is not required.

4.5.3 Transit Pass Subsidy

Although TransLink's Employer Pass Program is closing at the end of the year, there is no reason why individual companies cannot offer transit discounts to employees. The new Compass Card offers an opportunity for this which is still being explored.

4.5.4 Jack Bell Ride-Share

This program provides GVRD residents with free online ride-matching that connects commuters (drivers or passengers) with other commuters ("casual ride-share") or by providing ridesharing through a fleet of vehicles ("formal ride-share"). There are a number of formal rideshares from, to, and through the Vancouver area.

4.5.5 Car-Share

These programs provide vehicles rentals at various locations for employers and registered in the program at an hourly or daily rate (Modo, Car2Go and Zipcar) as described above. In the case of office workers, access to a car share vehicle at work can avoid the need to bring their own vehicle if needed for company business during the day. Modo, for example, have a specific subsidiary called Company Car for this purpose.

4.5.6 Teleworking

These programs are usually driven by the employee with the support of the employer and have potential benefits that include cost savings for employers, improved work conditions for employees, reduced trip-making, and lower vehicle ownership rates. It is acknowledged that many jobs (customer facing) at Oakridge are not suitable candidates for this.

4.5.7 Bicycle Facilities

Facilities should be provided to encourage employees to bike to work. This may include bike racks, showers and lockers. These end-of-trip facilities are required as part of the City's bylaws and complement the increased number of bicycle routes planned within the community.

4.6 TDM for Retail and Community Use Customers

This category of trips has traditionally been the hardest to target with TDM measures. The good news is that the opening of the Canada Line resulted in a change of mode split of visitors, in favour of transit. Some small measures which can be put in place are:

- Priority stalls for car share vehicles brought to the site;
- Bicycle valet parking and on-site maintenance shop; and
- Consideration of a home delivery service at the mall.

For special events held at Oakridge in the future, where the purchased of a ticket is involved, the cost of a transit ticket could be included within the purchase price.

5. STREET PLAN AND ACCESS REVIEW

5.1 Overview

This section outlines key aspects of the proposed site plan, in terms of principles and actual features. The site plan contains various elements which play a significant role in achieving many of the sustainability and site design objectives of the project. Some of the site plan elements envisaged in the policy documents are no longer practical given the planned density. This section first outlines how and why the site plan contains variations to what was previously envisaged, before outlining some of the key features planned.

5.2 Rationale of Street Design

5.2.1 Policy Review

The Oakridge Policy Statement advocates a public street running through the centre of the site. Based on the current proposed densities, approximately 1,000 – 1,500 vehicle trips may pass along this street during the Saturday peak-hour. This is because, in practical terms, the main accesses to and from the underground parkade would have to be located off this street.

As outlined previously, the policy statement views this street as a central feature of the site. In terms of design this would likely mean two traffic lanes, with plenty of pedestrian crossing opportunities and short term on-street parking to help slow down adjacent vehicles and create a buffer between moving vehicles and pedestrians on the sidewalks, as well as support for fronting commercial land uses.

In accommodating the projected traffic volumes, many of these important design elements would be compromised, including, the character of the street. Either the roadway would need to be widened to four lanes or, alternatively, street parking would be removed and pedestrian crossing opportunities would be limited. In addition, left-turn bays into the underground parkade would be required to avoid queues backing up to the travel lanes. These changes could have the effect of increasing vehicle speeds and further reducing the street's attractiveness to pedestrians.

For comparison, the street running through The Village at Park Royal, in West Vancouver, can be seen as similar in character to what the Policy Statement envisages at Oakridge. Peak-hour two-way vehicle flows of 400 – 500 vehicles are observed, less than half that projected at Oakridge. Even so, during peak times traffic moves very slowly. In addition, the street is not functioning as a main parking distributor.

If the proposed High Street through Oakridge did not connect to the parking then volumes on the high street would be significantly lower. However, this is not practical either as such a design would be highly inefficient in terms of circulation. Visitors would likely first drive along the High Street in the hope of finding street parking. If they weren't successful, which the majority would not be, they would then be required to exit the site and re-enter, creating additional impacts at key intersections surrounding the site.

If a 'secondary access' only were provided off the High Street, the possibility of street parking would likely attract a disproportionate number of vehicles, even if it were not designed as such.

Loading and servicing requirements for the site would also likely rely on the surface street for access, if it also served as the main access to the parking. This would further compromise its design and character. Large trucks would require access to the street in order to then enter the underground loading area. Surface street's geometry and character would be significantly impacted by all these requirements.

5.2.2 Design Response

The project team has responded to the challenges of high vehicle volumes being incompatible with a high quality pedestrian experience (in this instance) by separating the pedestrians and vehicles. High Street is proposed to be for pedestrians only, while beneath this street, a high quality underground parkade with clear drive aisles for vehicles is proposed. Exhibit ES1 outlines the main features of the proposed site plan in terms of access and transportation. In summary, the main features are:

- A new pedestrian 'High Street' running south-east to north-west through the site.
- A new public (no through) local street, 'New Street', on the western and southern side of the site to provide better interface with the existing neighbourhood.
- Numerous and high quality pedestrian routes across the site including both indoor and outdoor spaces, with connections to both urban and 'green' public realm focal points, notably The Commons on the roof of the existing mall.
- An increased number of controlled crossing points along 41st Avenue and Cambie Street, addresses severance challenges caused by these arterial streets.
- An extension to the existing bicycle network through the site, connecting with the Heather St and 45th Avenue bicycle routes via New Street.
- Eight inbound lanes and nine outbound lanes to serve the commercial component of the development, mainly be located at 41st Avenue and Cambie Street, with one secondary access indirectly at 45th Avenue.

These features, along with the overall site plan support the proposed density as well as the objective to achieve LEED Platinum ND.. A few of these key features, as well as how they contribute towards these goals, are outlined in the following paragraphs.

5.3 Pedestrian Street (High Street)

A pedestrian only street will create a high quality pedestrian experience, where outdoor pedestrian space is a key objective of the project and is in keeping with the Policy Statement.

The high street could be thought of in terms of being the heart of the development, while the other pedestrian connections are the arteries, filling it with life. It will offer visitors an outdoor, attractive, car free, urban environment. From here there will be connections to a 'commons' on the roof of the existing mall which will offer a landscaped green space, contrasting with the urbanity of the High Street. The lack of motorised vehicles on the surface means that pedestrians will be able to relax and experience a more human scale urban space. This would not be possible if vehicles bisect the site.

5.4 New Street

Another key element of the site plan is the creation of a new surface street (New Street) on the western edge of the site where it interfaces with neighbouring properties. It would connect to the area's street system at 41st Avenue and 45th Avenue, although critically, it would not connect in the centre, so as to eliminate the chance of traffic using it as a short-cut. Two loops would essentially be created, with the southern street connecting to Tisdale Street via an existing laneway. Details of this connection are still to be developed in detail.

New Street will provide access to the existing neighbourhood and also access to the proposed residential development via a ramp leading directly to the P4 residential parking field as well as the townhomes fronting the New Street. It is planned to be low-speed and low-volume in character and would not provide access to any of the retail or office components at Oakridge.

The street will have high quality facilities for pedestrians and cyclists, being the main connection between the Heather Street and 45th Avenue bike routes. **Exhibit 5.1** indicates a typical cross section of street.

5.5 Bicycle Access

A dedicated bicycle and pedestrian signalized crossing of 41st Avenue is planned at Heather Street, a City of Vancouver bikeway. It allows for a safer more efficient crossing for pedestrians and cyclists at this point, with a dedicated crossing phase, without vehicles. On the southern side, the bikeway feeds directly into the top of the High Street in a prominent location and makes a strong design statement that bicycles are important to the development of success.

5.6 On-Site Bicycle Connections

As indicated in Exhibit ES1, the Heather Street bikeway crosses 41st Avenue at a dedicated signalized crossing and runs south through the site for a short period before turning to run along New Street. The bikeway has been designed to minimize the number of times it crosses a street or driveway. Although vehicles will not be permitted to travel from one end of New Street to the other, bicycles will be able to do this, connecting in the south to 45th Avenue.

NEW STREET STREETSCAPE
SECTION

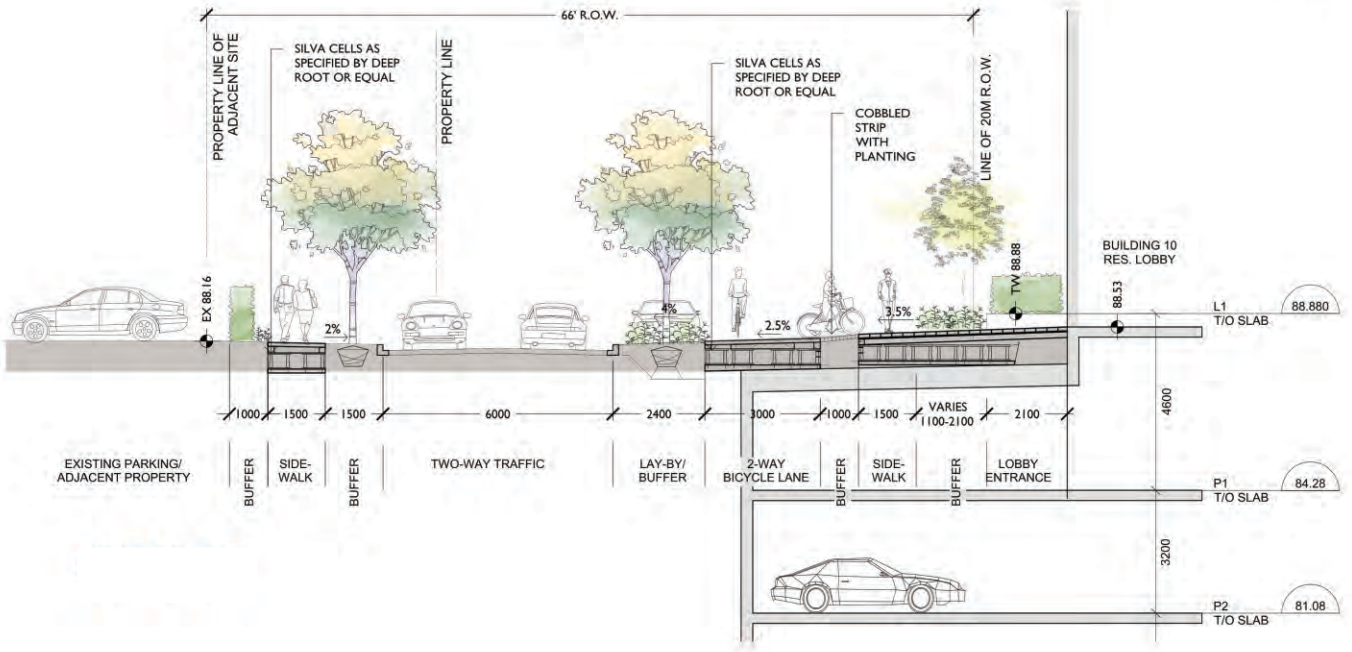

Exhibit 5.1

Proposed Cross Section of New Street

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5.7 Access Points

The four main vehicular access points are located at follows:

- On 41st Avenue at Manson Street (full movement, signalized);
- On 41st Avenue at the existing angled access between Manson Street and Ash Street (right in/ right out with left-out via the underground tunnel);
- On Cambie Street at the existing access between 42nd Avenue and 43rd Avenue (full movement, signalized); and
- On Cambie Street at 44th Avenue (full movement, signalized).

As previously mentioned, there is an additional access directly into the parkade for the grocery store located at the southern end of the New Street.

Consolidation of access points means less breaks in the sidewalk and provides a greater number of signalized access points and controlled crossing opportunities on Cambie Street and 41st Avenue than currently available.

5.8 Transit Plaza

The Transit Plaza at Cambie St and 41st Avenue is a key public space and arrival point for Canada Line Station passengers to Oakridge and will continue to be the case in the future. An underground connection from the station into the mall was briefly considered, but design challenges with the location of the parking garage for the existing Terraces residential strata and the desire to animate the plaza with people and energy led the team to retain and enhance the current access point from the station to the plaza.

In addition to the Canada Line, important bus stops are also located here, and requirements for shelter design and sheltered waiting and queuing areas will also be incorporated into the space. Off-street bicycle routes will use this area, so careful design will be required to ensure interactions are minimized.

5.9 Underground Parking

Five commercial vehicular access points will lead down into the P1 level of underground parking. where levels of commercial parking are planned while P4 is reserved exclusively for residents. The Internal Vehicular Site Circulation section provides more detail as to the main circulatory pattern and connections between levels.

5.10 Servicing and Loading

The main commercial loading access will be off the southern Cambie St access at 44th Avenue. More detail regarding loading and servicing access is provided in the Internal Vehicular Site Circulation section.

6. PEDESTRIAN AND BICYCLE FACILITIES

6.1 Introduction

The design for the new Oakridge site focuses on implementing pedestrian oriented streets and bicycle network connections to support a sustainable urban environment for the site. Redevelopment of the site will assist the City of Vancouver in achieving its goals of promoting more sustainable modes of transport and protecting the livability and environment of the community. This can be achieved by combining residential, employment, retail and recreational land uses and promoting walking and cycling through closer proximity to local services.

This section outlines existing and proposed pedestrian and bicycle connections to and from the site. It also includes information on bicycle parking for residential and non-residential uses.

6.2 Existing Pedestrian Connections

The existing site access points and pedestrian crossing facilities are shown in **Exhibit 6.1.** The existing conditions are listed below.

- Pedestrian Access: six main pedestrian access points have been identified, including the main atrium entrance along the corner of 41st Avenue and Cambie Street and the existing lane.
- Pedestrian Entry (to mall): Pedestrian access to the mall is also shown in Exhibit 6.1. A total of seven pedestrian entrances were identified for the ground level. (Note that only mall access points were presented in this exhibit), other pedestrian entrances such as underground access (parking) and office/medical uses are not displayed.
- Pedestrian Crossings: Two controlled pedestrian crossings were identified along 41st Ave and one at Cambie and 45th Ave. The controlled crossing on 41st Ave is a pedestrian signal at 41st and Heather St.; there is a zebra painted crossing with a pedestrian sign located midblock on 41st Ave between Heather St and Cambie St.; and, a full signal at 41st Ave and Cambie St. Four uncontrolled / informal pedestrian crossings are present along Cambie St. Exhibit 6.1 shows all pedestrian facilities for the site.

Exhibit 6.1

Existing Pedestrian Connections To and From the Site

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6.3 Future Pedestrian Connections

Two pedestrian controlled crossings are proposed along 41st Avenue. A new bike and pedestrian specific control signal will be installed at 41st and Heather Street.; there will also be a new signalized intersection on Manson Street and 41st Avenue. A full signal will be located at 41st Avenue and Cambie Street. There will be three signalized intersections along Cambie Street between 41st Avenue and 45th Avenue. These signalized intersections will be located at the following locations: midblock on Cambie Street between 42nd Avenue and 43rd Avenue, on Cambie Street and 44th Avenue and one at Cambie and 45th Avenue. Exhibit ES 1 shows all pedestrian crossings for the site.

To encourage pedestrian oriented street design and support a sustainable urban environment, multiple pedestrian access points will be implemented throughout the site and along 41st Avenue, Cambie Street and New Street. New Street runs from the north-west side of the development down to the south-east and connects at 45th Avenue. Multiple accesses are designed between New Street and the High Street and pedestrians can travel the length of New Street. This new public local street will be implemented to provide a better integration with the existing neighbourhood and allow pedestrians to access the site at 41st Avenue and neighbouring residential laneways to the west.

Currently, Oakridge Centre is surrounded to the west by on-site parking spaces with minimal pedestrian access to the site. High Street is proposed for this development to act as a pedestrian oriented connector to increase attractiveness to the site. High Street connects Heather Street from 41st Avenue to 45th Avenue and will facilitate an effective interface between the existing neighborhood and local services as it runs right through the site allowing access to various store frontages. It will be characterized by an open-air urban environment to provide a high quality pedestrian experience. Exhibit ES 1 depicts these access points.

6.4 Current Bicycle Infrastructure

Exhibit 6.2 outlines the current bikeways in the vicinity of the site. As indicated, the site is located close to several designated bikeways and bike lanes:

- **Heather Street Bikeway**: a north-south bikeway that connects South East False Creek to the north and Cambie Bridge to the south. Currently this bikeway is not connected between W 37th Ave to W 41st Ave and diverts via Willow Street to the west to avoid Oakridge.
- **45th Avenue Bikeway**: a west-east bikeway connecting the Balaclava Street bike lane to the west and the Ontario Street bikeway to the east.
- **Cambie Street bike lanes**: Cambie Street painted bike lanes connect to the Marine Drive Canada Line Station to the south and W 29th Ave, at which point cyclists must divert to either the Heather Street or Yukon Street bikeways, which terminate close to the Cambie Street Bridge.

Exhibit 6.2

Existing Bicycle Connections To and From the Site

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- **41st Avenue bike lane**: A minor painted bike lane is located along 41st Ave, between Willow St and Cambie St. This bike route is one way only and provides a west-east connection to Cambie St.

6.5 Future Bicycle Connections

Exhibit 6.3 highlights future bicycle connections to, from and around the site as well as within it.

6.5.1 Internal Bicycle Routes

The development is proposing a bike lane along New Street, which will be a new public local street that will be implemented to provide a better interface with the existing neighbourhood. New Street will run from the north-west side of the development to the south-east at 45th Avenue, but there is a vehicle only closure in the middle. Bicycles and pedestrians can travel the length of the street and the bike lane will serve as a connector between the Heather St and the 45th Avenue bikeways, enhancing the cycling experience in this area.

High Street, a pedestrian oriented connector through the site, will be characterized by a compact urban setting with a high quality pedestrian experience and will run almost parallel to New Street. Cycling will be informally permitted in this area as it is not envisaged as a high-speed cycle route but would typically be used by cyclists for local access. Bicycle speeds are envisaged to be low and mixed with pedestrians. Longer distance bicycle traffic would use New Street to connect between 41st Avenue and 45th Avenue. Bike racks would be provided along the High Street.

6.5.2 Bicycle Routes Adjacent to the Site

Multiple existing cycling routes within the local context of Oakridge, including the Heather Street Bikeway, which is a key north-south connection for cyclists in Vancouver. Currently this bikeway is not connected between W 37th Ave to W 41st Ave and diverts via Willow Street to the west (to avoid Oakridge). The development includes provision for a new bicycle route on the western portion of the site, providing continuation of the Heather Street bike route, north-south across the development. It will enable Heather Street between 37th Avenue and 41st Avenue to become a designated bicycle route in conjunction with the bicycle and pedestrian signal at Heather Street and 41st Avenue.

Currently Cambie Street does not function as a two way cycle route, but instead offers various cycling lane provisions between its north and south terminus. Within the context of the development site, there is currently only a northbound, bike lane. **Exhibit 6.4** illustrates the proposed separated two-way bike lane, which will run alongside the site, on Cambie Street.

The cross section shown in **Exhibit 6.4** represents an illustration of a potential cross section, at the south end of the site, by W 45th Ave. In this location, the illustration depicts a generous sidewalk and the separated cycle lane, with a 1 m buffer separation between the sidewalk, and a 2m boulevard buffer

Exhibit 6.3
Future Bicycle Connections

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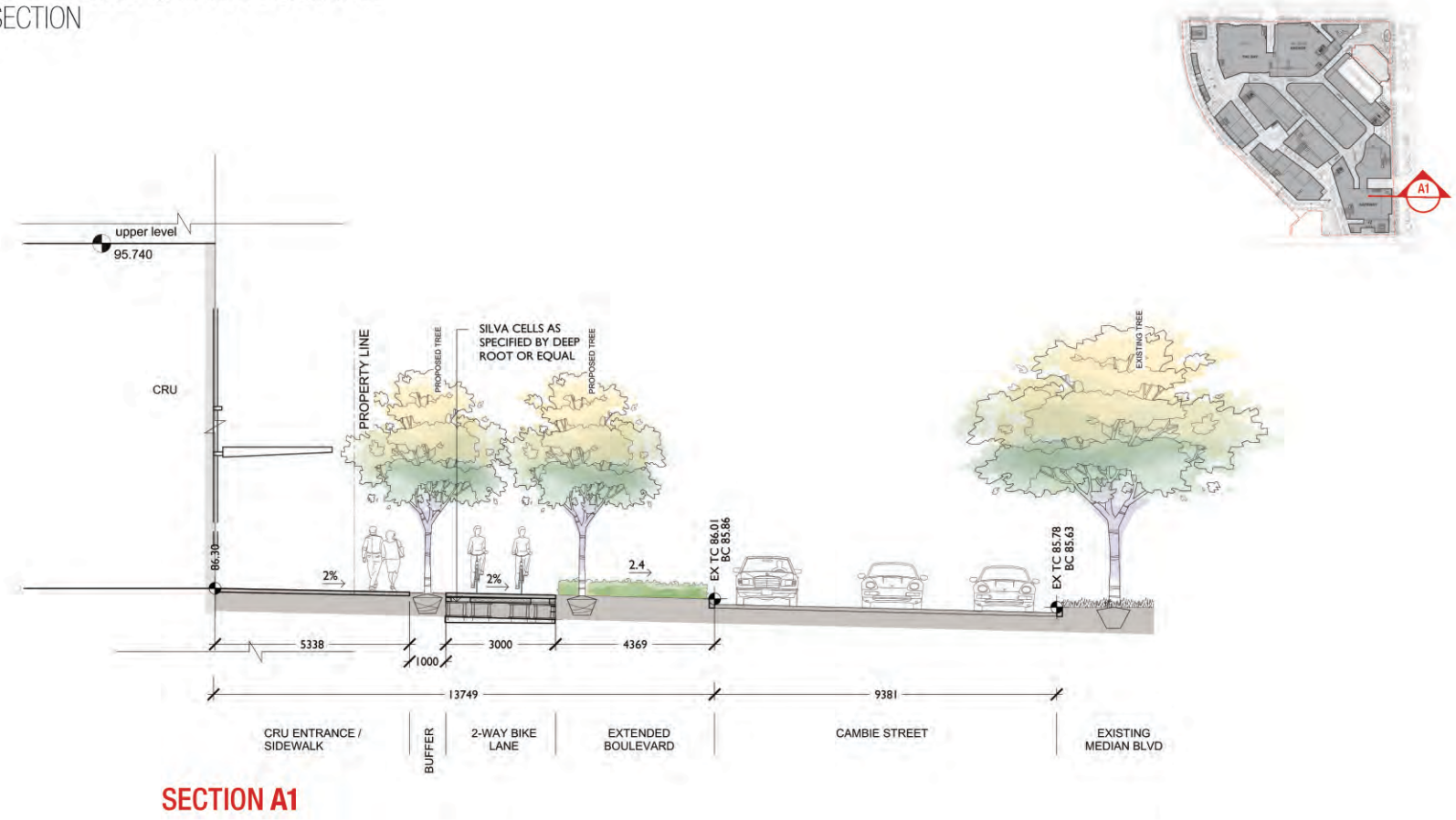

Exhibit 6.4

Proposed Cross Section on Cambie Street

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between Cambie Street. Given the change in land use and access points between W 41st Ave and W 45th Ave, this is likely to change along the site, but overall is a good reflection of the intended treatment.

On W 41st, the bike lanes connecting Willow Street to Cambie Street will be upgraded under the proposed development plan, to a separated, two-way, bicycle lane. A potential cross section is illustrated in **Exhibit 6.5** and the cross section shows a location outside The Bay, where the proposal is to provide a wide sidewalk and a 1 m buffer, before the separated bicycle lane, (similar to that proposed for Cambie Street). It should be noted that this example is illustrative only and given the range of land-use and building form along W 41st Ave, landscaping and dimensions will differ, along the extent of the site.

6.6 Future Bicycle Parking

Bicycle parking is a key component of encouraging more sustainable travel behaviour at the future Oakridge. This section sets out the bylaw requirements and proposed strategy for providing bicycle parking for the different users of the site.

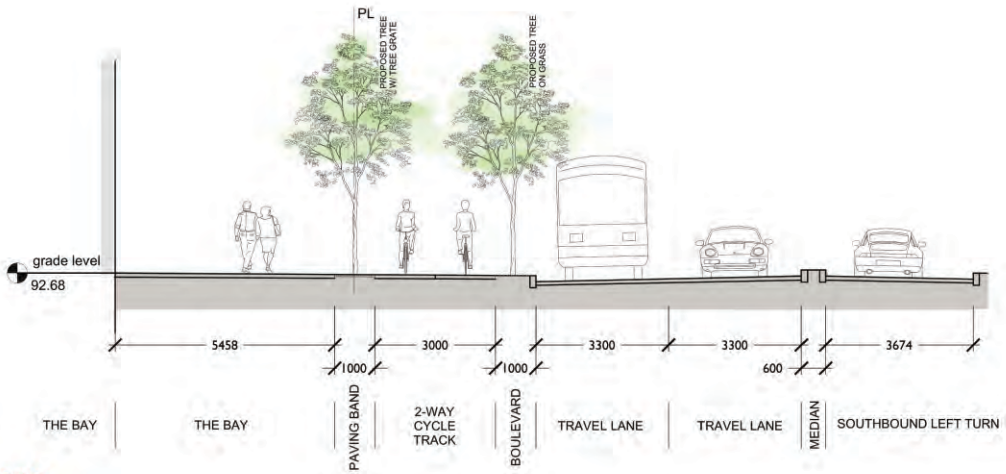
6.6.1 Residential Bicycle Parking

Table 6.1 illustrates the residential bicycle parking bylaw requirements and proposed supply.

Table 6.1: Residential Bicycle Parking Supply and Bylaw Requirements

Housing Type	Units	Class A Requirements	Class A Provided
Family Non Market	64	80	3,640
Rental	393	491	
Affordable Ownership	100	125	
Sustainable TO Market	1,460	1825	
Traditional Market	715	894	
Seniors Non-Market	120	12	
VRS Units (Low Income)	12	15	
HL Rate Rental Micro (Low Income)	50	63	
Total	**2,914**	**3505**	**3,640**

41st AVENUE - THE BAY STREETSCAPE
SECTION



SECTION A10

Exhibit 6.5

Proposed Cross Section on West 41st Ave

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As evident from Table 6.1, over 3,500 Class A bicycle stalls are proposed to be provided for the 2,914 residential units and the proposed development plan will supply slightly more than the minimum requirement.

The proposed location for the majority of the Class A parking spaces is to be located on P4. However, in order to provide efficient and convenient access to this parking, proposed high speed, bicycle elevators will transport cyclists and their bikes from grade, directly to P4. The locations of these elevators are proposed for the north- west corner of this site, providing convenient access to the Heather Street Bikeway, as well as the corner of W 41st Ave and Cambie Street, and a third off Cambie Street, midway along the block.

The required class B bicycle parking spaces has not been determined at this time, and will be decided upon for each phase of development, in conjunction with the City of Vancouver.

6.6.2 Commercial Bicycle Parking

Table 6.2 outlines the commercial bicycle parking requirement.

Table 6.2: Commercial Bicycle Parking Supply and Bylaw Requirements

Land Use	Area (m GFA)	Class A Requirements	Class A Provided
Retail	136,279	273	570
Office	39,488	79	
Community	3,252	7*	
Library	2,415	5*	
Childcare	836	0	
Total	**182,270**	**364**	**570**

* By-law rate uses the assembly area, which is not known at this time. For the purposes of a conservative estimate, GFA was used to calculate the required spaces, and therefore is over estimated.

As indicated, approximately 364 Class A bicycle stalls will be required for the retail, office and community uses. Space for approximately 570 stalls has been identified, which would result in exceeding the minimum requirements by approximately 200 stalls. The required class B bicycle parking spaces has not been determined at this time, and will be decided upon for each phase of development, in conjunction with the City of Vancouver.

6.6.3 Additional Bicycle Facilities

The TDM section has already outlined a proposed bicycle cooperative that would have bicycles available for residents when required, as an alternative to owning your own bicycle. The TDM section also mentions that a bicycle valet service will be in place to offer shoppers secure, covered and convenient bicycle parking while they shop. The bicycle valet and bicycle cooperative stalls are in addition to those mentioned above.

7. TRANSIT CAPACITY

7.1 Introduction

This section outlines the current and future transit demands as they relate to the redeveloped Oakridge site. Using the transit-specific travel demand forecasting numbers outlined in Chapter 3, this section reviews the following aspects:

- Existing passenger level of service and volume-to-capacity ratios for the Oakridge Canada Line Station to evaluate capacity of pedestrian space once Oakridge is built out;
- The current Canada Line line-haul demand and supply, as well as an estimation of how many people the redeveloped Oakridge site will add to this demand; and
- Current bus transit supply and demand along with future estimated additional passengers from the Oakridge site.

The following analysis is based on data collected by TransLink, and augmented by on-site observations by Bunt.

The volume and capacity analysis in this report are based on September to December 2012 counts provided by TransLink for pedestrian volumes entering and exiting the Oakridge-41st SkyTrain station, along with boarding and alighting volumes for buses. The peak-hours of the nodes and networks for each mode, are compared in **Table 7.1**.

Table 7.1: Oakridge Transit Peak Periods

Mode/ Element	Peak-hour		
	Weekday AM	Weekday PM	Saturday
Oakridge-41st Station	8:00-9:00am	5:00-6:00pm	3:15-4:15pm
Oakridge Buses	8:00-9:00am	5:00-6:00pm	4:00-5:00pm
Road Network (41st Ave & Cambie St)	8:00-9:00am	3:00-4:00pm*	2:00-3:00pm

*Friday PM Peak

For the AM peak, the peak-hour times are consistent across the nodes and networks with a peak-hour between 8:00 and 9:00am. The PM peak-hour is more varied, beginning at 3:00pm for the vehicle traffic and concluding at 6:00pm for the bus network. Similarly, the Saturday peak is also varied, ranging from 2:00 to 5:00pm. These peak travel demands are within typical weekday afternoon and Saturday peak periods where volumes are generally consistently high.

Person trips generated by the future Oakridge development will be added to the peak-hour volumes of each of the node and network in the following analysis. This provides a conservative estimate for future capacity considerations.

7.2 Existing Oakridge Station Capacity

7.2.1 Station Characteristics

The existing Oakridge-41st SkyTrain Station is an underground station with a single access near the southwest corner of the Cambie Street and 41st Avenue intersection. Pedestrians to and from Oakridge Centre typically access the Station via the street side plaza. The Station provides side platforms on opposite sides of the SkyTrain tracks, with an "inbound" platform heading north towards Downtown and an "outbound" platform heading south to Richmond and Vancouver International Airport. Access from the Station entrance/exit is provided by a flight of stairs, an "up" escalator, and an elevator (defined as "vertical circulation"). Access to and from the inbound platform requires a passage under the SkyTrain tracks with two sets of vertical circulation consisting of stairs, up escalators, and elevators. Access to the outbound platform requires passage through two walkways around one of the elevators. Currently, four fare gates are provided at the station in the concourse lobby area near the vertical circulation from the plaza.

7.2.2 Pedestrian Volumes

The passengers entering and exiting the Oakridge-41st Station were established using Automatic Passenger Count (APC) data recorded by TransLink at select locations in the Station from September to December 2012. The data set provided passageway continuous count data through this 4-month period. Data is presented in 15 minute intervals, grouped as entering or exiting the Station for four passageways: two walkways to the outbound platform, and the stairs and escalator to the inbound platform. Exhibit 7.1 illustrates the location of these passageways within the station.

Given the range of data available, October was evaluated as it represents a time period with standard commuter and non-commuter volumes (with schools in session and before impacts from the Christmas season). The data was then evaluated as follows:

- PM Peak: Tuesday, Wednesday and Thursdays in Oct 2012
- Saturday Peak: Saturday 13th, 20th and 27th (Thanksgiving Saturday removed)

Station capacity uses procedures outlined in the 3rd Edition of the *Transit Capacity & Quality of Service Manual* (TCQSM) using the methodology based on a 15-minute pedestrian volume interval. The peak 15-minute interval volumes by passageway and direction were then used for the analysis.

Entering and exiting pedestrian volumes have different patterns from each other. For pedestrian entries, it was assumed people enter the station at a fairly constant rate, while pedestrians exiting the station alight the SkyTrain in blocks whenever a train arrives at the Station.

To estimate these volumes, the 15 minute volumes were divided by the estimated number of trains arriving into the station during that interval. For all peak periods, there is a 3:20 minute headway, which amounts to four trains arriving at the Station in each direction within a given 15-minute interval. The appropriate 15-minute exiting volumes to use for the Station capacity analysis are therefore equivalent to the pedestrian volumes alighting a train within a minute of its arrival.

In order to evaluate the worst case scenario of two train arriving at the same time, the equivalent exiting volumes from both platforms were combined to simulate two groups of passengers (from inbound and outbound trains) arriving at any given station element simultaneously.

7.2.3 Pedestrian Distributions

The pedestrian assignments for the peak periods were determined using TransLink's APC data and augmented by site observations conducted by Bunt on Wednesday, May 19 and Saturday, May 22. The results are shown in **Tables 7.2** and **7.3** for pedestrians entering and exiting the Station, respectively.

Table 7.2: Station Entering Pedestrian Distributions

Percent of Total Entering Pedestrians:	Weekday AM	Weekday PM	Weekend
Platforms			
Inbound	75%	53%	49%
Outbound	25%	47%	51%
Vertical Circulation from Plaza			
Stairs	94%	95%	92%
Escalator	0%	0%	0%
Elevator	6%	5%	8%
Vertical Circulation from foyer to under tracks			
Stairs	98%	88%	90%
Escalator	0%	0%	0%
Elevator	2%	12%	10%
Vertical Circulation from under tracks to inbound platform			
Stairs	11%	5%	3%
Escalator	89%	95%	96%
Elevator	0%	0%	1%
North Walkway to outbound platform	11%	16%	21%
South Walkway to outbound platform	14%	31%	30%

Note: Vertical Circulation refers to a mode of vertical movement

Table 7.3: Station Exiting Pedestrian Distributions

Percent of Total Exiting Pedestrians:	Weekday AM	Weekday PM	Weekend
Platforms			
Inbound	49%	27%	45%
Outbound	51%	73%	55%
Vertical Circulation to Plaza			
Stairs	5%	14%	4%
Escalator	94%	85%	95%
Elevator	1%	1%	1%
Vertical Circulation to foyer from under tracks			
Stairs	11%	5%	4%
Escalator	89%	95%	95%
Elevator	0%	0%	1%
Vertical Circulation to under tracks from inbound platform			
Stairs	98%	88%	93%
Escalator	0%	0%	0%
Elevator	2%	12%	7%
North Walkway from outbound platform	28%	44%	33%
South Walkway from outbound platform	22%	30%	22%

Observations indicate the following:

- A large proportion of pedestrians entering the Station in the morning are destined for the inbound platform, while pedestrians exiting in the afternoon are originating from the outbound platform. This is consistent with commuter traffic patterns, with the potential for some pass-by traffic in the afternoon. Passenger splits are more even for both entering and exiting on weekends.
- All escalators within the Station are "up" escalators, and are used by the great majority of pedestrians when available at that location.
- Elevators are not highly utilized, and were observed to be typically used by pedestrians requiring walking assistance devices or with strollers. Usage was typically highest where pedestrians need to go downwards and do not have an available escalator.

7.2.4 Future Pedestrian Volumes

The APC count data was also the foundation of the future station volume and capacity calculations. The peak-hour was extracted from the APC data by examining the volumes used in the existing conditions analysis, and using the most frequently occurring peak-hour.

The peak-hour was then combined with other Bunt data as follows:

- Two modal splits representing a low and high transit ridership estimation where determined by multiple survey data sources[1].
- APC volumes equate to the SkyTrain volumes, by direction, and from this remaining volumes by mode were back-calculated.
- SkyTrain volumes then split to Oakridge users and non-Oakridge users, based on mode split surveys performed by Bunt and Associates in 2010 and Ivanhoe-Cambridge between 2010 and 2013.
- Future person trips for Oakridge users by mode were calculated based on ITE vehicle rates, which due to their auto-oriented characteristics, would provide a good basis for developing person trip rates. Using the mode split survey information, SkyTrain-specific pedestrian volumes were estimated.
- Future person trips for non-Oakridge users were projected by an assumed background growth rate of 3%.
- The same method to account for exit surging used in the existing conditions methodology was applied to the future pedestrian volumes.

Methodology and derivation of these future volumes are described in detail in Section 3.

7.2.5 Station Capacity & TCQSM Analysis

Pedestrian capacity analysis of Oakridge station was done according to the procedures outlined in the 3rd Edition of the Transit Capacity & Quality of Service Manual (TCQSM) using the manual calculations method, and based on the 15 min interval pedestrian APC data. TCQSM methodology outlines point or area analysis of discrete station elements (such as stairs, walkways, or platforms). For Oakridge Station, the following station elements were analyzed using those TCQSM methods:

- Pedestrian walkways on mezzanine level (to/from Outbound/ Southbound platform) with existing effective walkway widths;

[1] Data Source: Questionnaire Survey undertaken by Bunt & Associates on 19th and 20th November 2010.In addition to above, split modified to partly reflect Ivanhoé Cambridge(IC) data collected annually in April for 2010, 2011 and 2012.) In/ out splits were assumed to be consistent across travel modes. Person trips were estimated from IC Customer questionnaire.

- Stairs and escalator within 'Fair Paid Zone' (to/from Inbound/ Northbound platform) with existing effective stairway and escalator widths;
- Existing four fare gates; and,
- Stairs and escalator into/out of Station with existing effective stairs and escalator widths.

The method for determining pedestrian level of service (LOS) is based on calculations of pedestrian density averaged over the design period. **Table 7.4** summarizes the TCQSM LOS thresholds from LOS A through F. It is recommended in the manual that transit stations be designed to operate within a LOS C/D threshold or better during the design period.

Table 7.4: TCQSM pedestrian Level of Service for Transit Station Elements

Level of Service	Area/ Point Location Analysis	
	Walkways (m^2/ pedestrian)	Stairs (m^2/pedestrian)
A	>3.3	>1.9
B	2.3-3.3	1.4-1.9
C	1.4-2.3	0.9-1.4
D	09.-1.4	0.7-0.9
E	0.5-0.9	0.4-0.7
F	<0.5	<0.4

This analysis uses LOS thresholds as the evaluation procedure for stairways, which is based on average flow rate and maximum capacity of the stairway. An additional methodology exists to determine the maximum stairway capacity, using a 'Pedestrian Lanes' method. This method assumes that stair capacity is not linear, whereby adding a few units of width has little effect on capacity, but rather by adding the width of a pedestrian lane. Features that impact stairway capacity is summarized in **Table 7.5**.

Table 7.5: Capacity of stair lanes by width

Lane Width (cm)	Approximate Capacity (p/min/lane)	Comments
53-70	30	Notable friction, not recommended for daily use
71-78	38	Recommended for daily use
79-85	42	Provided extra space and larger capacity
>86	little or no added capacity	May be beneficial when pedestrian carries large items

The main staircase, at the entrance/exit to the station has been observed to allow for four pedestrian lanes to be in use. This corresponds to a lane width that falls into the minimum range indicated in the manual, corresponding to the interpretation: "Notable friction, not recommended for daily use".

Escalator capacity, as outlined in the TCQSM, is based on developed nominal design capacity values, as the theoretical capacity of escalators as rated by the manufacturers is based on 100 % utilization, (which is never attained). Values represent a utilization of 1 person per step on a 1.1 metre-wide escalator, and **Table 7.6** outlines this nominal capacity.

Table 7.6: Nominal Escalator Capacity Values

Type	Width at Tread (m)	Incline Speed (m/min)	Nominal Capacity (p/min)
Double Width	1.0m*	27.4	72
		30.5	85
		36.6	90

* Escalator tread based on CAD as built drawings is 0.98m

According to the TCQSM fare gate capacity is to be evaluated based on a design volume-to-capacity (v/c) ratio during peak period conditions. TransLink has estimated the capacity as 25 passengers per minute, which takes into account the bi-directionality of the gates. Given these fare gates are not yet operational, and that our understanding of the bidirectional functioning of the gates is not well understood, the capacity analysis should be considered as an estimation.

7.2.6 Base (without Oakridge Centre expansion) Conditions

Based on the methodology outlined in the previous section, the existing (2012 volumes from TransLink) Station capacity was calculated for both the inbound and outbound platforms, all vertical circulation locations, the existing fare gate, and the two walkways from the outbound platform.

Calculations were done for identified "pinch points" of the Station, as shown in **Exhibits 7.1**, **7.2**, and **7.3** for the weekday morning, weekday afternoon, and Saturday peak periods respectively. Operating capacities of each item are summarized in **Table 7.7** in terms of volume-over-capacity ratios (v/c) or Levels of Service (LOS). LOS values ranges from A signifying little or no delay, through to F which indicates long delays and/or crowded conditions. v/c ratios of 1.0 or higher indicate that the item is over capacity. The analysis indicates that the Oakridge-41st SkyTrain Station is currently operating adequately, with all Station layout aspects meeting the current pedestrian demand.

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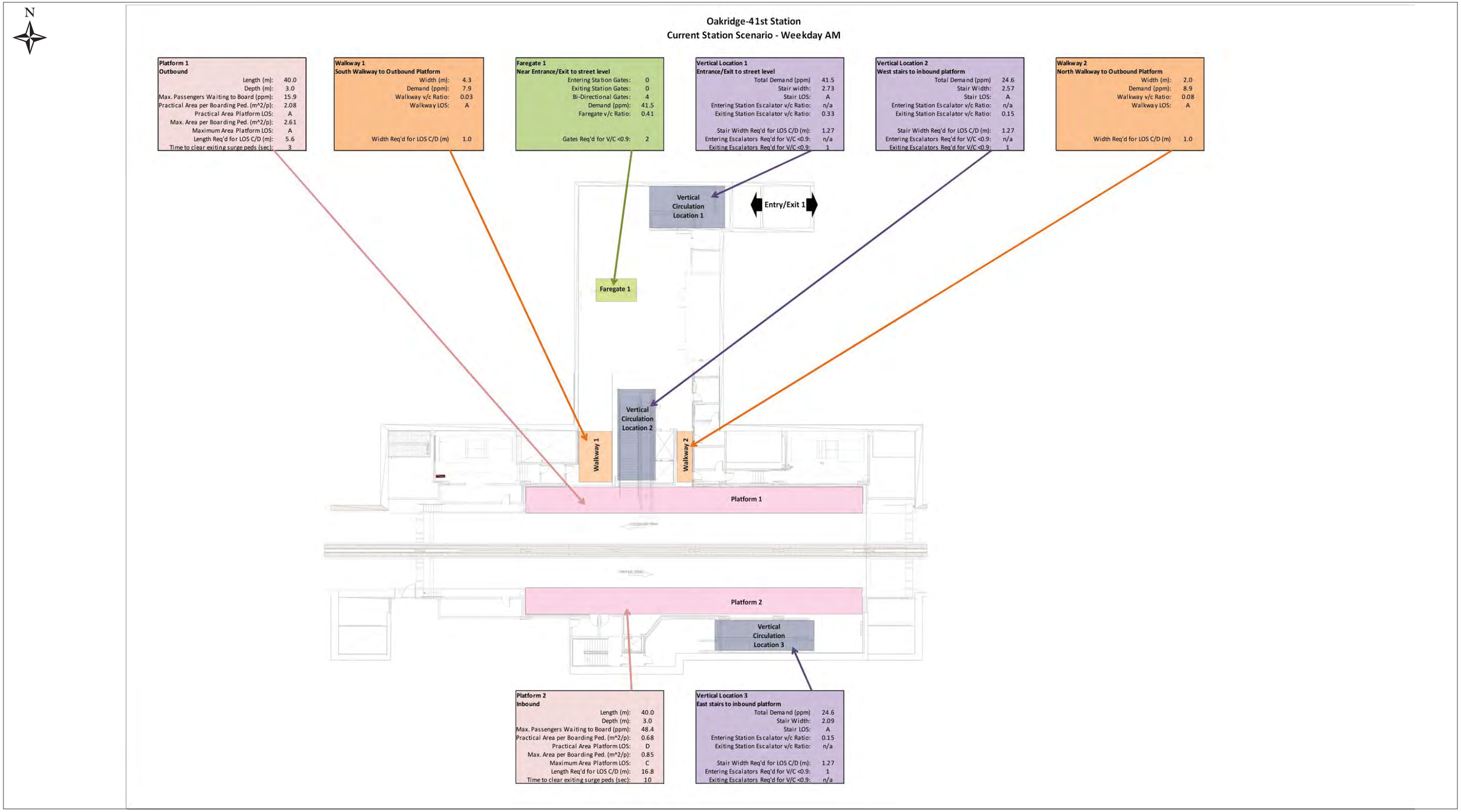

Exhibit 7.1
Station Illustration Weekday AM Peak Hour (Basecase)

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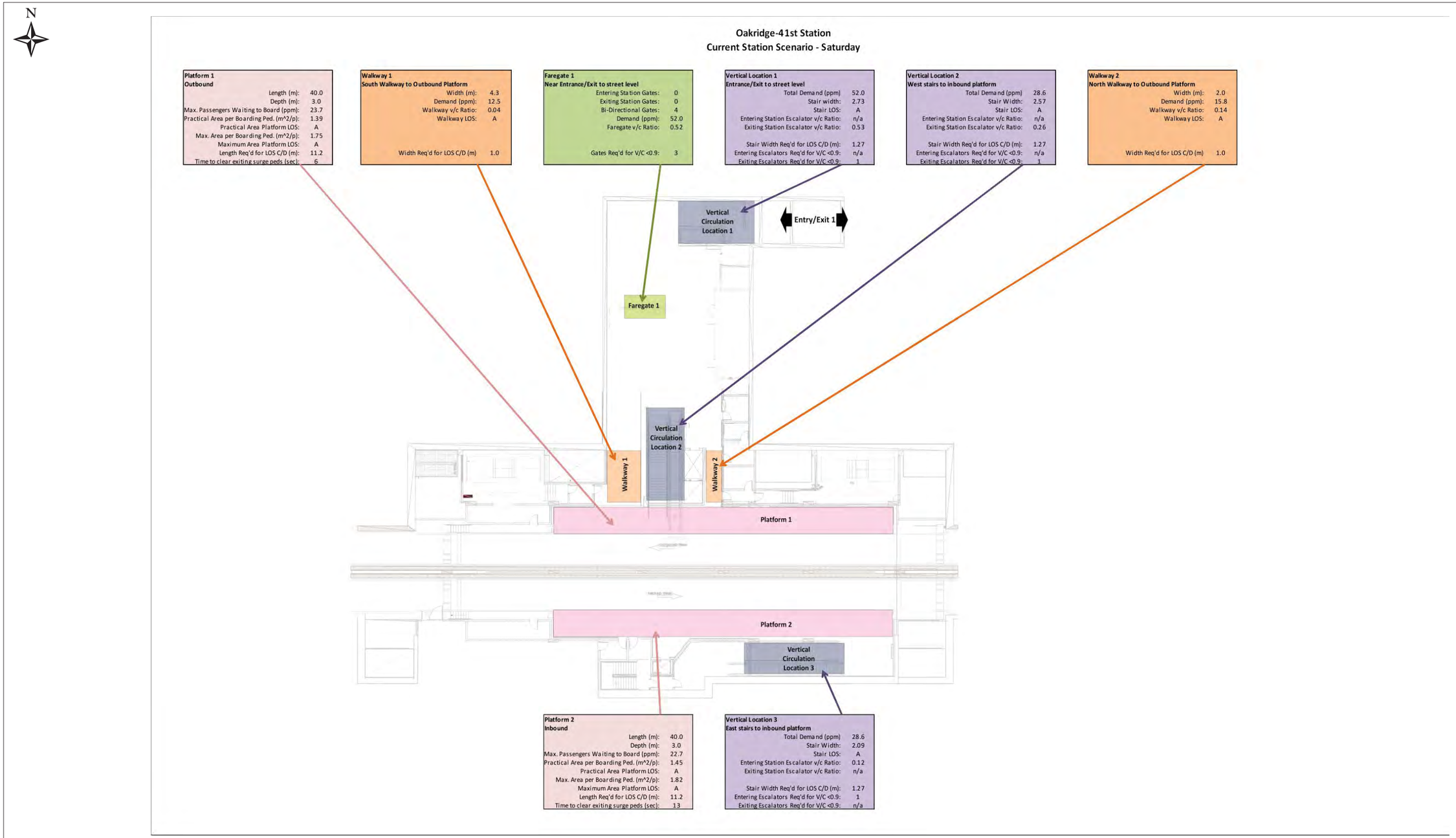

Exhibit 7.3

Station Illustration Saturday Peak Hour (Basecase)

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Oakridge-41st Station
Current Station Scenario - Weekday PM

Platform 1 Outbound	
Length (m):	50.0
Depth (m):	3.0
Max. Passengers Waiting to Board (ppm):	24.0
Practical Area per Boarding Ped. (m^2/p):	1.39
Practical Area Platform LOS:	A
Max. Area per Boarding Ped. (m^2/p):	2.30
Maximum Area Platform LOS:	A
Length Req'd for LOS C/D (m):	11.2
Time to clear exiting surge peds (sec):	11

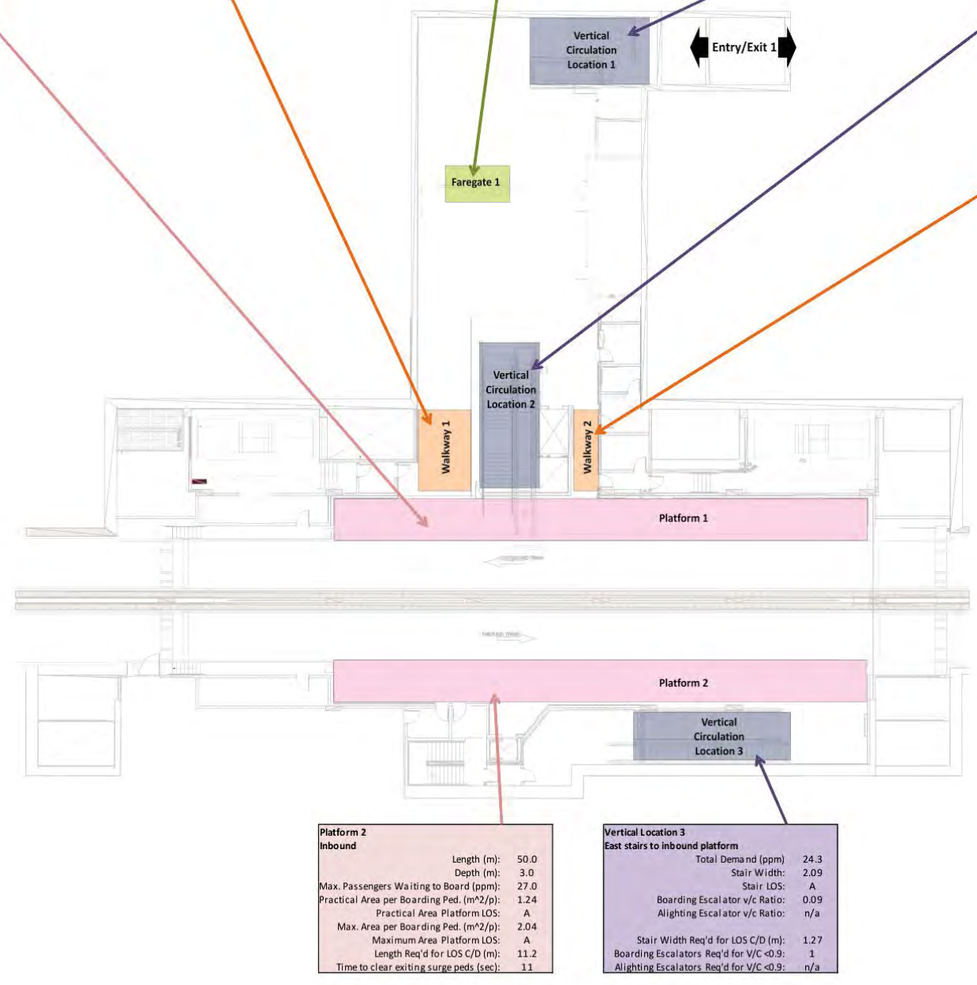
Walkway 1 South Walkway to Outbound Platform	
Width (m):	4.3
Demand (ppm):	21.6
Walkway v/c Ratio:	0.07
Walkway LOS:	A
Width Req'd for LOS C/D (m)	1.0

Faregate 1 Near Entrance/Exit to street level	
Entering Station Gates:	0
Exiting Station Gates:	0
Bi-Directional Gates:	4
Demand (ppm):	72.4
Faregate v/c Ratio:	0.72
Gates Req'd for V/C <0.9:	4

Vertical Location 1 Entrance/Exit to street level	
Total Demand (ppm)	72.4
Stair width:	2.73
Stair LOS:	A
Entering Station Escalator v/c Ratio:	n/a
Exiting Station Escalator v/c Ratio:	0.70
Stair Width Req'd for LOS C/D (m):	1.27
Entering Escalators Req'd for V/C <0.9:	n/a
Exiting Escalators Req'd for V/C <0.9:	1

Vertical Location 2 West stairs to inbound platform	
Total Demand (ppm)	22.6
Stair Width:	2.57
Stair LOS:	A
Boarding Escalator v/c Ratio:	n/a
Alighting Escalator v/c Ratio:	0.21
Stair Width Req'd for LOS C/D (m):	1.27
Boarding Escalators Req'd for V/C <0.9:	n/a
Alighting Escalators Req'd for V/C <0.9:	1

Walkway 2 North Walkway to Outbound Platform	
Width (m):	2.0
Demand (ppm):	28.2
Walkway v/c Ratio:	0.25
Walkway LOS:	A
Width Req'd for LOS C/D (m)	1.0



Platform 2 Inbound	
Length (m):	50.0
Depth (m):	3.0
Max. Passengers Waiting to Board (ppm):	27.0
Practical Area per Boarding Ped. (m^2/p):	1.24
Practical Area Platform LOS:	A
Max. Area per Boarding Ped. (m^2/p):	2.04
Maximum Area Platform LOS:	A
Length Req'd for LOS C/D (m):	11.2
Time to clear exiting surge peds (sec):	11

Vertical Location 3 East stairs to inbound platform	
Total Demand (ppm)	24.3
Stair Width:	2.09
Stair LOS:	A
Boarding Escalator v/c Ratio:	0.09
Alighting Escalator v/c Ratio:	n/a
Stair Width Req'd for LOS C/D (m):	1.27
Boarding Escalators Req'd for V/C <0.9:	1
Alighting Escalators Req'd for V/C <0.9:	n/a

Exhibit 7.2
Station Illustration Weekday PM Peak Hour (Basecase)

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Table 7.7: Existing Oakridge-41st Station Capacity

Existing Station Element	LOS or volume/capacity		
	Weekday Morning	Weekday Afternoon	Saturday
Platforms (practical area)			
Inbound	A	A	A
Outbound	D	A	A
Vertical Circulation to Plaza			
Stairs	A	A	A
Escalator	0.33	0.7	0.53
Elevator	A	A	A
Vertical Circulation to foyer from under tracks			
Stairs	A	A	A
Escalator	0.15	0.21	0.26
Elevator	A	A	A
Vertical Circulation to under tracks from inbound platform			
Stairs	A	A	A
Escalator	0.15	0.09	0.12
Elevator	A	A	A
Walkway			
North Walkway from outbound platform	A	A	A
South Walkway from outbound platform	A	A	A
Faregates	0.41	0.72	0.52

Note: volume over capacity ratios of 1.0 or higher or Levels of Service of F indicate item is over capacity

Projected Oakridge-41st Station conditions in the future assuming no Oakridge Centre expansion were calculated. The volumes represent existing pedestrian usage to and from Oakridge Centre and an estimate of 3% yearly growth of the additional (non-Oakridge related) use of the Station.

As part of their long-range forecasting for the Canada Line, TransLink has estimated about a 3% growth per year to the year 2045; as such, the future base Station conditions were estimated up to 2041.

Future conditions for the Station pinch points are shown in **Exhibits 7.4**, **7.5**, and **7.6** for the weekday morning, weekday afternoon, and Saturday peak periods respectively, and the operating capacities of each item are summarized in **Table 7.8** in terms of volume-over-capacity ratios (v/c) or Levels of Service (LOS).

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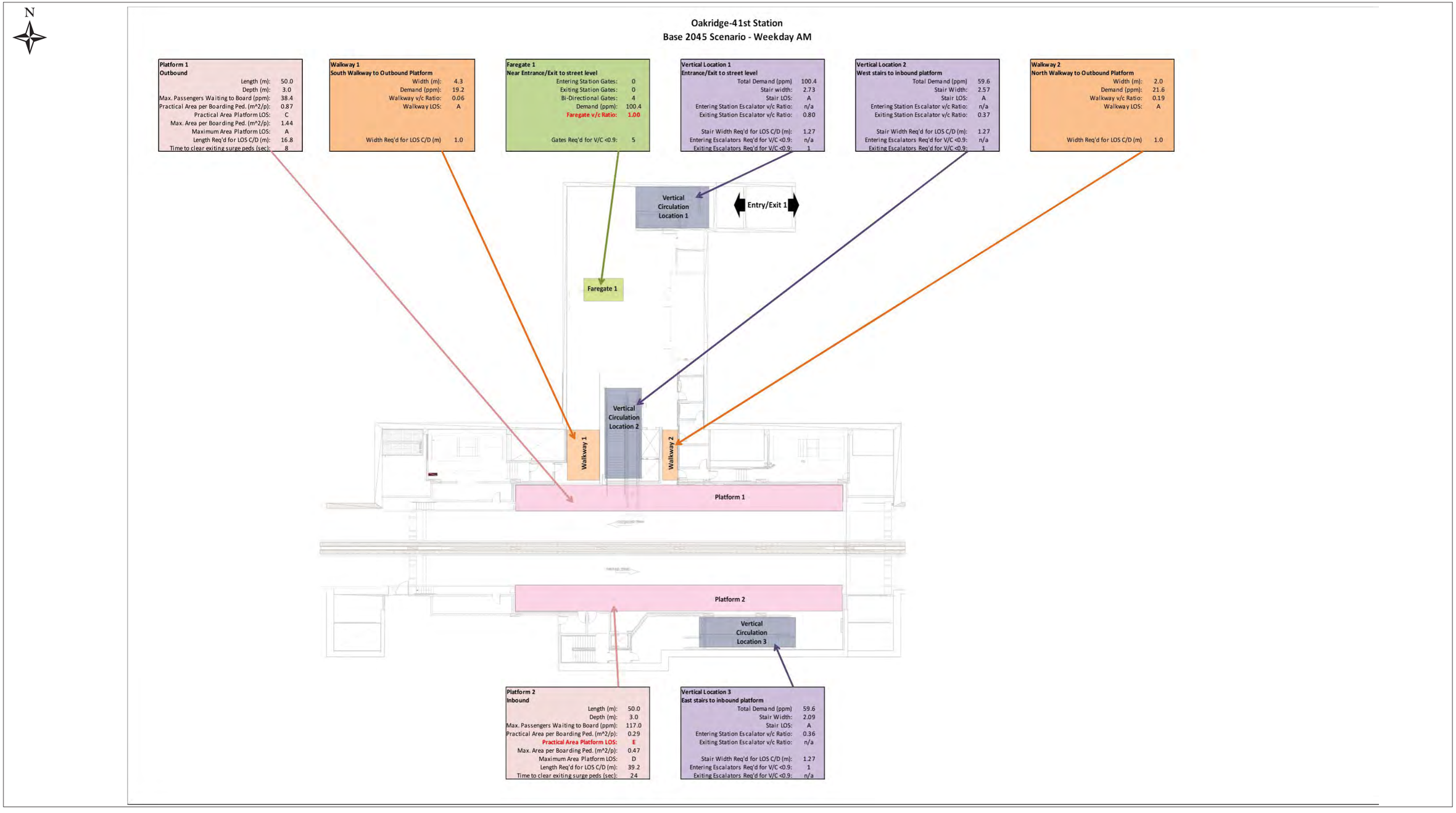

Exhibit 7.4

Station Illustration Weekday AM Peak Hour (Future Base)

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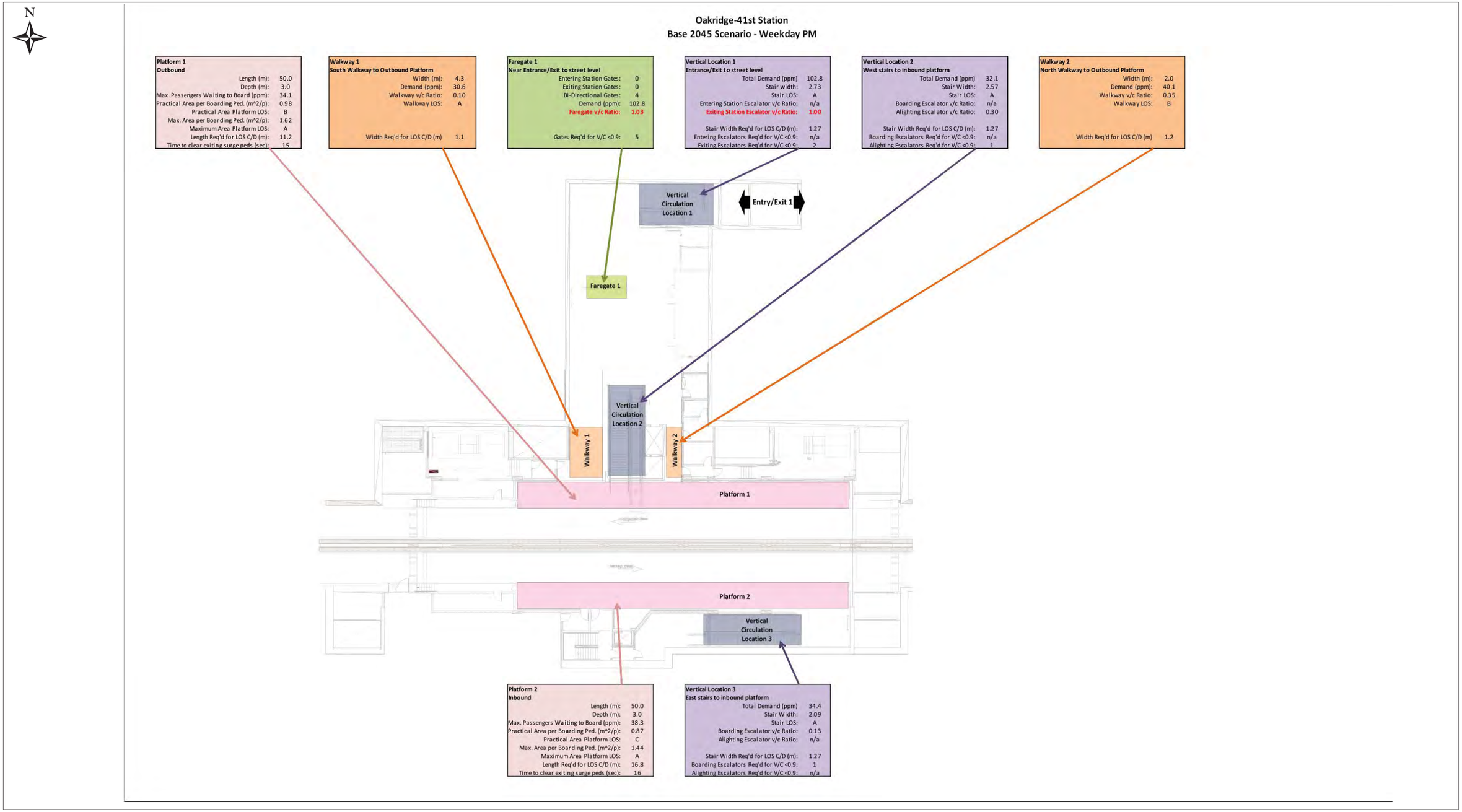

Exhibit 7.5

Station Illustration Weekday PM Peak Hour (Future Base)

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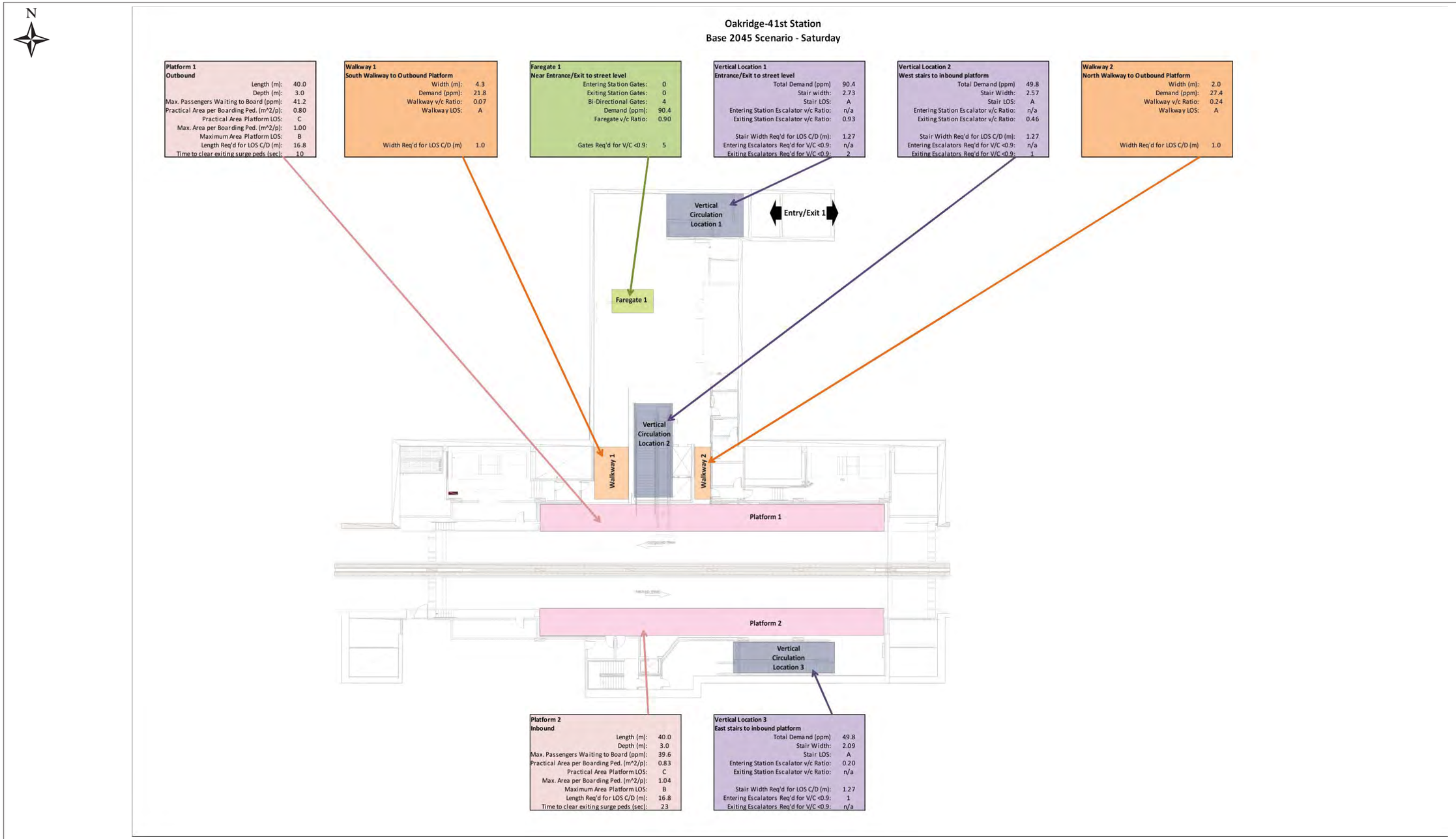

Exhibit 7.6

Station Illustration Saturday Peak Hour (Future Base)

bunt & associates

Table 7.8: 2041 Base Condition Oakridge-41st Station Capacity

Existing Station Element	LOS or volume/capacity		
	Weekday Morning	Weekday Afternoon	Saturday
Platforms (practical area)			
Inbound	C	B	C
Outbound	E	C	C
Vertical Circulation to Plaza			
Stairs	A	A	A
Escalator	0.80	**1.00**	0.93
Elevator	A	A	A
Vertical Circulation to foyer from under tracks			
Stairs	A	A	A
Escalator	0.37	0.30	0.46
Elevator	A	A	A
Vertical Circulation to under tracks from inbound platform			
Stairs	A	A	A
Escalator	0.36	0.13	0.20
Elevator	A	A	A
Walkway			
North Walkway from outbound platform	A	B	A
South Walkway from outbound platform	A	A	A
Faregates	**1.00**	**1.03**	0.90

Note: volume over capacity ratios of 1.0 or higher or Levels of Service of F indicate item is over capacity

The analysis indicates the following:

- The up escalator exiting the Station out onto the plaza is expected to be close to or at capacity during the peak periods, and would be unable to accommodate estimated future volumes. It is possible that with the increased delays, many pedestrians would choose to exit the Station via the stairs; however, it is expected that the escalator would continue to operate with long delays. The apparent measure to address this would be to provide an additional up escalator; however, the width of the existing structure housing the stairwell and escalator may need to be expanded to accommodate it.

- The existing four fare gates would lack throughput to accommodate future passenger demand, and would need to be increased to five.

- The inbound platform is expected to begin experiencing future crowding. The Station would allow for lengthening the existing platforms from 40 metres to 50 metres, and is expected to alleviate some of the crowding. More frequent train headways would also address this potential issue.

7.2.7 Future Conditions with Oakridge Expansion

Projected Oakridge-41st Station conditions in the future with full Oakridge Centre build-out represent expected pedestrian usage to and from the expanded Oakridge Centre (including all residential, retail, and institutional land uses) with the transit pedestrian split shown (high demand) in Section 3 Table 3.9. It includes an estimate of 3% yearly growth of the additional (non-Oakridge related) use of the Station.

Future base Station conditions were estimated up to 2041, and Station pinch points are shown in **Exhibits 7.7**, **7.8**, and **7.9** for the weekday morning, weekday afternoon, and Saturday peak periods respectively. The operating capacities of each item are summarized in **Table 7.9**.

Table 7.9: 2045 Expanded Oakridge Centre Condition Oakridge-41st Station Capacity

Existing Station Element	LOS or volume/capacity		
	Weekday Morning	Weekday Afternoon	Saturday
Platforms (practical area)			
Inbound	D	D	D
Outbound	E	D	D
Vertical Circulation to Plaza			
Stairs	B	C	A
Escalator	**1.14**	**2.31**	**1.82**
Elevator	A	A	A
Vertical Circulation to foyer from under tracks			
Stairs	B	A	A
Escalator	0.53	0.69	0.90
Elevator	A	A	A
Vertical Circulation to under tracks from inbound platform			
Stairs	B	C	C
Escalator	0.50	0.35	0.35
Elevator	A	A	A
Walkway			
North Walkway from outbound platform	A	E	C
South Walkway from outbound platform	A	A	A
Fare gates	**1.41**	**2.46**	**1.73**

Note: volume over capacity ratios of 1.0 or higher or Levels of Service of E or F indicate item is over capacity

Similar to the base 2045 scenario, measures to mitigate delays on the up escalator to the plaza, the fare gates, and the outbound platform may need to be addressed. The north walkway to the outbound platform may also encounter delays, although it is expected that pedestrians would use the south walkway should delays approach capacity. The analysis also indicates that these improvements would be required upon completion of the initial phase redevelopment of the Oakridge expansion.

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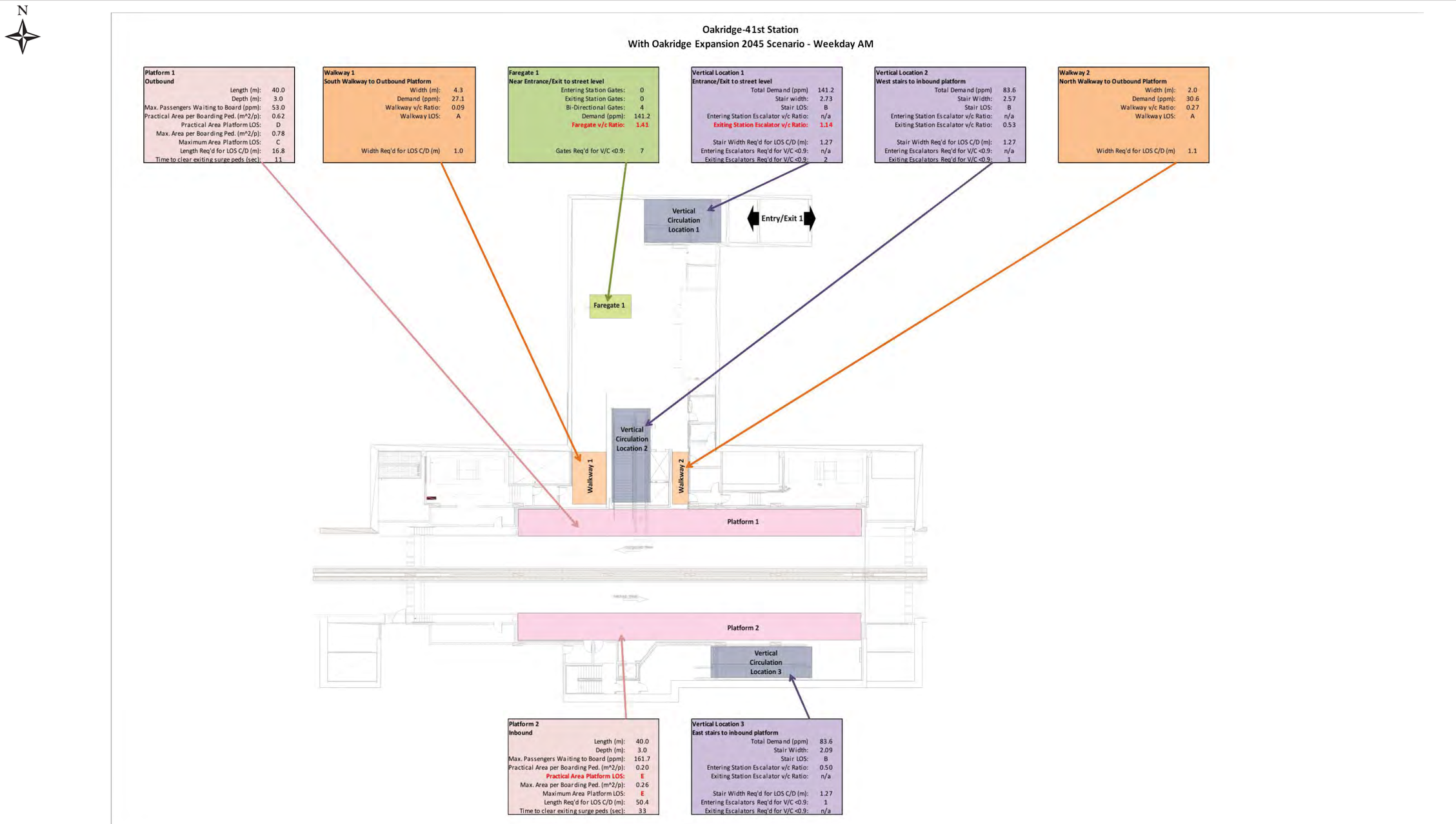

Exhibit 7.7

Station Illustration Weekday AM Peak Hour (Future Total)

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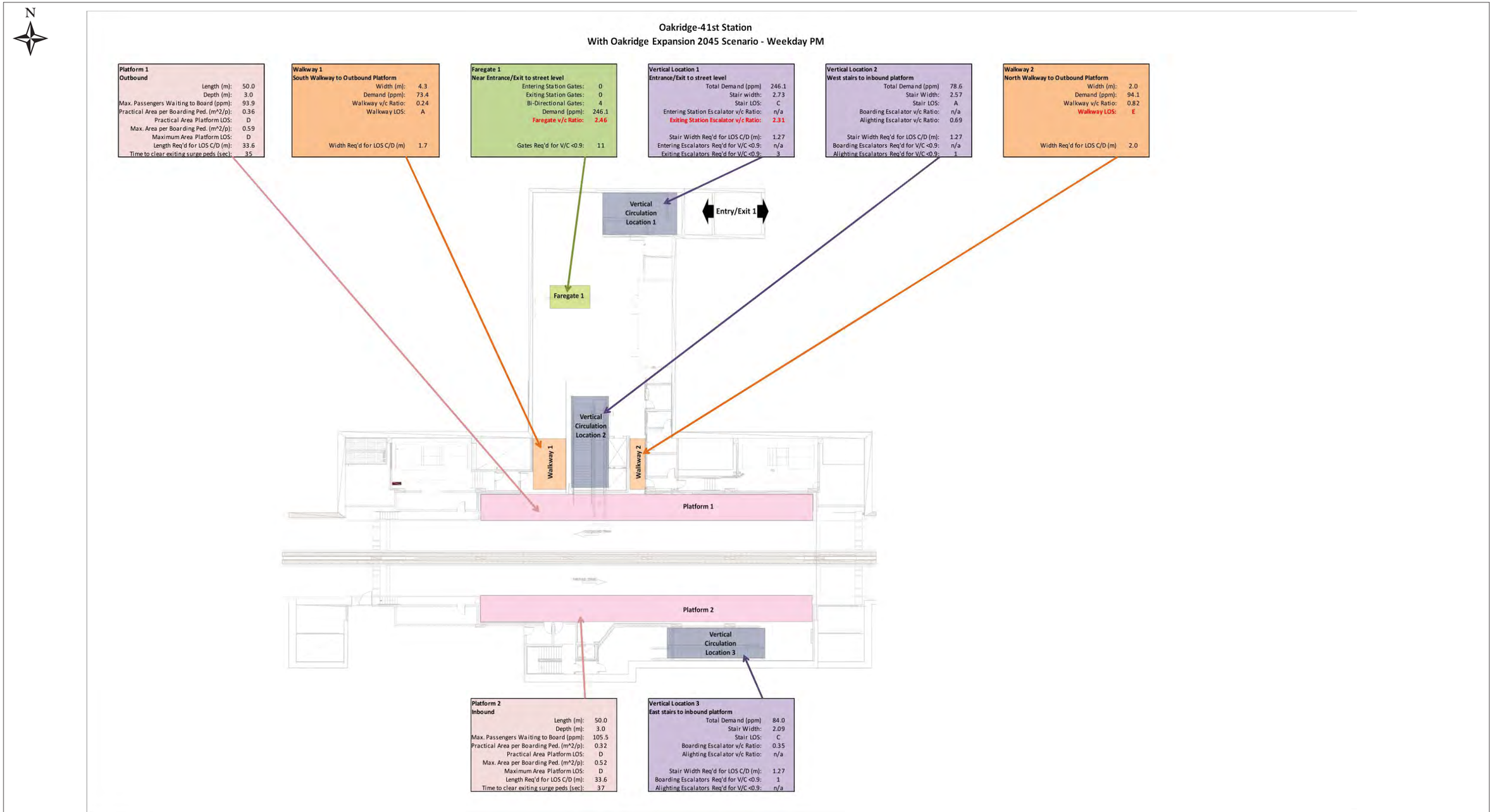

Exhibit 7.8

Station Illustration Weekday PM Peak Hour (Future Total)

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Oakridge-41st Station
With Oakridge Expansion 2045 Scenario - Saturday

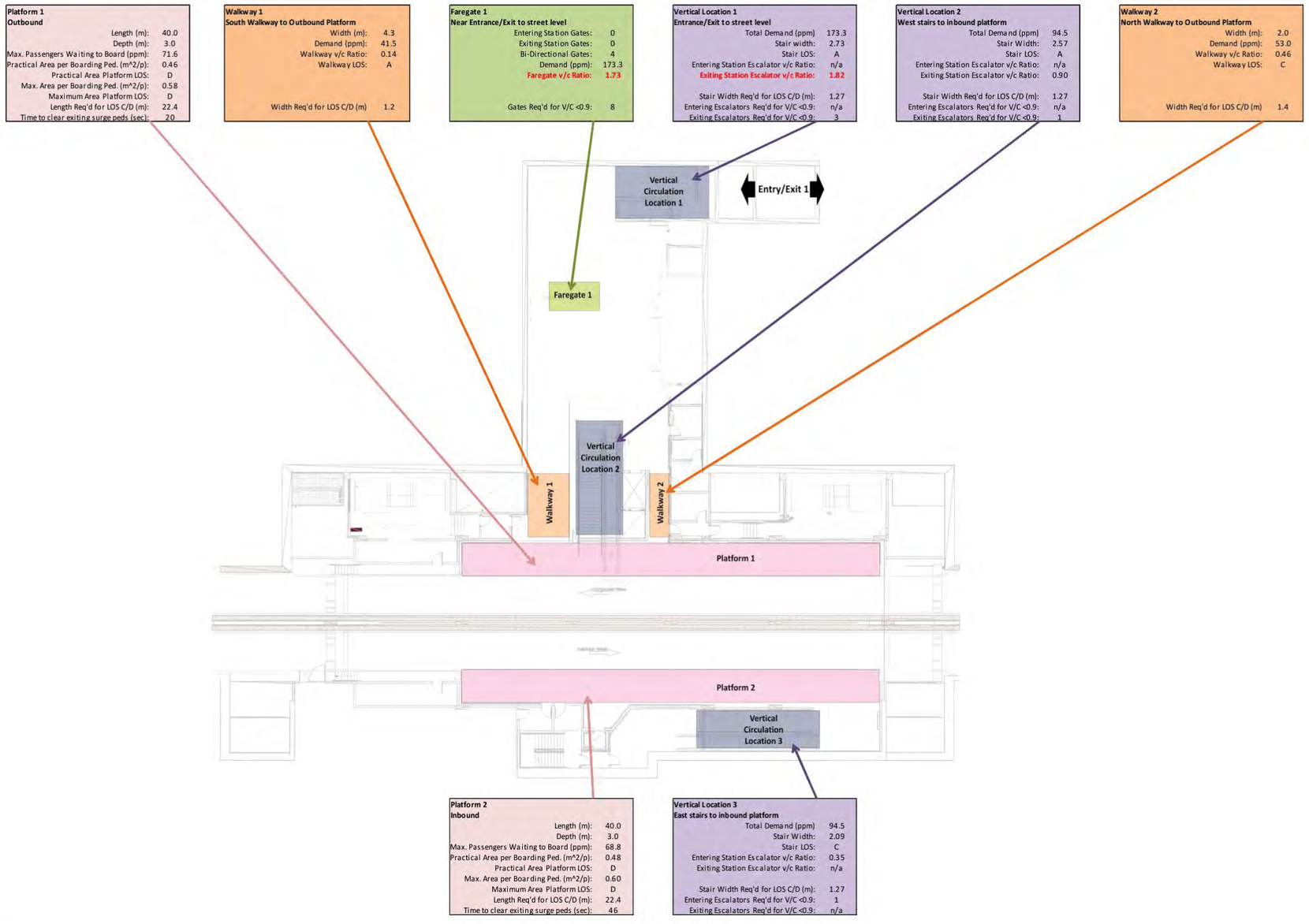


Exhibit 7.9

Station Illustration Saturday Peak Hour (Future Total)

7.3 Canada Line Line Capacity

TransLink has multiple options available to address passenger volumes and increase capacity of the Canada Line. These scenarios are summarized in **Table 7.10** and consist of the following:

- Increasing the train headways to two minutes, thus making the trains more frequent through more trains; and,
- Provision of a longer 3-car train with nine loading doors available, in conjunction with lengthening each station platform to 50 metres (currently at 40 metres).

Table 7.10: Current and Potential future capacities of the Canada Line

Line Capacity Scenario	No of Cars per Train	Headway (sec)	Total Capacity in Peak-hour (peak period per direction per hour)
Current	2	200	6,500
Future Medium Term	2	120	10,000
Future Long Term	3	120	15,000

TransLink has indicated that these Line improvements are currently planned, although there is no timeline yet, while additional and/or longer trains would need to be purchased.

7.4 Bus Transit Operations

Three bus routes directly connect to Oakridge. Route #15 runs north to south on Cambie Street, connecting Olympic Village Station to Marine Drive Station. Route #41 and #43 both run east/west along West 41st Avenue, and connect Joyce Station to the University of British Columbia.

TransLink was able to provide passenger volumes for these bus routes for similar periods considered for the Canada Line and Oakridge Station. For routes #41 and #43, September to November 2012 was considered, and for Route #15, January to November 2012 was examined (to attain a robust sample size). Routes #15 and #41 use standard bus vehicles, which have a peak capacity of 45 passengers, while Route #43 uses an articulated bus vehicle, with a peak capacity of 85 passengers.

Exhibit 7.10 illustrates the percentage split for travel volumes for passengers boarding and alighting at Oakridge, as well as the current (2012) average leave load at Oakridge, by direction and overall/ combined bus network capacity. The PM and Saturday peaks approach capacity in the eastbound direction (toward Joyce Station).

Future Oakridge bus volumes were estimated using the same modal split described in Section 3.3, and the high range split was used to determine future transit trips. It should be noted the resultant 2023 bus transit volumes were estimated without the knowledge of current number of bus passengers who are attributed to Oakridge use. The new future Oakridge bus transit person trips were therefore added to the existing peak-hour volumes. The 2023 peak-hour bus transit volumes, as leaving loads at Oakridge are illustrated in **Table 7.11**.

Table 7.11 Estimated Future Bus Network Capacity

Direction	Weekday Morning			Weekday Afternoon			Saturday		
	Total Leave Load	Available Capacity	Remaining capacity	Total Leave Load	Available Capacity	Remaining capacity	Total Leave Load	Available Capacity	Remaining capacity
East	265	1115	850	1273	1115	-158	753	440	-313
West	1166	1620	454	511	865	354	447	440	-7
North	56	220	164	10	165	155	17	220	203
South	58	220	162	41	165	124	38	220	182

The eastbound bus network is projected to be over capacity in both the PM and Saturday peak-hour periods, especially in the Saturday period where capacity is significantly exceeded at a volume 71% of the original capacity. Westbound Saturday service is projected to be at capacity, and other services appear to be adequate for all future peak periods.

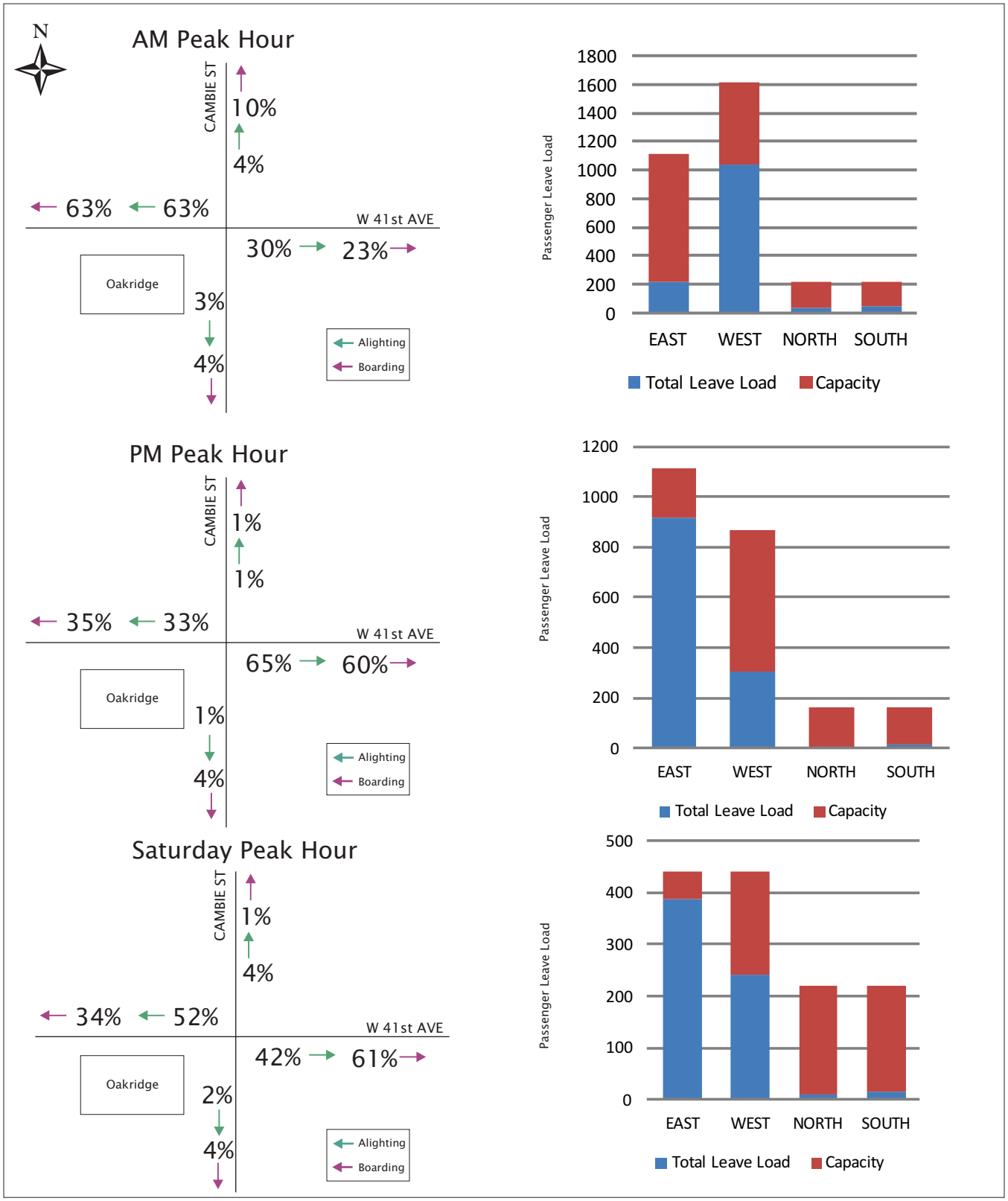


Exhibit 7.10

Bus Boardings and Alightings

7.5 Bus Stop Considerations

There are currently three bus stops that the Oakridge redevelopment will impact: the Route 41 and 43 stops on the eastbound nearside of Cambie Street, and the Route 15 southbound farside of 41st Street. Items to consider about its location and design are as follows:

7.5.1 Locations

Given that the Cambie Street and 41st Avenue intersection is a major transit transfer site between the buses and the SkyTrain, it is preferable to maintain the general location of the existing bus stops to the southwest quadrant of the intersection. This would minimize the need for transit users walking between the Station and the bus stops to cross either of the major streets. The eastbound 41st Avenue bus stop is likely to be located within the eastbound right-turn lane; the bus stop should located as far west within the lane as possible so that eastbound right-turn vehicles would not potentially enter the lane and exit to avoid waiting behind a loading bus.

7.5.2 Bikeways

As noted in Chapter 6, two-way bikeways separated from the road are planned for the south side of 41st Avenue and the west side of Cambie Street. Users on both these bikeways may potentially conflict with people waiting at the bus stop or alighting a bus. TransLink has indicated a preference to keep bikeway users and bus passengers separated (as opposed to a shared space). From a bus boarding and alighting operations perspective, it is also preferable to locate the bus stop and waiting area by the curb, and have the bikeway routed behind the bus stop. To reduce the likelihood of passengers conflicting with cyclists, the bus stop should be of adequate size to accommodate waiting passengers (discussed below), the bikeway to be clearly and conspicuously marked in the vicinity of the bus stop to make pedestrians aware of the bikeway dedication, and signage should be installed warning pedestrians to be aware of cyclists.

7.5.3 Bus Stop Size

The bus stops should be sized to accommodate both the buses that are expected to use the bus stop and the likely number of waiting passengers that will use the bus stop. Currently, Routes #15 and #41 are served with standard buses of about 12.4 metres in length, while Route #43 is served with articulated 18.6 metre buses. TransLink has indicated that should the bus stops for the #41 and #43 be combined, it is preferable that the bus stop be long enough to accommodate both a standard and articulated bus at the same time. According the TransLink's *Bus Infrastructure Design Guidelines*, such a bus stop would generally require a bus stop length of 43.0 metres (31.0 metres to accommodate the buses, and 12.0 metres to allow each bus to pull out of the bus stop and onto the eastbound through lane), excluding the eastbound right-turn lane taper length. TransLink also requires a minimum bus stop width of 3.0 metres to accommodate door clearances and wheelchair loading operations.

8. RETAIL, OFFICE AND COMMUNITY USE PARKING

8.1 Introduction

This section outlines the current supply and demand of commercial parking at Oakridge, as well as outlining the future supply and estimated demand. In doing this, reference is made to other comparable shopping centres, as well as existing lease requirements which have to be honored. Context is also provided with the bylaw requirements.

8.2 Current Supply and Demand

Table 8.1 summarizes the existing supply and demand of parking at the site. Parking surveys were carried out in November 2010.

Table 8.1: Existing Parking Supply and Demand

Subject	Units
Current Parking Supply	3,263 stalls
Current Parking Demand	2,425 stalls
Current Parking Supply Ratio	4.0 stalls per 1,000 sq ft GFA 4.7 stalls per 1,000 sq ft GLA
Current Peak Parking Demand Ratio	2.9 stalls per 1,000 sq ft GFA 3.5 stalls per 1,000 sq ft GLA

The above table shows that the current demand for parking is 2.9 stalls per 1,000 sq ft GFA, which translates into a peak demand for 2,425 stalls. It occurs on a Saturday, meaning the influence of the limited office space currently on the site is minimized.

8.3 Bylaw Comparison

The City of Vancouver minimum parking bylaw requirements for general retail are contained in Section 4.2.5.1 of the City of Vancouver parking Bylaw. The minimum parking rate is stated as follows:

> *A minimum of one space for each 100 square metres of gross floor area up to 300 square metres, and one additional space for each additional 50 square metres of gross floor area.*

For the proposed floor area at Oakridge, this translates into a rate of 1.86 stalls per 1,000 sq ft GFA or 2.25 stalls per 1,000 sq ft GLA and a minimum parking requirement of approximately 3,600 parking stalls compared to 5,400 stalls that are proposed in the development to meet current peak demand.

8.4 Future Proposed Supply and Demand

Several factors have been taken into consideration when considering the future non-residential parking supply and demand for the site:

- Changing parking demand at Oakridge;
- Existing tenant lease requirements; and
- Parking supply levels at other comparable sites.

8.4.1 Changing Parking Demand at Oakridge

Bunt & Associates has been involved with the Oakridge Mall for many years, so has historical data showing an ongoing decrease in parking demand over the years. **Table 8.2** summarises some of that data.

Table 8.2: Historical Oakridge Parking Demand

Date of Survey	Observed Parking Parking Ratio per 1,000 sq ft (GLA)	Notes
1989	5.0	
Pre Christmas 2004	4.8	Pre-Christmas count will be higher than at other times.
November 2010	3.5	3.5/ 1,000 sq ft GLA is for all uses, based on a Saturday (this is equivalent of 2.9/ 1,000 sq ft GFA).

Evidently, rates have trended down over time, even taking into account the 2004 survey was carried out pre-Christmas while the recent decrease in demand could be attributed in part to the Canada Line.

8.4.2 Tenant Lease Requirements

While on one hand parking demand is falling, Ivanhoe Cambridge has several long-term leases in place with anchor tenants of the mall. Irrespective of the projected demands, these tenants have an important say in the future parking supply for the site.

Specifically, some of the major anchors have lease requirements requiring a rate of 4.5 parking stalls per 1,000 sq ft GLA.

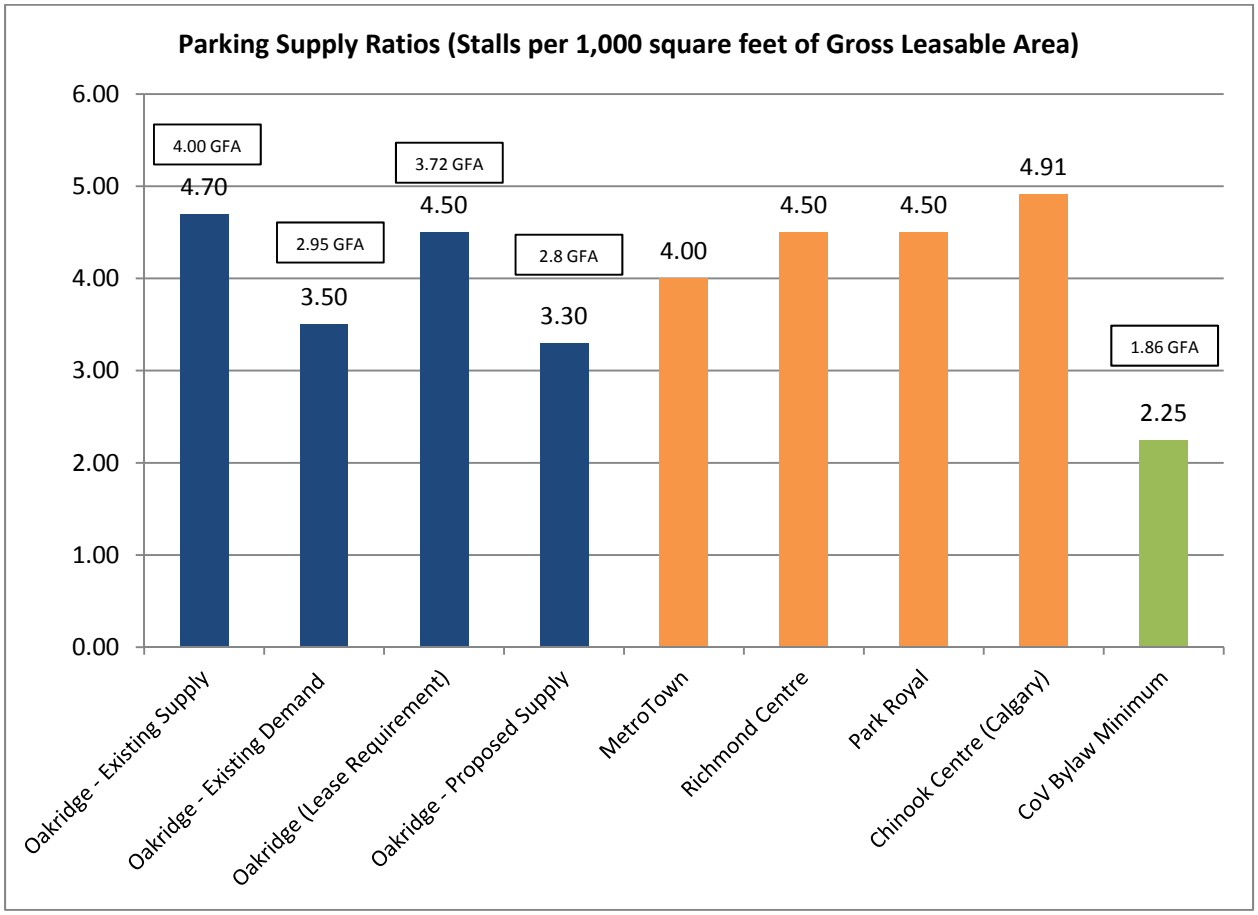
8.4.3 Parking Supply at Comparable Sites

Another important aspect to the supply is competing shopping centres where large malls such as Metrotown, Richmond Centre and Park Royal have parking supply ratios of 4.0 per 1,000 sq ft GLA or more.

8.4.4 Proposed Supply

A supply of 5,400 stalls is proposed to service 1,960,000 sq ft (GFA) of retail, office and community space. This equates to a ratio of 2.8 stalls per 1,000 sq ft GFA or 3.3 per 1,000 sq ft GLA. **Figure 8.1** graphically illustrates the existing supply, demand, lease requirements, proposed supply, comparable sites and bylaw minimums.

Figure 8.1: Commercial Parking Supply Summary



The graph helps to illustrate that the proposed supply ratio is approximately 30% less than current ratio, which will give Oakridge a relatively low supply of commercial parking compared to many comparable centres within Metro Vancouver and beyond. The proposed supply is also marginally less than the current demand, in terms of ratio, reflecting a belief that the trend towards lower parking demand will likely continue to some degree. Finally, it is clear that the proposed supply comfortably exceeds the minimum bylaw requirement.

8.5 Current Parking Management

Parking management has already been discussed as part of the TDM section. However, this section focuses on parking stall efficiencies rather measures to reduce demand.

Vehicle parking for Oakridge visitors is currently free of charge but restricted to a four hour maximum parking stay. Bunt & Associates has been informed that this parking management measure is strictly enforced by parking security which monitors the area daily. Parking violators are provided with three written notifications followed by a charge penalty and towing of their vehicle.

Office and retail employees (long term parkers) are provided with an employee parking pass, which is free of charge and only requires a deposit fee and allow employees to park their vehicles beyond the four hour limit. Although the area in which these passes are valid is not restricted, employees are encouraged to park on the roof top and the peripherals of the parking levels to allow visitors to utilize the preferred parking stalls in closer proximity to the mall entrances.

The four hour time restriction for visitor parking and employee parking pass program were implemented after Canada Line was in place in order to manage the changing parking patterns. Further, these parking restrictions are also helpful in discouraging park & ride activities at Oakridge Centre.

8.6 Future Parking Management

For the future site, parking management strategies will be implemented to improve the utilization of the parking stalls and this section briefly reviews different policies and parking control measures that could be put into practice to ensure effective usage of parking stalls and encourage sustainable modes of transportation. Measures are complementary to the TDM measures outlined earlier in the report.

8.6.1 Parking Pricing

Visitor parking will continue to be free for four hours. For longer term and all day parking, the current free parking pass should be replaced with a paid for parking management system. Ideally, monthly or weekly passes should not be available, but drivers would be required to pay on a daily basis. This will encourage drivers to consider more sustainable travel modes on days when they do not need their car. Any parking management plan will need to be actively managed and reinforced with continuous monitoring and penalties for parking violators.

8.6.2 Parking Zones

As at present, longer term parkers should be encouraged to park in less popular areas. For example, any longer term parking ticket could only be valid in certain areas of the parkade. In addition, some parking stalls close to the entrance to certain uses, such as the library, could have different parking restrictions, such as a short time limit for book drop offs, to ensure available stalls are used in an efficient manner.

8.6.3 Valet Parking

This parking service improves parking stall utilization. It also provides visitors with a high end parking service that will enhance their shopping experience at the mall. Valet parking drop off locations will be positioned close to the two main vehicle entrances to the mall, one off 41st Avenue and one off Cambie Street. Valet parked vehicles should be located in the least popular areas of the parkade.

9. RESIDENTIAL PARKING

9.1 Introduction

This section considers the residential parking supply and anticipated demand. The proposed parking ratios are low relative to other developments in the City. In total, 2,914 units are proposed for the Centre with 1,400 parking stalls assigned to residents, for an overall ratio of 0.48 stalls per unit, plus 100 stalls for the bespoke car coop. Policy context and social trends support this ratio while the available parking stalls are anticipated to be assigned to unit types which have differing demands. Supply is compared to the City bylaw and other City precedents, TDM measures to reduce parking demand and, finally, on-street parking supply and demand within the surrounding neighbourhood is reviewed.

9.2 Policy Context and Car Ownership Trends

Transportation 2040 and the Greenest City Action Plan contain references to lower parking ratios around rapid transit stations as key components of a vision to promote more sustainable transportation choices and reduce greenhouse gas emissions, as well as reducing housing costs. In addition, Transportation 2040 mentions future plans to consider zero parking minimums around certain areas.

This sets a context and expectation that a landmark development such as Oakridge, high density and mixed use, located in a highly accessible central location, should be innovative and push the envelope when it comes to residential parking supply.

Policies have a strong basis in social changes, which are ongoing within the City of Vancouver and beyond. Auto ownership levels are decreasing in Vancouver and most new residential developments in the City are being built with parking that is underutilized. Social changes that are expected to impact auto ownership are:

- An aging population that is driving less;
- Young people driving less with fewer drivers' licences;
- Young people increasingly traveling by modes other than the car (affordability being a key issue);
- 60% of future population growth will take place in the 50 largest cities in North America;
- Housing is becoming less affordable whilst the cost of owning a vehicle is significant. Creating infrastructure that allows people to make a choice to not own a car, contributes to overall affordability in the City of Vancouver.

Policy and societal shifts are obviously closely linked and provide an impetus to respond and create new developmental landmarks.

From a practical point of view, there is evidence to suggest that a low parking supply can influence demand. **Table 9.1** represents results from an ICBC vehicle registration search for buildings in Vancouver that have low parking supply rates.

Table 9.1: Vehicle ownership in Multi-Family Buildings With Low Parking Supplies

Building	Units	Parking Supply	Parking Supply Per Unit	Parking Demand	Parking Demand per Unit
66 West Cordova	108	18	0.17	41	0.38
989 Nelson St (Electra)	242	150	0.62	50	0.21
128 Cordova Street (Woodwards)	366	310	0.85	230	0.63

Evidently, the parking demand for each of these buildings is lower than would be expected in a typical building. 66 West Cordova stands out due to its exceptionally low supply of 0.17 stalls per unit. Having been completed just over 18 months prior to the writing of this report, it is interesting to note how the reduction of parking supply contributes to are ownership over time. The Electra Building, which has been occupied over 5 years, is an excellent example of this trend. The demand at 66 West Cordova of 0.38 stalls, is still significantly lower than comparable buildings with conventional parking supplies and lower than what is proposed at Oakridge.

9.3 Bylaw Requirements and City Precedents

Although the site sits within its own CD-1 zone and the bylaw will be set for this zone specifically, it is useful to compare the proposed parking supply with City of Vancouver standards. **Table 9.2** outlines both the general City bylaw and downtown specific bylaw for off-street parking.

Table 9.2: City of Vancouver Off-Street Parking Bylaw

Housing Type	Units	Bylaw Requirement – Outside Downtown	Bylaw Requirement - Downtown
Family Non Market	64	67	41
Rental	393	267	176
Affordable Ownership	100	55	38
Sustainable TO Market	1,460	1,213	792
Traditional Market	715	903	677
Seniors Non-Market	120	49	49
VRS Units (Low Income)	12	6	6
HL Rate Rental Micro (Low Income)	50	25	25
Total	**2,914**	**2,585**	**1,804**

Note: The by-law rates used in the non-downtown calculations were taken from the City of Vancouver's Off-Street parking Bylaw sections: 4.2.1.3 Three of More residential units; 4.2.1.9 Three or more residential units, low income; 4.2.1.12 Seniors Supportive/ Assisted Housing. None of these rates specifically require residential visitor parking.

Evidently, the general bylaw would require 2,585 stalls if applied to Oakridge, while using the downtown rate would result in a requirement for 1,804 stalls. The 1,400 proposed stalls represent approximately three-quarters of the downtown rate and half the general City rate.

9.4 Future Proposed Supply

With the proposed residential supply of 1,400 parking stalls (corresponds to an overall ratio of 0.48 stalls per unit) it will be comprised of several specific parking supply ratios for different types of housing that Oakridge will provide. **Table 9.3** outlines the number of units, parking supply and ratio for each of the main housing types.

Table 9.3: Proposed Parking Supply

Housing Type	No. of Units	Proposed Stalls	Ratio
Family Non-Market	64	16	0.25
Seniors Non-Market	120	12	0.10
VRS Housing	12	1	0.08
HIL Rate Rental Micro Units	50	5	0.10
Rental	393	100	0.25
Affordable Ownership	100	8	0.08
Sustainable Transit Orientated Market	1,460	371	0.25
Traditional Market	715	887	1.24
TOTAL	**2,914**	**1,400**	**0.48**

Some housing types are geared toward non-market and low income residents and have considerably lower parking provision than the traditional market units. This is in a bid to keep costs down, as well as recognizing that residents of these units are less likely to want to afford a car. 'Sustainable Transit Orientated Market' units make up approximately half of the total units and are supplied with one stall per four units. It recognizes that some families in these units require a vehicle, especially given that 220 of the units would be three-bedroom and will likely be occupied by families with young children. The traditional market units make up one-quarter of the total and have an overall parking ratio of 1.24. 30% of the units are three-bedroom or penthouse units that would typically expect at least one parking stall with the unit.

Even though 'traditional market' units are well supplied with parking and they will be marketed in a traditional manner, 'Sustainable' units will be purposely marketed towards people looking for a car ownership free lifestyle. Site location and amenity factors will be highlighted, as well as provision for bicycles and the private car club.

9.5 Residential Car Club and other TDM Measures

Section 4.4 outlines proposed TDM measures for Oakridge residents, focusing on the proposed car club. These measures are designed to complement the lower parking ratio. As mentioned, up to 100 car club cars will be located on site, providing a high ratio of vehicles to drivers meaning a car should always be available when required the vast majority of the time. Other TDM measures proposed in Section 4.4 are:

- Public car share;
- Bicycle coop;

- Incentivized Transit Pass;
- TravelSmart measures such as personalized travel planning.

9.6 Residential Visitor Parking Supply

Residential visitors are not proposed to have dedicated parking facilities but will share the commercial parking supply. During evenings and weekends when visitor parking demand peaks, the parking stalls that would have been occupied by office employees will be relatively empty, and these stalls will be available for use by visitors.

9.7 On-Street Parking Management

With such a low residential parking supply proposed, it is necessary to examine the impact of some residents of Oakridge potentially parking vehicles off-site on neighbouring streets. As such, this section briefly details a review of the on-street parking supply availability (based on current supply and demand) in the vicinity of Oakridge.

9.7.1 Background

As part of the developers on-going discussions with the City as part of this project, the City requested a review on on-street parking supply and demand be undertaken so as to better understand the potential impacts, should Oakridge residents wish to park some vehicles on the street.

A review estimating the existing on-street parking supply within a 400m distance from the perimeter of the site has been undertaken. In addition, demand surveys conducted for a sample of representative streets in the area have also been undertaken. It also takes into account parking restrictions within this area to understand the "real" on-street parking availability given the existing restrictions. The following briefly describes the methodology used to conduct this review and provides a summary of our findings.

9.7.2 On-Street Parking Supply Estimate

Bunt used VanMap, Google Street View and information from the City's residential parking permit fees and areas webpage (http://vancouver.ca/streets-transportation/residential-parking-permit-areas-and-fees.aspx) to estimate the on-street parking supply within a 400m radius ('as the crow flies') of the site's perimeter based on the associated parking restrictions for each block. **Exhibit 9.1** highlights the overall parking supply and parking restrictions within 400m of the site.

The on-street parking supply was estimated using the following key methods and assumptions:

- A 400m radius (an approximate 5-minute walk) from the perimeter of the site was used as the boundary threshold;
- Curb lengths were measured between parking restriction signage (i.e. taking into consideration bylaw restrictions for parking distances from stop signs etc.) using aerial imagery and Street View;

- Driveways, lane accesses and other street sections where parking is not allowed were excluded from the estimate including a 5% reduction of curb space availability for fire hydrants per block (based on a sample of streets and the approximate amount of space where parking is restricted due to fire hydrants); and,

- Parking spaces were estimated based on 6m per vehicle, consistent with methodology employed by the City.

9.7.3 On-Street Parking Demand Estimate

In order to determine the number of available on-street parking spaces within a 400m walking radius of the site, parking demand surveys were undertaken on select representative blocks in the vicinity of the site to indicate an average occupancy rate. Five blocks were selected from each quadrant surrounding the site (using 37th Avenue, Oak Street, 49th Avenue, and Manitoba Streets as the boundaries) and included streets with various restriction types to ensure a representative sample of each area.

Parking demand spot counts were conducted on these sample blocks between 12am and 1am on a weeknight (Thursday May 23, 2013) to capture the peak residential demand (i.e. when most people are home), and the results of which are illustrated at **Exhibit 9.2**. It should be noted that this represents a snapshot of the parking demand, and that a daytime survey may also be necessary in order to understand if there are any additional parking pressures in the neighbourhood which may occur during peak times for Oakridge Centre.

9.7.4 Findings

The estimated on-street parking supply, demand, and available supply is presented in **Table 9.4**.

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Exhibit 9.1

Estimated On-Street Parking Supply & Restrictions

Oakridge Centre Rezoning Transportation Assessment, Vancouver, BC
4241.26 October, 2013 Scale NTS

bunt &associates

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Exhibit 9.2

On-Street Parking Demand Survey & Restrictions

Oakridge Centre Rezoning Transportation Assessment, Vancouver, BC
4241.26 October, 2013 Scale NTS

bunt & associates

Table 9.4: On-Street Parking Supply Estimate within 400m Walking Distance

Parking Restriction Type	Estimated Supply (# of Spaces)	Estimated Demand (# of Spaces)	Estimated Availability (# of Spaces)
Non-Resident Parking			
No Restrictions	720	230	490
1 Hr / 2 Hr Parking (Evening Unrestricted)	260	85	175
3-Minute Passenger Zone 8am – 5pm (Evening Unrestricted)	40	15	25
No Parking 9am – 6pm Except Residents of This Block (Mon – Sat)	470	150	320
No Parking 8am – 5pm Mon – Fri (Evening Unrestricted)	30	10	20
Sub-Total	*1,520*	*490*	*1,030*
Resident Parking			
Resident Parking Only	710	225	485
Parking Permit	80	25	55
Sub-Total	*790*	*250*	*540*
Total	2,310	740	1,570

Note: Some figures have been rounded for ease of interpretation

It is estimated that there are approximately 2,310 on-street parking spaces within 400m of Oakridge Centre. The estimated existing on-street parking demand for this same area is approximately 740 spaces (32% average per block), which results in an estimated on-street availability of 1,570 spaces within 400m of the site boundary (i.e. 5-minute walking distance).

To break the numbers down, approximately 1,520 spaces are for unrestricted parking with 490 occupied spaces and 1,030 available spaces, while 790 spaces have resident parking controls with 250 occupied spaces and 540 available spaces.

Therefore, this review indicates that there is a significant amount of on-street parking available in the vicinity of the site regardless of parking restrictions to accommodate any potential spillover from the Oakridge site.

10. EXISTING TRAFFIC OPERATIONS

10.1 Introduction

This section outlines the existing traffic conditions surrounding the site on 41st Avenue, Cambie Street and 45th Avenue. The existing site accesses and the existing laning on the roads which surround the site will also be summarized. Finally, the existing traffic volumes in and out of the site and on the surrounding road network, as well as the traffic operations performances at these site accesses and key neighbouring intersections, will be presented.

10.2 Scope of Traffic Review

The scope of the traffic review covers all of the public accesses into the Oakridge Mall site. It does not cover a loading access on 41st Avenue, nor a residential access off Cambie Street. In addition to this, the following neighbouring intersections are also included:

- 41st Avenue/ Cambie Street;
- 41st Avenue/ Willow Street;
- 45th Avenue/ Cambie Street.

Analysis of existing and future intersection performance is separated out into site accesses and neighbouring intersections. Where a site access currently or in the future lines up with a street intersection, it is included under the site access heading.

It was determined that the most appropriate time periods for assessment would be the Friday PM and Saturday peak-hours, focused on the site peak rather than the network peak. This is because the site accesses will be under most pressure during this time. Having said this, there was little difference between the two peaks in reality.

10.3 Existing Site Accesses and Laning

There are currently seven accesses to the Oakridge Shopping Centre. This excludes the aforementioned loading access on 41st Avenue and the residential access off Cambie Street, both of which were not analyzed.

The seven existing accesses include two accesses off 41st Avenue, three accesses off Cambie Street and two accesses off 45th Avenue.

The existing laning for the streets, are indicated on **Exhibit 10.1 and 10.2.**

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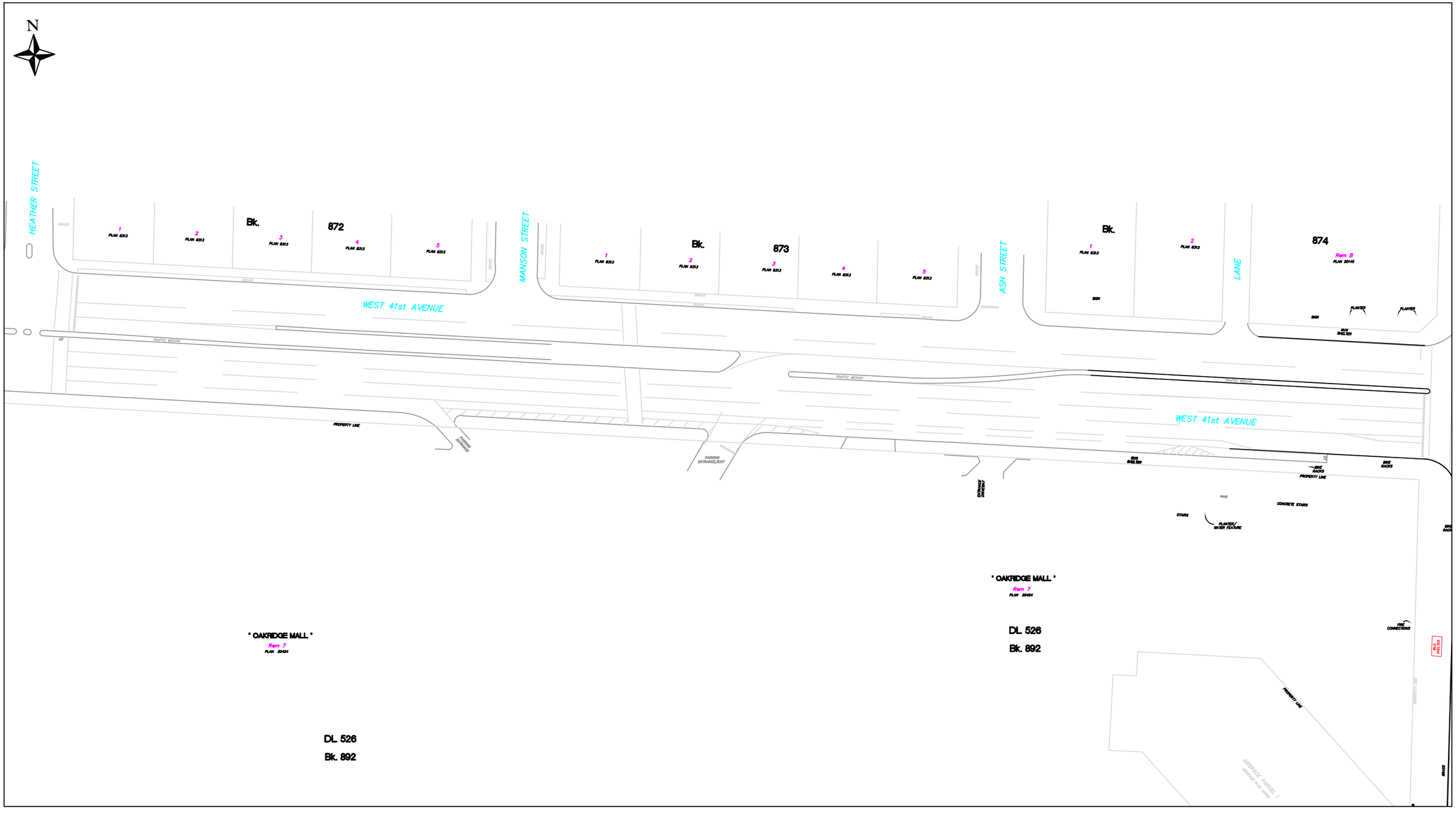

Exhibit 10.1

Existing Lane Configuration on 41st Avenue

Oakridge Centre Rezoning TIA
4241.26 October, 2013 Scale NTS

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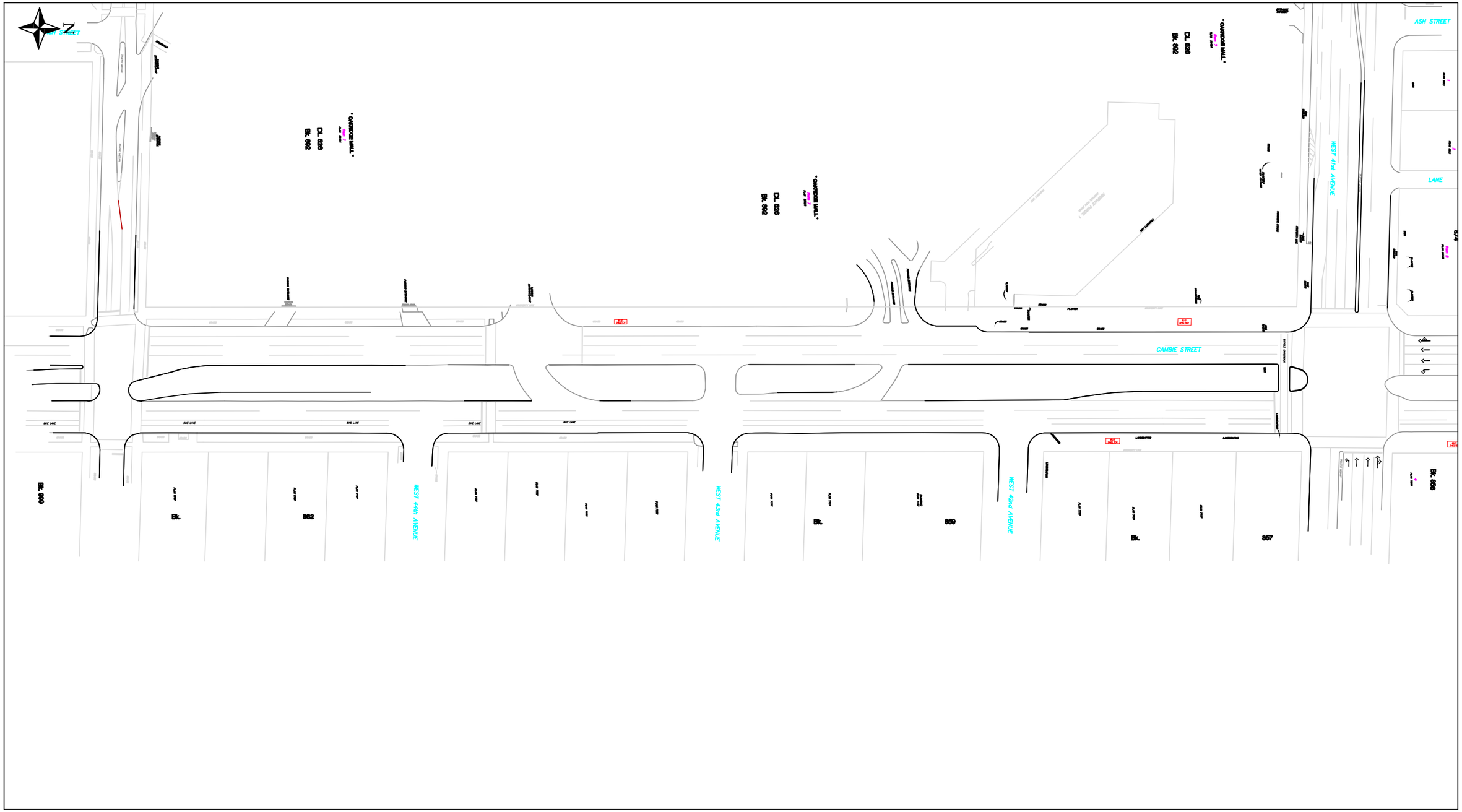

Exhibit 10.2

Existing Lane Configuration on Cambie Street

Oakridge Centre Rezoning TIA
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10.4 Existing Street Network

Bordering the site are two main arterial roads, which are 41st Avenue to the north and Cambie Street to the east. To the south is 45th Avenue, a local street, and to the west is a residential laneway.

41st Avenue functions primarily as a four lane road, however, adjacent to the site, it expands up to seven lanes in some areas. Nearby the site, Cambie Street operates as a five to seven lane road, depending on the section. 45th Avenue and the residential lane are both two lane roads.

The study area currently has four signalized intersections, which are the 41st Avenue / Willow Street, 41st Avenue / Cambie Street, 45th Avenue / Cambie Street and East Access 2 / Cambie Street intersections.

The 45th Avenue / Cambie Street and East Access 2 / Cambie Street intersections are both semi-actuated, while the Willow Street / 41st Avenue intersection is currently only pedestrian/cyclist-actuated. The 41st Avenue / Cambie Street intersection is fully-actuated.

The major intersection in the study area is at 41st Avenue and Cambie Street. Each approach has left-turn storage lanes, with "protected-permitted" signal phasing to help accommodate the high left-turn vehicle demand. Under existing conditions, this intersection operates with a long cycle length (approximately 125 seconds) during both the weekday PM and Saturday Mid-day peaks.

As mentioned, a detailed schematic of the study area lane configuration are shown on Exhibits 10.1 and 10.2

10.5 Existing Traffic Volumes

Traffic volumes at the existing Oakridge site accesses were taken from counts conducted on November 19th and 20th, 2010 for the Friday PM and Saturday Mid-day peak periods, respectively. Although these counts were originally conducted for an earlier stage of the Oakridge Centre redevelopment study, the site trips are not expected to have changed since that time.

Moreover, for the surrounding intersections, additional traffic counts were collected on November 18th and 19th, 2011 for the Friday and Saturday peak periods.

Based on these counts, the peak-hours for the site were determined to be 3:30PM – 4:30PM for the Friday PM peak-hour and 2:00PM – 3:00PM for the Saturday Mid-day peak-hour.

In comparison to the site peak-hour, the network peak-hour on the Friday was 3:00PM – 4:00PM, and on the Saturday, the network peak occurred at the same time as the site peak (2:00PM - 3:00pm). On the Friday, during the network peak, the volumes at 41st Avenue / Cambie Street were 2% higher (95 vehicles).

As will be acknowledged later in this section, the 41st Avenue & Cambie Street intersection is already under pressure and is close to capacity. Analysis for this study focuses on the site peak rather than the network peak. Having said this, for the Friday PM peak there is only a 30 minute difference between these two peaks and for the Saturday there is no difference. Focusing on the site peak ensures that the driveway

intersections can accommodate the peak traffic volumes that they are estimated to experience and there is potential to alter these driveway accesses to create additional capacity if required. For the network intersections, especially the Cambie Street & 41st Avenue intersection, it is not practical or desirable to create additional capacity through the addition of travel lanes etc, hence the focus on the site peak. The existing site peak-hour traffic volumes for the Friday PM and Saturday Mid-day are shown on **Exhibits 10.3 and 10.4**.

Exhibits 10.3 and 10.4 indicate that traffic volumes surrounding the site are relatively high, with the busiest streets being 41st Avenue and Cambie Street. The highest volumes are experienced along Cambie Street, with approximately 3,000 vehicles using Cambie Street during the PM peak-hour on Friday, and slightly less than that on the Saturday. In comparison, 41st Avenue experiences approximately 2,300 vehicles using it during the Friday PM peak-hour and 1,900 vehicles during the Saturday peak-hour. In addition, the total traffic generated by the existing site was 2,868 trips and 3,109 trips during the Friday and Saturday peak-hours, respectively. Overall, the busiest site accesses were the two northern accesses on 41st Avenue, East Access 1 on Cambie Street, and the Main South Access on 45th Avenue. A summary of the existing site trips observed at each site access is summarized in **Table 10.1**.

Table 10.1: Existing Site Traffic Volumes (Two-Way)

Access	Friday PM Peak-hour		Saturday Mid-day Peak-hour	
	Vehicle per Hour (vph)	% of Total Trips	Vehicle per Hour (vph)	% of Total Trips
North Access 1	483	17%	432	14%
North Access 2	911	32%	1,095	35%
East Access 1	377	13%	480	15%
East Access 2	198	7%	203	7%
Safeway East Surface Access (Separate right-In driveway and right-out driveway have been assumed as a single access)	288	10%	238	8%
Safeway South Surface Access	122	4%	92	3%
Main South Access	489	17%	569	18%
Total	**2,868**	**100%**	**3,109**	**100%**

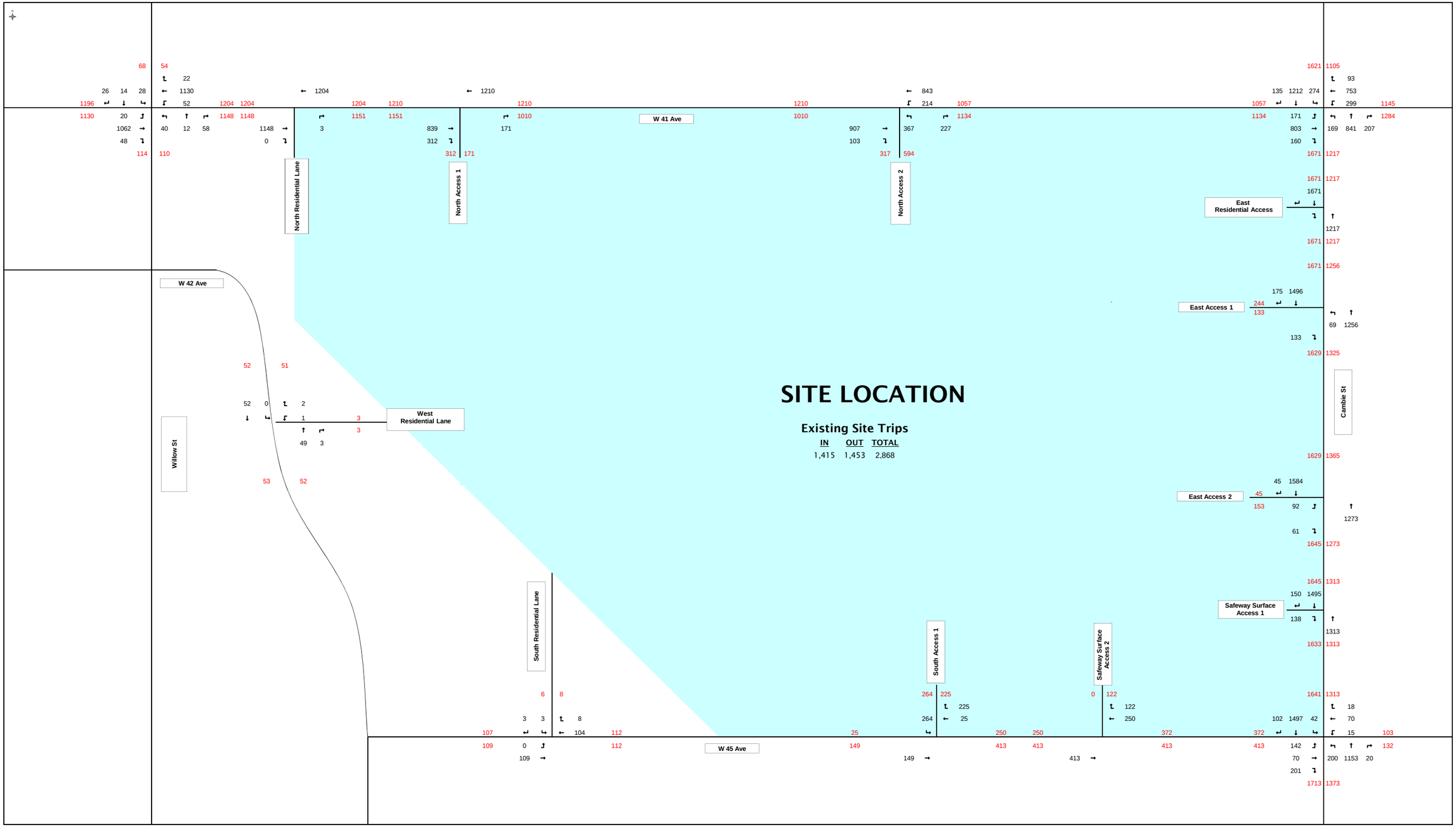


Exhibit 10.3

2011 Existing Friday PM Peak Hour Traffic Volumes

Oakridge Centre Redevelopment

4241.26 October 2013 NTS

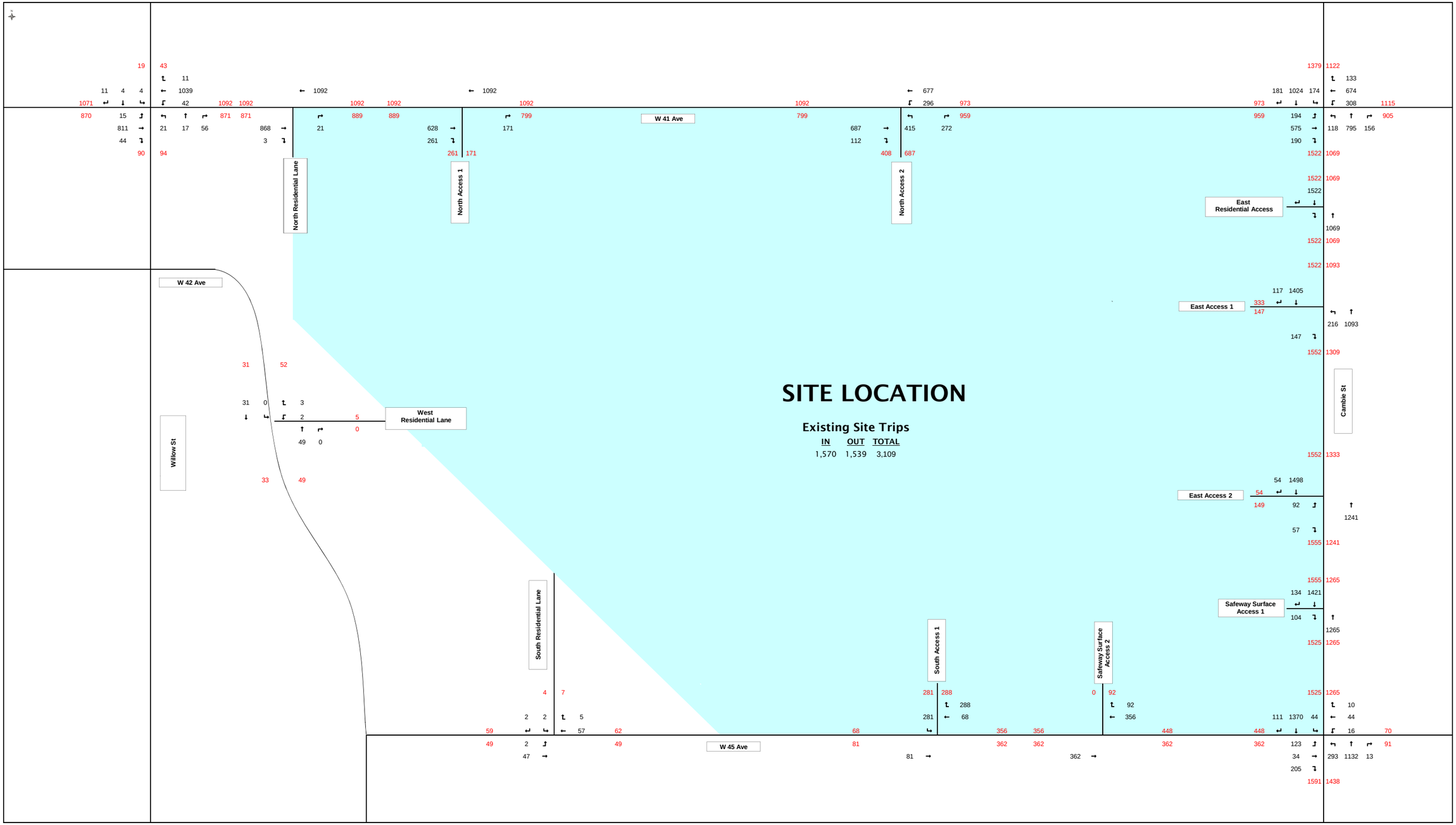


Exhibit 10.4

2011 Existing Saturday Mid-Day Peak Hour Traffic Volumes

Oakridge Centre Redevelopment

4241.26 October 2013 NTS

10.6 Existing Traffic Operations Performance

Using the existing traffic volumes previously shown in Exhibits 10.3 and 10.4, the traffic operations performances were analyzed at both the existing site driveway intersections and the key neighbouring intersections. Note that because the grocery store South Access is a "right-in only" driveway with no opposing movements, it has not been included in the analysis.

All road network intersections and site accesses were assessed based on the methods outlined in the 2000 Highway Capacity Manual (HCM), using the Synchro 6.0 analysis software. The traffic operations were assessed using the performance criteria (as calculated by the software) of Level of Service (LOS), volume-to-capacity (v/c) ratio and delay. Also, 95th percentile queue lengths were assessed and compared to available storage capacity.

The LOS rating is based on average vehicle delay and ranges from "A" to "F" based on the quality of operation at the intersection. A LOS "A" represents optimal, minimal delay conditions while a LOS "F" represents an over-capacity condition with considerable congestion and/or delay. Delay is calculated in seconds and is based on the average intersection delay per vehicle. **Table 10.2** below summarizes the LOS thresholds for the five Levels of Service, for both signalized and unsignalized intersections.

Table 10.2: Intersection Level of Service Thresholds

Level of Service	Average Control Delay per Vehicle (Seconds)	
	Signalized	Unsignalized
A	≤10	≤10
B	>10 and ≤20	>10 and ≤15
C	>20 and ≤35	>15 and ≤25
D	>35 and ≤55	>25 and ≤35
E	>55 and ≤80	>35 and ≤50
F	>80	>50

Source: Highway Capacity Manual

The volume to capacity (v/c) ratio of an intersection represents ratio between the demand volume and the available capacity. Certain performance thresholds have traditionally been used to determine whether capacity improvements warrant consideration. However, in this urban, higher density setting, capacity improvements are not practical or desirable. In addition, there is now a widely accepted view that where conditions are already pressurised, increasing traffic capacity itself leads to higher traffic volumes.

In order to help decide which movements to highlight and comment on in this analysis, the following thresholds have been used:

Signalized Intersections:

- Overall intersection v/c ratio not to exceed 0.85;
- Overall intersection Level of Service not to be worse than LOS D;
- Individual movement v/c ratio not to exceed 0.90 ;
- Individual movement Level of Service not to be worse than LOS E;
- 95th percentile queues not to exceed available storage.
-

Unsignalized Intersections:

- Overall intersection Level of Service not to be worse than LOS D;
- Individual movement Level of Service not to be worse than LOS E;
- 95th percentile queues not to exceed available storage.

In the two sections below, the site driveway traffic operations and the neighbouring intersection traffic operations are presented separately, highlighting only the specific intersections or intersection movements that fall below the thresholds described above.

A detailed summary of the traffic operations at all of the analyzed intersections is provided in **Appendix B**.

10.6.1 Existing Traffic Operations Performance at Site Driveways

Under existing conditions, the operations at each of the site driveways were shown to be within the acceptable performance thresholds during both the Friday PM and Saturday Mid-day peak-hours.

It is also worth noting that at the existing accesses, the highest on-site 95th percentile queue length was reported to be 21m (approximately 3 vehicles), which was for the eastbound left-turn at East Access 2. All other 95th percentile queues lengths were reported shorter than this.

10.6.2 Existing Traffic Operations Performance at Neighbouring Intersections

Although the traffic operations at the majority of the neighbouring intersections meet the aforementioned performance criteria under existing conditions, there are a few locations which are experiencing difficulties during the peak-hours. **Table 10.3** summarizes these locations and highlights specific failing movements.

Table 10.3: Traffic Operations at Neighbouring Intersections Failing Acceptable Criteria

Location	Failing Movement	Time Period	Issue	Description
41st Ave & Cambie Street	Overall Intersection	Friday PM	V/C Ratio	Overall V/C ratio of 0.99 is essentially at capacity.
	NB Left-turn	Friday PM	Queues	95th percentile queue of 70m exceeds 50m storage lane.
	SB Left-turn	Friday PM	V/C Ratio & Queues	V/C ratio of 0.97 exceeds acceptable threshold and 95th percentile queue of 115m exceeds 80m storage lane.
	WB Left-turn	Friday PM & Sat Mid-Day	V/C Ratio	V/C ratios of >1.0 and 0.91 on Friday and Saturday, respectively, exceed acceptable thresholds.
		Friday PM	LOS	LOS F exceeds acceptable threshold.
45th Ave & Cambie Street	NB Left-turn	Sat Mid-Day	Queues	95th percentile queue of 76m exceeds 70m storage lane. Minor issue which occurs only at peak periods is not considered problematic.
	SB Left-turn	Friday PM & Sat Mid-Day	Queues	95th percentile queues of 20m and 19m on Friday and Saturday, respectively, exceed 10m storage lane. As the storage lane is very short (accommodating only a single vehicle), this is not considered an issue.
	SB Through	Friday PM & Sat Mid-Day	Queues	95th percentile queues of 125m and 116m on Friday and Saturday, respectively, exceed 114m storage distance to the East Access 2 intersection to the north. This is typical of congested conditions.

As the table indicates, under existing conditions, the intersections under the most pressure are the 41st Avenue & Cambie Street and 45th Avenue & Cambie Street intersections. As is evident today, the 41st Avenue & Cambie Street intersection is at capacity during the peak-hours, thus the high v/c ratios and long queues are to be expected. In particular, during the Friday PM peak period, the queues for the northbound and southbound left-turn lanes are very long, and occasionally, overspill the available storage. Moreover, during the Friday and Saturday, the v/c ratios for the westbound left-turn exceed the acceptable threshold. In addition, although not highlighted in the table above, the westbound left-turn queues were also reported to be very long in the peak periods, though they were still accommodated within the available storage.

Although much less busy than the 41st Avenue & Cambie Street intersection, the 45th Avenue & Cambie Street intersection still experiences long queues, particularly in the southbound direction during the peak-hours. On both Friday and Saturday, the southbound through 95th percentile queue is shown to extend past the East Access 2 intersection to the north. Moreover, on the Friday, the northbound left-turn 95th percentile queue length is reported to exceed its 70m storage lane.

It should be emphasized that, even though the 95th percentile queue length was reported to exceed the available storage for the movements described above, the average queue lengths are typically much shorter than the 95th percentile queue, and can most often be accommodated within the available storage.

10.7 Summary

The following key findings summarize this section:

- The existing site peak-hours were identified to be 3:30PM – 4:30PM on the Friday PM peak-hour and 2:00PM – 3:00PM on the Saturday Mid-day peak-hour.
- Cambie Street is the busiest street in the network with approximately 3,000 vehicles during the PM peak-hour on Friday, and slightly less than that on the Saturday.
- 41st Avenue experiences approximately 2,300 vehicles using it during the Friday PM peak-hour and 1,900 vehicles during the Saturday peak-hour.
- The total traffic generated by the existing site was 2,868 trips and 3,109 trips during the Friday and Saturday peak-hours, respectively.
- Under existing conditions, the operations at each of the site driveways were within the acceptable performance thresholds for both analysis periods.
- The 41st Avenue & Cambie Street and 45th Avenue & Cambie Street intersections experience some delays during the peak-hours.
- The 41st Avenue & Cambie Street intersection is closest to capacity of all the intersections in the network, experiencing high v/c ratios and long queues for some of its movements. In particular, during the peak-hours, the northbound, southbound and westbound left-turn movements experience either high v/c ratios or 95th percentile queues that extend past the available storage, or both.

11. VEHICLE TRIP GENERATION

11.1 Introduction

This section outlines the methods used to estimate the number of vehicle trips that the redeveloped Oakridge site will generate once it has been build out. There are a number of different elements that have been used to help develop this estimate:

- The current trip rate generation from the existing site;
- Trip rates from existing malls with a similar GFA/GLA to the proposed Oakridge development and located within transit services;
- The degree to which the varying uses will be complementary and result in combined trips (internal capture);
- The number of pass-by trips associated with the site;
- Influence of other modes, especially transit and the Canada Line;
- Changing densities and land uses around the site in the long term, combined with changing social attitudes and travel patterns.

Trip rates have been estimated for each of the main land uses within the expanded mall: retail; office; residential; and, community use. Based on this, an overall estimate for the number of trips the expanded development will generate during peak times has been calculated.

11.2 Retail Trip Rate

11.2.1 Existing trip rate

The number of trips generated by the existing Oakridge mall is the first source of information used to predict the trip rate for the expanded mall. Excluding other land uses, the existing retail generates approximately 2,700 trips during the Friday PM peak-hour and 3,000 trips in the Saturday peak-hour. This equates to a trip rate of 3.90 and 4.34 trips/ 1,000 sq ft respectively.

11.2.2 ITE research

The ITE Trip Generation Guide indicates that as the size of the retail increases (Shopping Centre rate has been used), the rate of increase in trips, although broadly linear, is not one-to-one. **Exhibit 11.1** shows this in graph form, based on the equations contained in the ITE Trip Generation Guide. This makes intuitive sense because as malls become larger they tend to have a higher number of complimentary uses, such as restaurants etc which can increase the length of stay (and increase the average spend) while reducing the number of trips per sq ft. Thus if the trip rate for the expanded portion of the mall was based on the existing mall rate, that rate would need to be discounted against the existing rate to account for this.

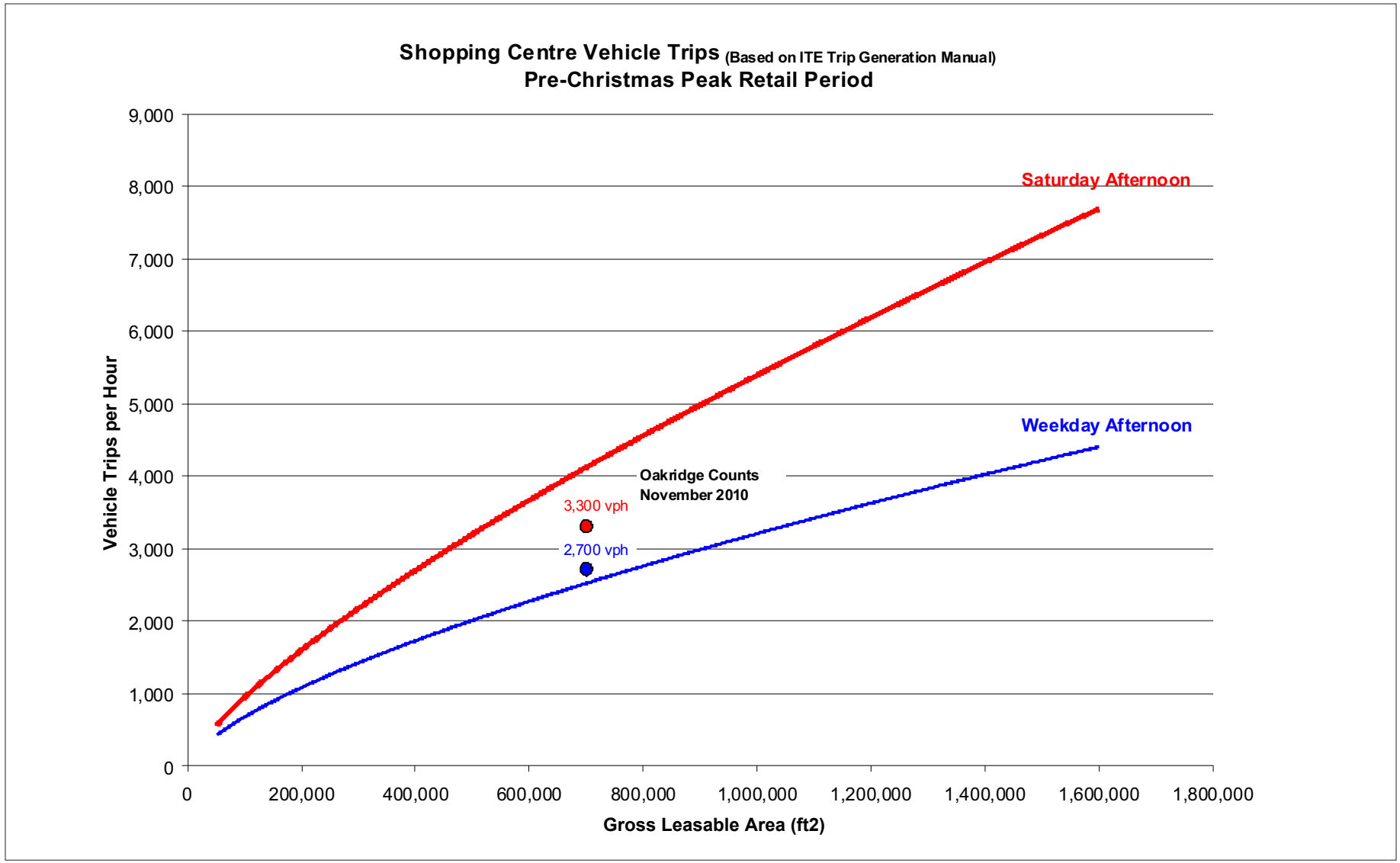


Exhibit 11.1

ITE Trip Generation Rates for Shopping Centre

11.2.3 Oakridge rate over time

The trip rate has for Oakridge Mall has fallen since earlier surveys were carried out by Bunt & Associates in 2004 - 05. Then, total Saturday trips were recorded at over 4,000 vehicles, compared with 3,100 today (all uses). The expanded development is not due to be fully built out until 2023, over ten years away. Although the rate of decline will vary, the trend towards lower trip rates in the future will likely continue as density, mix of uses an the convenience of more sustainable travel modes all increase.

Bunt & Associates have worked on similar projects in the past, including Metrotown and Guilford. Experience here supports the results of surveys at Oakridge, in that trip rates do generally fall over time.

11.2.4 Recommended rate

Based on the information above, it was decided to base the new trip rate, for the expanded retail space, on the existing trip rate. For the expanded space over and beyond the existing floor area, a rate 60% of the existing rate was used. This reflects a number of factors:

- The ITE trip generation curve for shopping centres;
- General falling of the trip rate over time for this sort of centre in Metro Vancouver;
- Future densification in the surrounding area, especially along the Cambie Corridor.

Table 11.1 summarises the resultant trip rates.

Table 11.1: New Retail Trip Rate

Peak-hour	In	Out	Total
Weekday PM	1.19	1.15	2.34
Saturday	1.31	1.29	2.61

Note: All rates are per 1,000 sq ft GLA.

As shown in Table 11.1, the retail part of the new mall is estimated to generate vehicle trips at a rate of 2.34 per 1,000 sq ft GLA during the Friday PM peak-hour and 2.61 per 1,000 sq ft GLA during the Saturday peak-hour. Combined with the existing trip rate, this leads to a weighted average for all retail (new and existing) of 3.24 per 1,000 sq ft GLA during the Friday PM peak-hour and 3.61 per 1,000 sq ft GLA during the Saturday peak-hour

11.3 Office Trip Rate

There is an existing small office component at Oakridge, comprising a mixture of general office and medical office. However, it was not possible to survey the trip rate associated with this office component in isolation, so estimation of an appropriate trip rate must come from other sources.

11.3.1 General office

For general office, rates can vary widely depending upon location, adjacent land uses, density, transit service etc. Table 11.2 indicates the standard ITE rate as well as the rate for Bunt & Associates' downtown Vancouver office.

Table 11.2: Sample Office Trip Rates

Name	Location	PM Peak-hour Trip Rate	Saturday Peak-hour Trip Rate
ITE General Office Building (Land Use 710)	-	1.49/ 1,000 sq ft	0.41/ 1,000 sq ft
1177 West Hastings Street (Former Bunt Office)	Downtown Vancouver	0.8/ 1,000 sq ft	Zero
Recently agreed with City of New Westminster (30% reduction over ITE rates)	Close to Skytrain station in New Westminster	1.04/ 1,000 sq ft	0.29/ 1,000 sq ft

Clearly there is a large difference between the general ITE rate and the small sample of Bunt & Associates' office in a dense downtown setting. One issue in this instance is that it is a challenge to collect accurate survey data from office buildings in Transit Orientated Developments (TODs) in Metro Vancouver. This is because accesses and parking are often shared with neighbouring land uses, making isolation of the office trips problematic. Other methodologies have therefore been used to help estimate an appropriate trip rate.

The ITE Trip Generation Guide states that for the majority of site surveyed, 'transit service was either non-existent or negligible'. From this can be extrapolated the assumption that density is generally low and therefore there is little mix of use. If there was higher density, transit service would be more frequent. The base ITE rate is clearly inappropriate in this instance as Oakridge will be a TOD. An appropriate rate would therefore be significantly less than this base rate. ITE have published the results of studies in the ITE Journal (June 2009) which showed that residential developments in TODs had trip rates approximately half that of the base ITE rate. If this same reduction were applied to the office rate, this would result in a weekday PM trip rate of 0.75 trips per 1,000 sq ft. However, it is probably realistic to assume that an office would not experience the same level of trip reduction as a residential building under the same circumstances.

For a recent office development by a Skytrain station in New Westminster, a 30% reduction on the ITE office rate was agreed upon with the City. This equates to just over 1 trip per 1,000 sq ft in the PM peak-hour.

Based on the above, an overall, a trip rate of one per 1,000 sq ft (PM peak-hour) was considered appropriate in this instance. This is essentially the same as was previously agreed for the City of New Westminster in a similar situation. The rate is significantly lower than the ITE base rate, but higher than Bunt & Associates' downtown rate and also higher than a 50% reduction on the ITE rate, which is what was observed for residential development around TODs.

11.3.2 Medical office

The ITE Medical Office land use (Land Use Code 720) comprises a facility focused on out-patient care, including dental, but does not include surgical care or prolonged in house care. One or more private physicians or dentists would generally operate in one facility, as is currently the case at Oakridge. Table 11.3 outlines two rates to consider.

Table 11.3: Sample Medical Office Trip Rates

Name	Location	PM Peak-hour Trip Rate	Saturday Peak-hour Trip Rate
ITE General Office Building (Land Use 720)	-	3.46/ 1,000 sq ft (one hour between 4pm and 6pm)	3.63/ 1,000 sq ft (peak-hour of generator)
Bunt sample based on estimated parking demand	Uptown, New Westminster BC	2.8/ 1,000 sq ft	-

Some of the same issues apply to medical office rates as they do for the general office. Although it is not stated, it can be assumed that the majority of the surveys contained in the ITE guide for medical office are for locations with little or no transit service, and thus lower density in nature. The Bunt & Associates rate is based on an estimation of parking demand. Although this is less accurate that a vehicle trip survey, the result shows a lower rate than the ITE base rate. Based on the experience with the general office, it could be that the rate experienced at Oakridge will be even lower than this, especially since Uptown's transit connections are based on bus only. However, there is not data to support this. Therefore, the Bunt & Associates estimate of 2.8 trips per 1,000 sq ft for the PM peak-hour has been used to estimate the number of medical office trips.

11.3.3 Overall combined office rate

The following points have been taken into consideration when developing an overall combined rate for the office component:

General offices are normally closed on Saturdays and therefore generate very few trips on the weekend. Based on ITE data for general office, the Saturday peak-hour trip rate has been reduced to 28% of the weekday peak-hour rate.

No adjustment has been made for medical offices as these facilities are often open during the Saturday peak-hour.

Currently, the blend of general office to medical office is estimated at 80% general office, 20% medical office. For the future combined office component, a similar mix is assumed.

Table 11.4 summarises the resulting combined office trip rate.

Table 11.4: Estimated Future Oakridge Combined Office Trip Rate

Peak-hour	Inbound Rate (trips/ 1,000 sq ft)	Outbound Rate (trips/ 1,000 sq ft)	Combined Rate (trips/ 1,000 sq ft)
Weekday PM	0.30	1.06	1.36
Saturday	0.42	0.36	0.78

Table 11.4 shows that the office component is estimated to generate trips at a rate of 1.36 per 1,000 sq ft during the weekday PM peak-hour and only 0.78 per 1,000 sq ft during the Saturday peak-hour.

11.4 Residential Trip Rate

Like offices, residential trip rates vary widely across Metro Vancouver based on location, surrounding land uses and density and access to transit. Table 11.5 outlines some example rates of residential multi-family trip rates collected by Bunt & Associates close to rapid transit stations, as well as the ITE rate for comparison purposes.

Table 11.5: Example Multi-Family Residential Trip Rates

Name	Location	PM Peak-hour Trip Rate (per unit)	Saturday Peak-hour Trip Rate (per unit)
ITE High-Rise Residential Condo/ Townhouse (Land Use 232)	-	0.38	0.35
ITE High-Rise Apartment (Land Use 222)	-	0.35	0.40
Bunt surveys of residential condo towers adjacent to a rapid transit station	Richmond	0.22	0.18
Bunt surveys of residential condo towers adjacent to a rapid transit station	Burnaby	0.26	-

Based on Table 11.5 it can be seen that the surveys carried out by Bunt & Associates of existing residential towers close to rapid transit stations reveal lower trip rates than ITE quotes for similar land uses. A recent study published in the ITE Journal (June 2009) concluded than residential developments close to TODs produce up to 50% fewer trips than the current ITE rates state. This study was based on surveys of 17 TOD projects across the USA.

For Oakridge in particular, in addition to the above, the residential parking supply may be a constraining factor in so far as that the supply is likely to be less than one stall per unit. Thus those units without a car stall will attract people willing to forgo private automobile ownership and thus contribute towards a lower trip rate.

Based on this, it was decided to utilize the rates from the lower of the two Bunt surveys. Thus a rate of 0.22 trips per unit is used for the weekday PM peak-hour and a rate of 0.18 trips per unit is used for the Saturday peak-hour.

11.5 Community Use Trip Rates

Community uses are a relatively small component of the overall development. Within the estimated 70,000 sq ft of space dedicated for community use, there will likely be a fitness centre, a library, a seniors centre, a daycare, meeting rooms and other uses. Some of these will be contained within a 'community centre' while others, including the seniors centre, may be separate. Due to the relatively small size of this

component, as well as the fact that many of its trips will be generated by people already on the site (internal capture) a single rate has been used for these uses.

The ITE Trip Generation Manual (8th Edition) was used and the 'Recreational Community Centre' trip rate was used (Land Use 495). Table 11.6 summarises the rates used.

Table 11.6: Community Centre Trip Rate (ITE Land Use 495)

Time Period	In (per 1,000 sq ft)	Out (per 1,000 sq ft)	Total
Friday PM (One hour between 4pm and 6pm)	0.54	0.91	1.45
Saturday Peak-hour	0.58	0.49	1.07

As shown in Table 11.6, the trip rates are relatively low on a per sq ft basis. Unlike the other land uses described above, no initial reduction over ITE rates is recommended. However, as mentioned above, there are other factors which effectively reduce this rate, as outlined below.

11.6 Other Factors

The two other main factors to account for when estimating the number of trips that the expanded Oakridge will generate are internal capture and pass-by trips.

11.6.1 Internal Capture

In a mixed use development, internal capture is used to describe the process whereby someone travels to the development, and while there, visits more than one land use, for example, retail and community centre. The person, or vehicle, has only made two trips (one inbound and, when they leave, one outbound) but they have visited two separate land uses. Therefore, when estimating trip generation rates, one of these land uses' trip rates should be discounted to take into account this behaviour. As the variety and mix of uses increases, this in turn raises the rate of 'internal trip making' or internal capture.

The ITE Trip Generation Handbook contains rates and a methodology to estimate internal trip capture. However, it is limited in nature and Bunt & Associates' experience on other projects suggests that it is not that accurate in many instances. Based on experience with similar projects, as well as considering rates suggested by ITE and its associated publications, Table 11.7 outlines the percentage reductions applied to the base trips rates, by land use.

Table 11.7: Proposed Internal Capture Rates

Land Use	Internal Trip Capture Reduction
Office	15%
Residential	10%
Community Uses	25%

Notes: Rates apply both to weekday PM peak-hour and Saturday peak-hour.

The retail land use is assumed to be the primary land use at Oakridge. Thus other land uses are reduced relative to this. For example, Table 11.7 shows that the analysis assumes that 15% of office workers also visit the retail during the same visit to the site. For community use it is higher, with a quarter of community use users estimated to also visit the retail at the mall on the same visit.

11.6.2 Pass-By Trips

Pass-by trips are trips that are already on the network irrespective of the development. If the development was not in place they would still travel past the development on their way to their final destination. For the expanded Oakridge development, pass-by trips have been incorporated into the retail trips only. Retail trips are a good candidate for pass-by trips and their existence has been documented in surveys. For office and residential trips, pass-by trips are very uncommon for obvious reasons. For Community Centre trips, although a small portion of these could be pass-by trips, it would not be a large number and has not been included in the analysis.

Pass-by trips are assigned as a certain percentage of the overall number of trips generated for the development. In terms of estimating the appropriate percentage, the ITE Trip Generation Handbook, as well as Bunt & Associates' experience on similar projects was considered and the following percentages were used in the analysis:

- Retail pass-by trips Friday: 25%
- Retail pass-by trips Saturday: 20%

The slightly higher rate for the Friday is a reflection of people travelling from work to home, stopping at the mall on route. This is supported by earlier questionnaire survey data which shows home based trips to the existing mall to be just over 50% on Friday, but 85% on a Saturday.

These pass-by trips were applied equally to each of the mall accesses.

11.7 Overall Trip Generation Estimate

Based on all of the above information, Table 11.8 summarises the estimated number of trips that the expanded Oakridge development will generate, once fully built out.

Table 11.8: Trip Generation Summary

Land Use	Friday PM Peak-hour			Saturday Peak-hour		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Retail	774	746	1,519	853	839	1,692
Office	70	249	319	99	84	183
Residential	312	168	479	170	237	407
Community Use	32	55	87	35	30	64
Gross New Trips	1,188	1,217	2,405	1,156	1,191	2,346
Existing Trips	1,415	1,453	2,868	1,570	1,539	3,109
Gross Total Trips	2,603	2,670	5,273	2,726	2,730	5,455
New Retail Pass-by	190	190	380	169	169	338
Existing Retail Pass-by	474	474	948	528	528	1,056
Net Total Trips	1,939	2,006	3,945	2,029	2,033	4,061

Note 1: Office, residential and Community Use includes internal trip capture.

Note 2: The number of trips is based on earlier GFA and residential unit number estimates. These are slightly higher estimates than the current plan. Thus, the traffic operation results are very conservative.

Table 11.8 shows that over 3,900 net trips in the PM peak-hour are estimated to be generated by the new Oakridge development once fully built out. This includes the existing mall which will become part of the new development. During the Saturday peak-hour, just over 4,000 net trips are estimated. Excluding pass-by traffic, nearly 5,300 vehicles will enter or leave the site during the PM peak-hour, once fully developed, compared to nearly 5,500 vehicles during the Saturday peak-hour. In each instance, less than half the trips are from the new expanded parts of the development.

11.8 Comparison With Travel Demand Estimate

A comparison with the estimated vehicle volumes from Section 3 Travel Demand Forecast was carried out to assess to what degree the volumes estimated in this section matched earlier volumes.

The volumes are a good match, although the travel demand forecast estimated moderately lower vehicle volumes in the PM peak hour. To provide a robust analysis these higher estimates have been used in the analysis.

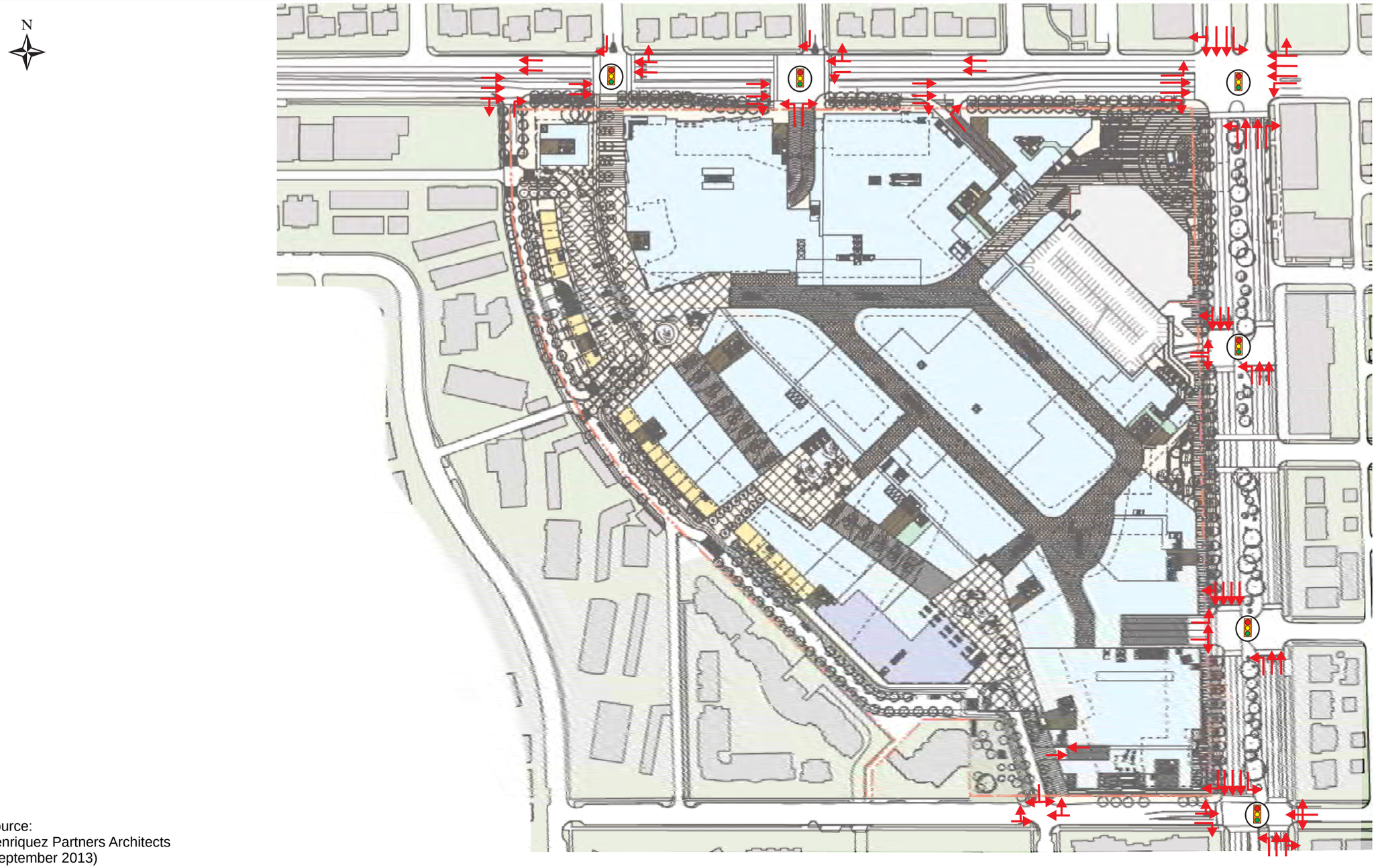
12. FUTURE VEHICLE ACCESS AND LANING

12.1 Introduction

The main aim of the access strategy and laning configuration is to ensure that the estimated vehicle trip generation can be accommodated by the development's access points. The quantity, type and location of these access points are critical in this regard. **Exhibit 12.1** provides a summary for the overall future access strategy. **Exhibit's 12.2 and 12.3** conceptually indicates the future laning on 41st Avenue and Cambie Street.

12.2 Access Numbers and Location

The number of proposed entry and exit lanes proposed for the site are summarised in **Table 12.1**.



Source:
Henriquez Partners Architects
(September 2013)

Exhibit 12.1
Future Access and Laning Configuration

Oakridge Centre Rezoning TIA
4241.26 October, 2013 Scale NTS

BUNT 4207-T (Consultants)-UPDATED OPTIONS.dwg

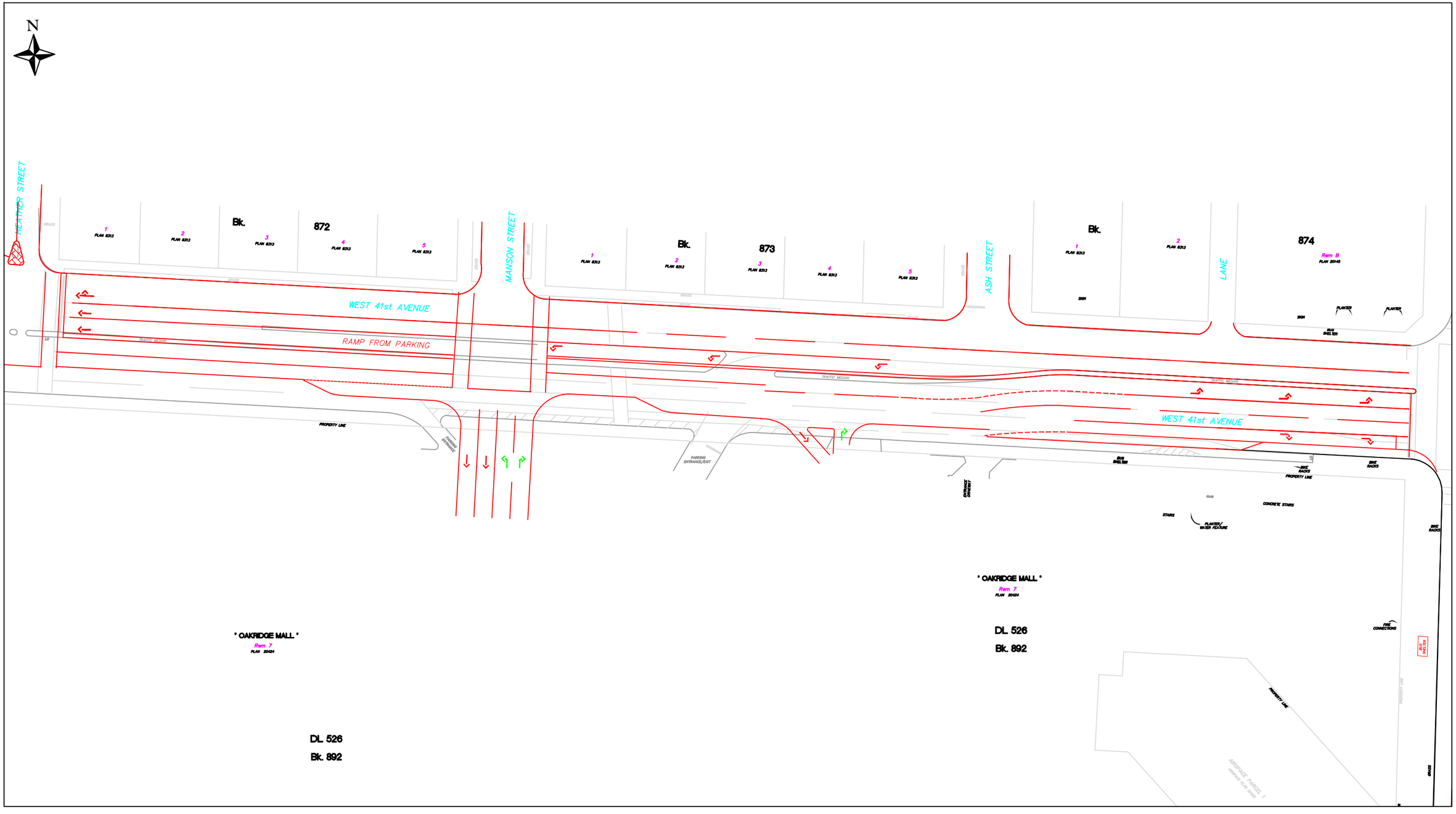


Exhibit 12.2

Existing Lane Configuration on 41st Avenue

Oakridge Centre Rezoning TIA
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BUNT 4207-T (Consultants)-UPDATED OPTIONS.dwg

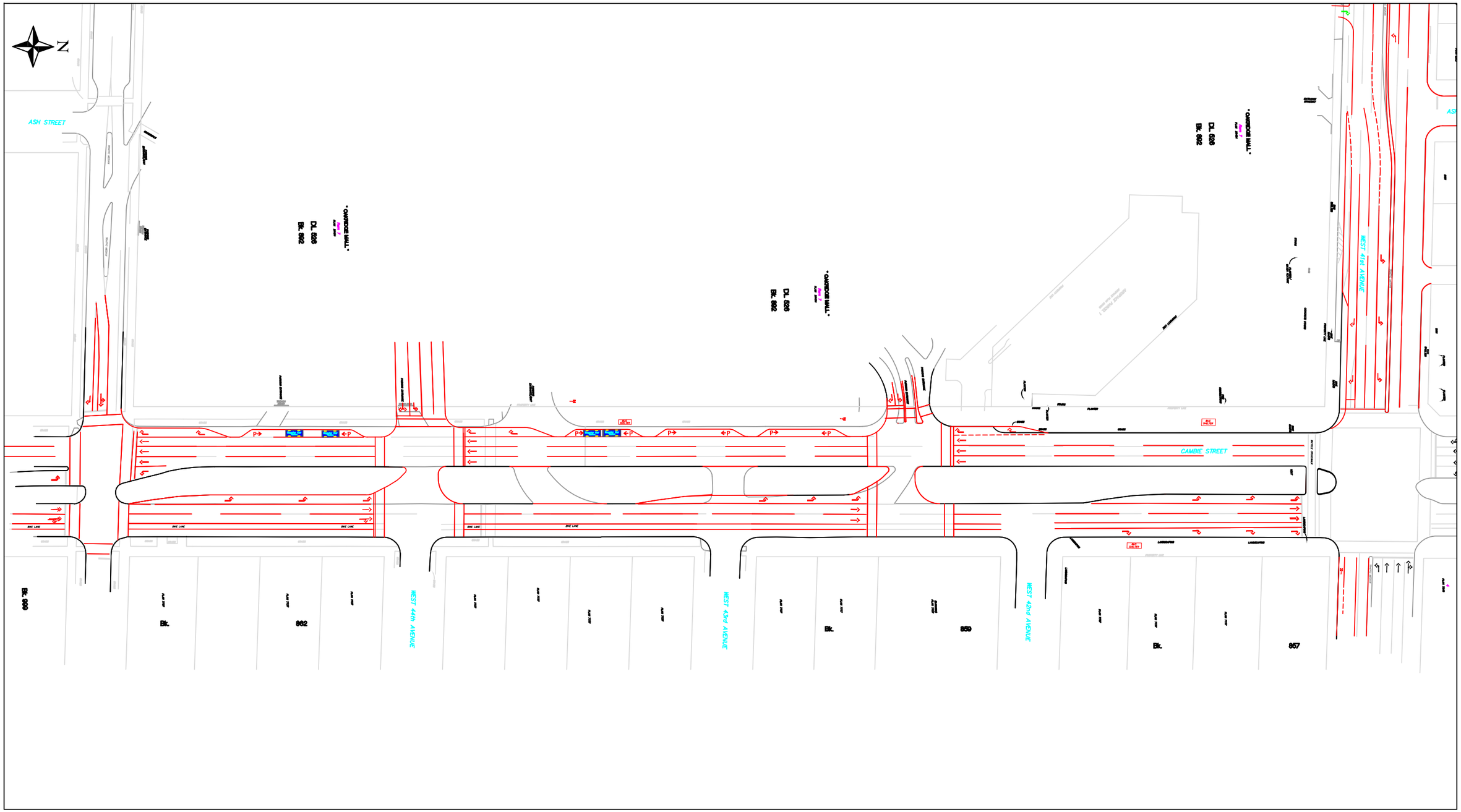

Exhibit 12.3

Future Lane Configuration on Cambie Street

Oakridge Centre Rezoning TIA
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Table 12.1: Proposed Oakridge Access Locations

Location	Inbound	Outbound
41st Avenue	• Laneway 'New Street' (1 lane – right in only; residential only) • Main 'Manson Street' Access (2 lanes – signalized) • Existing 'Angled' Access (1 lane – right in only, unsignalized) **TOTAL – 4 lanes incl. one residential only**	• Laneway 'New Street' (1 lane – right out only; residential only) • Main 'Manson Street' Access (2 lanes– signalized) • Existing 'Angled' Access (1 lane – right out only, unsignalized • Existing 'Tunnel" Access (1 lane – left out onto westbound 41st Avenue) **TOTAL – 5 lanes incl. one residential only**
Cambie Street	• Northern, existing entrance (2 lanes – signalized) • Southern, new entrance (2 lanes – signalized) **TOTAL – 4 lanes**	• Northern, existing entrance (2 lanes – signalized) • Southern, new entrance (2 lanes – signalized) **TOTAL – 4 lanes**
New Street	• 'Grocery' Access lane, unsignalized) – New Street connects to 45th Avenue. **TOTAL – 1 lane**	• 'Grocery' Access (1 lane, unsignalized) - New Street connects to 45th Avenue. **TOTAL – 1 lane**
TOTAL	**6 accesses, 5 accessible to commercial traffic (9 lanes, 8 accessible to commercial traffic)**	**7 accesses, 6 accessible to commercial traffic (10 lanes, 9 accessible to commercial traffic)**

Table 12.1 shows that a total of eight inbound and nine outbound commercial access points are planned to be provided. Each of these access points varies in its ability to process inbound and outbound traffic. In general however, Table 12.2 summarises the number of trips and parking stalls per access, if divided evenly. This estimate includes provision for one residential access on New Street.

Table 12.2: Average Number of Stalls and Trips per Access

Variable	Number per Access
Number of non-residential stalls	795
Number of inbound trips (Gross Total, Saturday Peak-hour)	340
Number of outbound trips (Gross Total, Saturday Peak-hour)	290

Table 12.2 indicates that there are approximately 794 non-residential stalls per access, on average. Some accesses will of course be more popular than others. Given that these stalls serve office and community use as well as retail, this ratio is felt to be acceptable. The number of trips per access is 340 for inbound trips and 290 for outbound trips, using the Saturday peak-hour, as this is the busiest hour of the week. Once again, some of these trips are assumed to use a dedicated residential access on New Street. Even so, these numbers are considered acceptable in broad terms, although the specific operational characteristics of each access will ultimately determine their capacity. The traffic analysis section covers this in more detail.

12.3 Access Characteristics

Each of the key accesses is described below.

12.3.1 41st Avenue & Manson Street

This would serve as the primary access off 41st Avenue, offering full movement and the greatest access capacity on this street. This access is planned to have two inbound and two outbound lanes and will be fully signalized. It would function as a t-intersection, with Manson Street to the north as a right in/ right out configuration. It is planned that the access will form the entrance into a tunnel, taking vehicles to the P1 level after a short section at grade.

12.3.2 Northbound-left Tunnel onto 41st Avenue

There is currently a "tunnel" to facilitate northbound-left turning vehicles onto westbound 41st Avenue. The tunnel plays an important role in distributing westbound exiting vehicles, as they avoid the conflicting eastbound movement on 41st Avenue. It also provides access for local residents to the south and west of Oakridge who are not permitted to turn right out of the 45th Avenue access. In the future, this tunnel is even more important in capacity terms than it is now, due to the overall increased volumes of vehicles that will be visiting the site.

12.3.3 41st Avenue & Existing Angled Access

This angled access is an existing access location east of the proposed Manson Street access. This would be a secondary access on 41st Avenue. The angled access itself provides a right in/ right out movement to the mall.

12.3.4 Cambie Street & Existing Northern Access

The current access at this location between 42nd Avenue and 43rd Avenue is unsignalized and provides right in/ right out and left-in movements. In the future this access is planned to be signalized, which will enable a left-out movement to be possible. This left-out movement will in turn require a second outbound lane from the mall, where currently there is one. Full signalization will be required to increase the capacity of the access to accommodate Oakridge traffic in and out of the mall. This will remain a main access point into the mall.

12.3.5 Cambie Street & 44th Avenue

This is a new planned access opposite 44th Avenue and will be full movement and fully signalized. It will offer two inbound and two outbound lanes. This will also serve as the only service access into and out of the mall, and is therefore required to accommodate truck movements. Like at Manson Street, 44th Avenue opposite the mall will become right in/ right out only. This access will be a major access point to the mall as it connects directly with the underground street that will distribute vehicles to available parking stalls, as well as providing convenient access to the planned valet parking service.

12.3.6 New Street & Safeway Access

The access will provide one inbound and one outbound lane, and connects to 45th Avenue through the proposed New Street. It will provide direct access to the parking area closest to the grocery store, although access to the rest of the mall is also possible. This is not considered to be one of the major access points. The New Street will also provide access to a surface parking located at the north-west quadrant of the proposed Oakridge redevelopment. This parking lot will be accessed via the 41st Avenue and New Street intersection (no connection to 45th Avenue).

12.4 Comparison with Current Accesses

There are currently more accesses, both inbound and outbound, than are planned to be the case in the future. However, many of these accesses are limited in movement and capacity. For example, many offer one movement only such as right-in or right-out. By consolidating into fewer but higher capacity accesses there are opportunities for stronger street frontages and fewer interruptions for pedestrians using the sidewalk. It also creates better legibility for vehicle drivers visiting the mall and makes wayfinding easier and clearer.

12.5 Traffic Distribution and Assignment

Traffic distribution (the location at which vehicles enter or leave the study network) has been based largely on current traffic volumes and observations of current vehicle movements in and out of Oakridge. It is also influenced by the available movements vehicles can make within the study network. Table 7.3 outlines the inbound and outbound distribution of trips for the different land uses (the same distribution has been assumed for Friday and Saturday).

Table 12.3: Vehicle Trip Distribution

Destination/ Origin Point	Retail (Inbound/ Outbound)	Residential (Inbound/ Outbound)	Office & Community (Inbound/ Outbound)
41st Ave West	30% / 30%	28% / 28%	30% / 30%
41st Ave East	20% / 20%	20% / 20%	20% / 20%
Cambie St North	20% / 20%	20% / 20%	20% / 20%
Cambie St South	30% / 30%	20% / 20%	30% / 30%
Willow St North	- / -	2% / 2%	- / -
Tisdall St South	- / -	10% / 10%	- / -

Table 12.3 shows that roughly 30% of the site's traffic is estimated to come to and from the west (41st Avenue) with another 30% from the south (Cambie Street). Most of the remainder comes from the north and east along Cambie Street and 41st Avenue. For the residential component, some more local traffic patterns were estimated, including 2% of residential traffic to and from the northern end of Willow Street and 10% to and from the southern end of Tisdall Street.

Although vehicle trip distribution was kept largely uniform, vehicle assignment within the network to reach these edge points experienced more variation. Available movements within the network played some role in this, along with the desire to balance volumes between all of the available accesses whilst also acknowledging that some accesses would be more popular for certain origins or destinations. Exhibits 7.1 – 7.6 show the percentage distribution within the study network for each of the three land uses (office and community use are combined), for both inbound and outbound movements. These exhibits also show the assumed trip distribution, as outlined above.

12.6 Lane configuration

12.6.1 41st Avenue Recommended Lane Configuration

Currently 41st Avenue has a complex lane configuration, particularly in the eastbound direction, as many lanes are added and dropped in the vicinity of the Oakridge site.

In the future, this lane configuration is recommended to be simplified. Assuming a four lane cross-section as the base, in the eastbound direction:

- Right turn lanes with storage bays will be added at the proposed accesses along 41st Avenue;
- An existing eastbound through lane will be dropped, from three to two through lanes, west of Manson Street up to the existing angled access ;
- The proposed two through eastbound lanes will transition to four (one left, two through, one right) lanes at the 41st Avenue and Cambie Street intersection.

In the westbound direction:

- Two westbound through lanes;
- A new westbound-left lane will be added at the Manson Street intersection (existing left turn lane at access will be removed);
- Manson Street at 41st Avenue will be configured as a right in/right out vehicle movement.

These changes are summarised on Exhibit 12.2.

12.6.2 Cambie Street Recommended Lane Configuration and Cross Section

Cambie Street will remain the same in the future for the northbound direction. In order to accommodate the proposed 2-way bicycle lanes, the existing southbound direction will be modified from three to two trough lanes, just south of 41st Avenue.

A new northbound left-turn lane being added to the East Access 2 / Cambie Street intersection. It should also be noted that in the future, East Access 2 will be relocated further south to line up with 44th Avenue, as outlined in the previous section.

In the future, it has also been assumed that the break in the median allowing vehicles to turn left from Cambie Street onto 43rd Avenue and vice-versa will be closed. Associated with this change is the extension of the northbound left-turn lane at East Access 1. These changes are illustrated on Exhibit 12.3.

13. FUTURE TRAFFIC ANALYSIS

13.1 Introduction

This section outlines the future intersection and driveway operational performance, once the development is fully built out. As part of this the impacts of this development on existing traffic volumes are discussed. The methodology used to predict the future conditions at adjacent intersections uses evidence from elsewhere in Vancouver which shows traffic volumes at arterial intersections have even decreased, even in the face of significant adjacent development. This indicates that existing background traffic is displaced by new trips to more local destinations.

The traffic analysis for the neighbouring intersections, where site traffic trips are added to the existing background traffic volumes, is presented in **Appendix B** for reference.

Trip distribution and assignment for the new site traffic is discussed in the previous section as are the characteristics of the revised site accesses.

13.2 Future Total Traffic Volumes

Future total traffic volumes are made up of existing background traffic volumes together with future estimated site traffic volumes. They have been established for two reasons:

- For use in assessment of the site accesses (below);
- For use in assessment of the neighbouring intersections, included in Appendix B.

In this instance, background traffic is the component of traffic in the study area that would be present on the roadway system if the site did not redevelop as planned. Typically, these volumes would be established by applying an annual traffic growth rate to the existing traffic, accounting for an increase in traffic volumes occurring between the current day and the time that the development is completed.

However, recent studies have shown that vehicle traffic in Vancouver has actually been decreasing or remaining constant over the past several years. Moreover, due to the reconfiguration of the accesses and land uses at the site, it was also important to first strip off the existing site traffic from the road network, prior to adding on the future site trips. Once the existing trips were removed from the network, the future site trips were added to the background traffic volumes.

13.2.1 Estimation of Background Traffic Growth

Traditional traffic impact assessment methodology is less reliable in congested environments where intersections are already at or near capacity. Drivers do not usually simply accept ever increasing levels of congestion if reasonable alternatives exist. For example, when fully built out, Oakridge will generate nearly 2,500 more trips than it does today. Approximately 500 of these trips are estimated to pass through the Cambie Street & 41st Avenue intersection. As indicated earlier, this intersection is already

essentially 'at capacity' during peak times so any increase in traffic will cause it to 'fail'. However, in reality as Oakridge site traffic increases and starts to affect the performance of this intersection, some existing background traffic will, over time, find alternatives to travelling through the intersection at its most congested times. This is because people only have a tolerance for a certain level of delay but beyond that, they will seek alternatives.

There are several ways that drivers currently using the intersection during peak times may adjust their travel behaviour in response to additional congestion levels:

- They may choose to travel at a different time of day, thus avoiding the peak-hours;
- They may choose a different route, which given the grid system of arterial streets in Vancouver, is perfectly possible in this instance;
- They may choose to use a different mode of travel, such as switching to transit. This will also be a realistic option for some, given the presence of the Canada Line and other high frequency bus services;
- They may choose a different destination. For example, the route to the closest grocery store is now congested enough that another grocery store that is further away by distance is now quicker to get to; and,
- They may not make the trip at all, or combine it with other trips. Certain discretionary trips may not be made at all, or multiple trips are combined into one trip at another time. There is evidence to suggest that in congested neighbourhoods drivers make fewer trips, but each trip has a higher number of stops, or destinations, on it.

There is increasing evidence that, in Vancouver at least, new development around key intersections is not leading to higher volumes of traffic. New local trips are replacing the longer distance trips as a result of this changing travel behaviour, as described above. Some examples of recent increases in density around key arterial intersections include:

i. Cambie Street & Marine Drive. Recent studies undertaken in support of higher density development at this location showed that traffic volumes have actually decreased by an average of 1% per year for the past few years.

ii. Cambie Street and Broadway. This intersection has seen significant development in proximity to it in the past few years, both directly adjacent to it on the north-west corner, as well as just north of it along Cambie Street. Despite this significant increase in density, traffic volumes through the intersection are falling.

Table 13.1 summarises actual traffic volume counts for these two intersections, with data from the City of Vancouver (Vanmap), for all available years.

Table 13.1: Historical Traffic Volumes for Two Comparative Intersections

Intersection	Year (one day sample, Weekday PM Peak-hour)					
	1998	2002	2004	2006	2010	2011
Cambie St & Broadway	6289	5847	5180	5610		5090
Cambie St & SW Marine Dr.		6322	6133		5631	

Data from City of Vancouver's Vanmap (Online Public GIS)

This data supports the long term trend in Vancouver for falling vehicle trips but it also suggests that new short term trips to these new destinations are replacing previous longer distance trips.

Therefore, with the addition of new site traffic from Oakridge, the Cambie Street & 41st Avenue intersection is still predicted to operate largely as it does today, but the people using it will change, with more trips starting or ending at Oakridge and longer distance 'through traffic' increasingly seeking alternatives.

The percentage by which existing background traffic would have to decrease in order for the overall traffic volume to remain the same, once Oakridge is built out, was therefore calculated. The Cambie Street & 41st Avenue intersection was used for the calculation as this intersection is the most critical off-site intersection in the study area and would be most negatively affected by the future site traffic due to its already congested conditions today.

In the future, there will be in the order of 500 and 550 net new site trips experienced at this intersection during the Friday and Saturday peak-hours, respectively. Calculating what this number of trips would represent as a percentage of the existing traffic volumes, results in approximately 11%.

As such, in order for the existing traffic volumes at the intersection to decrease enough so that the new site trips do not cause a net increase in overall volumes at the intersection, the corresponding annual traffic reduction rate (compounded annually) needs to be approximately 1.1% on both the Friday and Saturday. This calculation assumes that the reduction in traffic occurs over the course of ten years, which is the projected timeline for the development to reach full build-out.

In other words, it is concluded that background traffic will reduce by approximately 1% per year over the next 10 years and this displaced traffic will be replaced by site traffic. This reduction and replacement will result in overall volumes and operations at the Cambie Street & 41st Avenue intersection remaining relatively constant. In addition, this 1% reduction would seem to be realistic given the experience elsewhere in the City.

The resulting future total traffic volumes for the Friday PM and Saturday Mid-day peak-hours are shown on Exhibits 13.1 and 13.2, respectively.

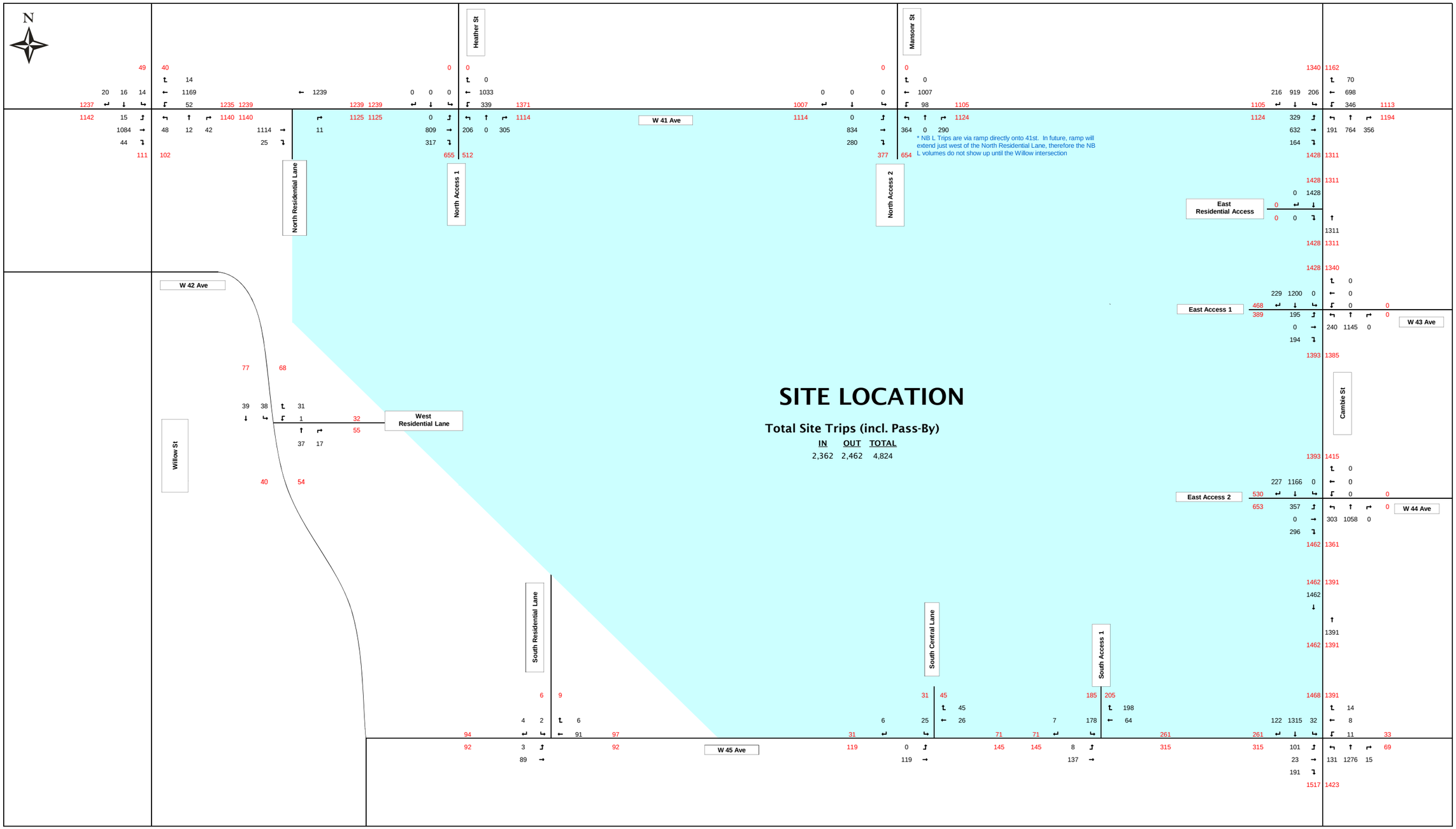

Exhibit 13.1

2030 Total Friday PM Peak Hour Traffic Volumes

Oakridge Centre Redevelopment

4241.26 October 2013 NTS

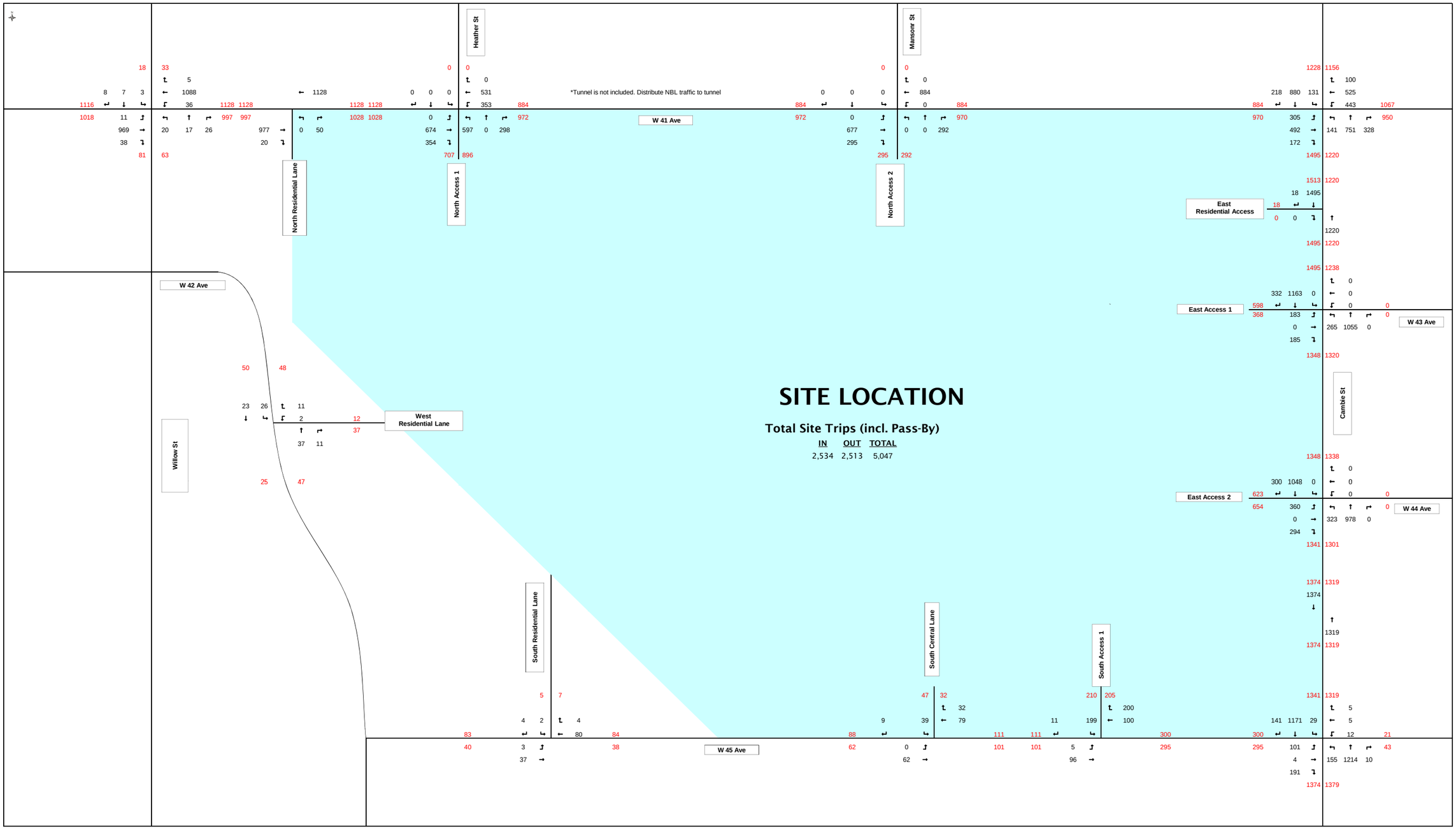

Exhibit 13.2

2030 Total Saturday Mid-Day Peak Hour Traffic Volumes

Oakridge Centre Redevelopment

4241.26 October 2013 NTS

13.3 Future Traffic Operations Performance at Site Driveways

Using the future total traffic volumes shown on Exhibits 13.1 and 13.2, the traffic operations were analyzed at the site driveways. The same traffic operations performance criteria used for the existing traffic operations analysis was once again used for the future analysis. The site driveway traffic operations results, presented below, highlight only the specific movements that did not meet the performance thresholds. A detailed summary of the traffic operations at these driveways is included in Appendix B.

Given the future site traffic is approximately 70% higher than the existing volumes, the overall traffic operations are still shown to operate reasonably well. The driveways which are expected to experience some issues are summarized in Table 13.2.

Table 13.2: Traffic Operations at Site Driveways Failing Acceptable Criteria

Location	Failing Movement	Time Period	Issue	Description
East Access 1 / Cambie Street	NB Left-turn	Friday PM & Sat Mid-Day	Queues	95th percentile queues of approximately 60m on Friday and Saturday, exceed 52m storage lane. (Note: Future NB left-turn storage lane assumed to be increased from 45m to 52m in the future)
	SB Through	Friday PM & Sat Mid-Day	Queues	95th percentile queues over 100m for the southbound through traffic. Distance between East Access 1 and 41st Avenue is less than 120m (bus stop)
East Access 2 / Cambie Street	NB Left-turn	Sat Mid-Day	Queues	95th percentile queue of 83m exceeds 70m storage lane. (Note: Future NB left-turn storage lane assumed to be 70m)
	SB Through	Friday PM & Sat Mid-Day	Queues	95th percentile queues of 136m and 120m on Friday and Saturday, respectively, exceed 120m distance from East Access1.

As the above table indicates, with the future site traffic, there are difficulties expected at East Access 1 and East Access 2. At East Access 1, the northbound left-turn 95th percentile queues are reported to potentially exceed the available storage lane. This occurrence is in part due to the presence of a pedestrian signal phase associated with the new east-west pedestrian crossing added to the access in the future. The pedestrian phase increases the overall required cycle length at the intersection, leading to longer queues. However, it is considered that the increased benefit to pedestrians outweighs the increased queue length, which only has a chance to exceed its storage lane during the peak-hours.

Similarly, at East Access 2, on the Saturday, the northbound left-turn 95th percentile queue was also shown to exceed the available storage. Moreover, for both access on the Friday and Saturday peak-hour, the southbound through 95th percentile queue lengths were reported to exceed the available distance between the access and the next intersection to the north. This is partly due to the change in laning configuration from three through lanes to two for the southbound direction. This change was required to accommodate the 2-way separated bike lane and pedestrian facilities.

14. INTERNAL VEHICULAR SITE CIRCULATION

14.1 Introduction

The internal vehicular site circulation was reviewed to not only ensure that vehicles can circulate within the site efficiently, but also to ensure that there are no negative impacts of internal operations that will adversely impact street operations.

The internal site circulation is critical for this site, as generally, directional orientation experienced by users in underground parkades is somewhat challenging when compared with surface parking lots, due to the lack of daylight and visible landmarks used for orientation. This is further affected by the fact that the existing Oakridge Centre configuration is at approximately a 45 degree angle with the existing street network, and the proposed underground parking layouts generally follow this alignment among other design considerations. However, the design of the internal circulation routes has been made as direct, visible and connected as possible to offer legibility, clarity and route flexibility for drivers.

14.2 Outline of Underground Parking Circulation

The main circulation drive aisles and internal ramps are shown in **Exhibit 14.1** for the above ground level (including High Street) and **Exhibit 14.2** on the P1 parking level, with Levels P1 through to Level P4 exhibiting similar layouts. The general layout characteristics are as follows:

- There is no continuous street-level through access along High Street; the entrances from both 41st Avenue and Cambie Street only accesses parking or parking ramps.
- All parking access controls are such that the right-of-way is for the traffic entering from the street. For example, the southbound traffic at the Manson Street access into the site will encounter an internal intersection at the bottom of the ramp, but will have the right-of-way over all other movements by providing Stop signs for other movements. This is to ensure that queues will not extend from the parking areas onto the street. Likewise, parking spaces are located away from street entrances to minimize the likelihood of parking manoeuvres from causing queuing onto the streets.
- Good wayfinding signs are to be provided at the entrances to reduce the likelihood of confused or disoriented drivers from potentially slowing or queuing the entering movements.
- The main circulation aisles for P1 allows for customers to navigate the parking without making multiple circuitous movements, which is critical for drivers at the first point of entry. Three internal ramps between parking levels provide opportunities for vehicles to re-circulate and indicate where vehicles can enter and exit between levels.

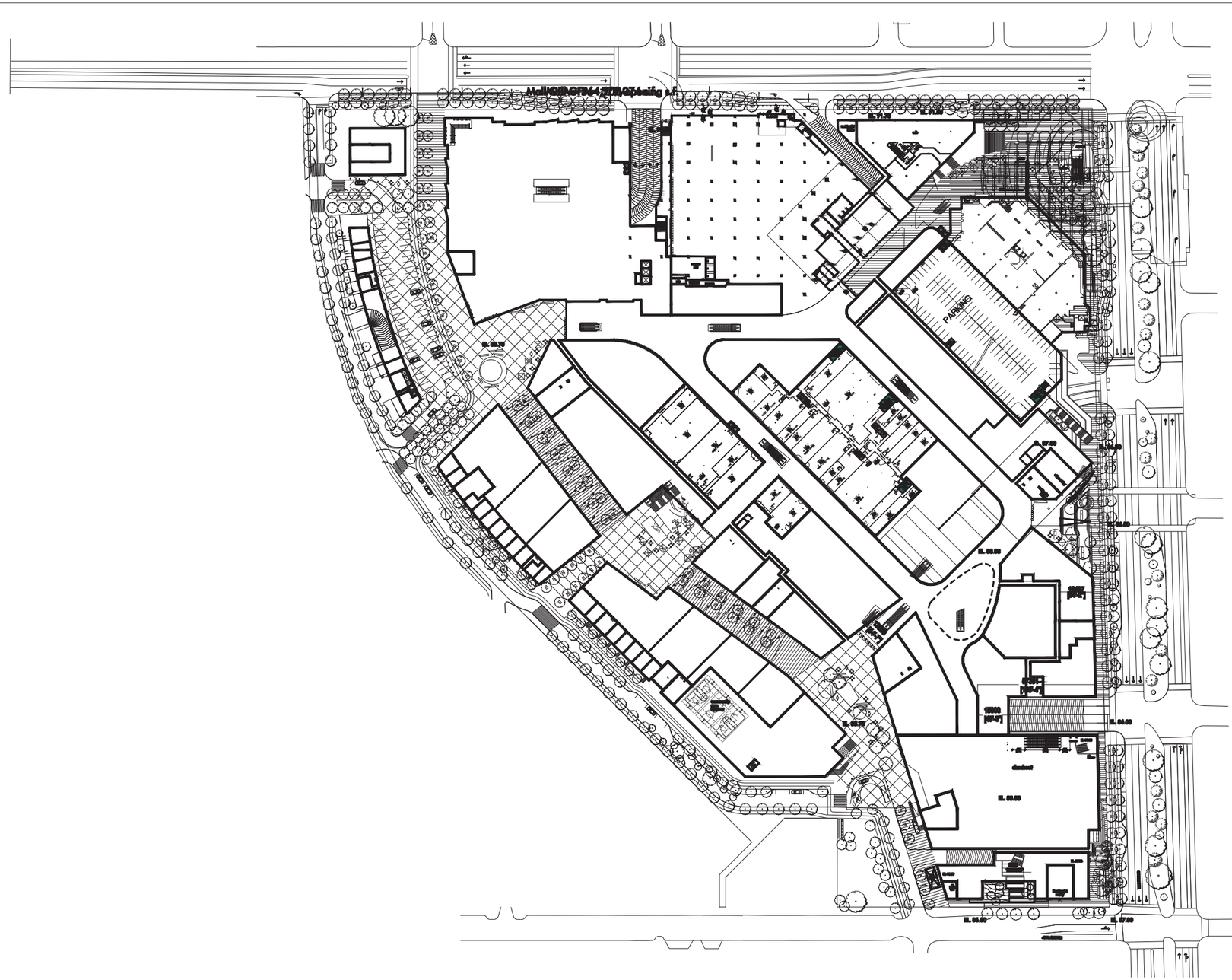

Exhibit 14.1

Vehicle Circulation on L1

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Exhibit 14.2
Vehicle Circulation on P1

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- To assist drivers navigating through each level of the parkade, and for ease of identification when returning to their vehicles, it is recommended that each parking level be identified separately through a "zoning" system using measures such as colour-coded walls and columns, symbols, or naming. Directional signage should also be provided with major store names and arrows to guide entering vehicles to park at the most appropriate locations for their purpose of visit (for example, for customers to the main mall areas and the Bay, signage to direct drivers to the south side of the mall).

In general, the layout as currently designed should adequately service the Oakridge redevelopment. The Project Team will continue to fine-tune the parking layout as part of the design development process to ensure safe and efficient movements of vehicles along the main circulation aisles.

14.3 Retail Loading and Servicing

Retail loading is generally provided via an internal loop road along a similar alignment to the existing loading areas. This road route was reviewed and was shown to be able to accommodate vehicles up to WB-20 class, and is not expected to impede passenger vehicle traffic.

The Safeway loading areas are close to an internal intersection with direct access from Cambie Street. Loading vehicles would access the area after clearing the intersection, and not impede with passenger vehicle traffic.

14.4 Residential Loading and Servicing

Residential loading and servicing is provided at the P4 parking level for the condominiums, and at street level via New Street for the townhouses. The loading bays and passageways are designed as a Class B as per the City's Bylaws.

14.5 Valet Parking Operations

Valet parking is being proposed for key locations at Oakridge as a value added service for customers. This will help to relieve some of the pressures that can be caused by circuitous vehicle movements while people search for available parking. It also provides convenience to shoppers and diners by allowing them the opportunity to arrive at or near their destination without having to find premium parking should they wish to use the service.

Approximately 62 stalls would be allocated for use by valet services at the P1 level, and are configured as tandem parking (4 spaces stacked in a row).

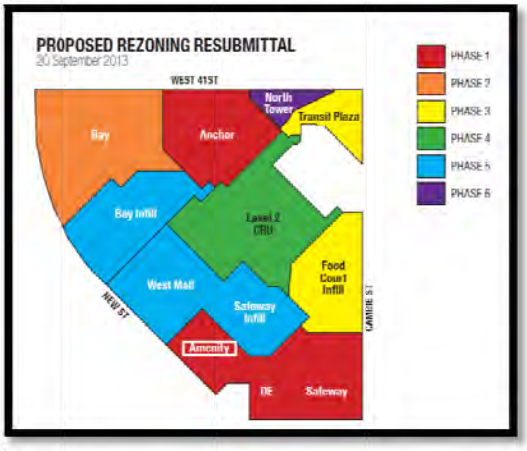
15. PHASING

15.1 Outline of Proposed Development Phasing

Given the size of the proposed redevelopment, the Oakridge site is planned as a phased development. A total of six phases have been identified as part of the development and are shown in **Exhibit 15.1.** A brief summary is provided below**:**

1. Phase 1: Anchor Tenant (North-eastern quadrant), Safeway and Amenity space;
2. Phase 2: The Bay;
3. Phase 3: Food court and Transit Plaza;
4. Phase 4: Level 2 CRU;
5. Phase 5: The Bay (infill), Safeway (infill), and West Mall; and,
6. Phase 6: North Tower.

Exhibit 15.1 Proposed Development Phasing



The residential component is planned to be developed following the completion of the podium level (as per phases shown). The 6 phases are expected to be completed over a period of at least 10 years. Subject to the successful passage of a rezoning bylaw for the site, construction of Phase 1 is planned as early as Fall 2014.

A transportation impact assessment will be conducted for each phase during the construction process to ensure proper operations, accessibility and circulation of the site for the internal and external network.

During construction some accesses and circulations isles are expected to be closed temporarily. Alternative routes and wayfinding will be reviewed and provided pre and post construction.

16. CONCLUSIONS & NEXT STEPS

16.1 Conclusions

Ivanhoe Cambridge, the owner of Oakridge Centre, and its residential partner Westbank Projects have conceived an ambitious and innovative master plan for a future Oakridge Centre mixed-use community. The plan has been developed in accordance with the policies and guidelines contained in the City's 2020 Greenest City Action Plan and Transportation 2040 and will place commercial and residential density in a location that will encourage alternative modes of transportation.

Among the specific transportation initiatives proposed in the Oakridge Centre master plan:

- Phased upgrades to the Canada Line station and Transit Plaza to ensure the design of the new Oakridge Centre encourages and optimizes transit use;
- Reduced parking for the residential component compared to other non-transit oriented conventional developments and a one-third lower commercial parking ratio than exists today on site;
- A "Car Club" to provide Oakridge residents with access to vehicles when needed;
- A significant quantity of on-site bicycle storage for residents accessed by High Speed elevators to grade as well as a bike share program for residents, a bike valet and dedicated bicycle parking area for visitors and significant improvements to the designated bike routes that pass by or through Oakridge Centre.
- Improved pedestrian crossing alternatives from Cambie and 41st Avenue into the site as well as Vancouver's first pedestrian only outdoor High Street.
- A new local street along the edge of the master plan, designed to serve as a buffer between some of the new residential units and existing residential neighbourhood;
- An efficient, high-ceilinged, and easily navigable parkade.
- These transportation initiatives reviewed as part of this report are as follows:

Cycling and Pedestrian Connections

- Separated two-way bicycle paths will be provided along both the Cambie Street and 41st Avenue frontages of the Oakridge Centre site. In addition, a new bicycle path will be constructed on the western portion of the site, providing a continuation of the Heather Street bike route north-south across the development.

- A total of 4,300 bicycle parking spaces will be provided, including over 3,600 for new residents and 570 for customers and employees of the commercial and community uses. In addition, an innovative bike valet service is proposed with customer access to Cambie Street that will provide a convenient option for cyclists visiting the area to store their bicycles securely while spending time shopping, dining or visiting the park or community centre. A bike share program for residents with 100 bicycles will also be in place, providing access to a bicycle whenever required.

Public Transit

- TransLink has confirmed that the Canada Line has the ultimate capacity to serve more than double the passengers it presently serves with several methods to add capacity..
- The additional ridership levels from a general increase in background ridership and the full development of Oakridge to the 2025 horizon can be accommodated without major investments from TransLink.
- Improvements to the public realm at the Transit Plaza and to the Oakridge 41st Avenue station house will be implemented as part of the redevelopment to accommodate future growth in both Bus and Skytrain ridership.

Residential Parking

- Oakridge Centre's residential will be served by less than 50% of the parking capacity of a typical project in the City and support reduced vehicle trips to and from Oakridge Centre. This is consistent with the Transportation 2040 plan, where auto ownership levels are trending lower in Vancouver and most new residential developments in the City are being built with parking that is underutilized, especially around transit stations. This seeks to encourage more sustainable travel modes, as well as reducing housing costs.
- A total of 1,400 resident use parking spaces are planned for the proposed 2,914 residential units. New residents can make the choice to live car-free, a car share program will be available to all future residents of the project and will go beyond the offerings of existing public car share operators in Vancouver.
- A survey of existing on-street parking demand for the neighbourhood indicated that there is a significant amount of on-street parking available in the vicinity of the site regardless of parking restrictions to accommodate any potential spillover from the Oakridge site.

Commercial Parking

- Compared to today, commercial parking ratios at Oakridge Centre will reduce by one-third. This reduction is facilitated by improved transit ridership to the Centre, expected increases in 'walk-up' traffic by on-site and local area residents, and the sharing of parking with office tenants, the community centre and retail.

- Broader trends support a reduced commercial parking ratio as customer and staff parking demand at Oakridge during the pre-Christmas period has decreased by over 25% in the past 10 years. This trend is expected to continue.

- A total of nearly 5,400 spaces are planned for customers and employees in support of the 2.0m square feet of commercial retail, community and office uses. This parking will also be available for use by visitors to the residential buildings as the peak visitor demand typically occurs in the evening period when commercial parking activity is lower.

- The underground parkade system will be thoughtfully designed with ample lighting, high ceilings and clear directional signage to allow easier navigation than what exists today.

Traffic

- Oakridge Centre presently generates approximately 50 vehicle trips per minute on the area road system during both the weekday and Saturday afternoon peak periods. Redevelopment is anticipated to increase vehicle trips to approximately 80 vehicles per minute during the weekday PM peak period, and 85 vehicles per minute during the Saturday afternoon peak period. Approximately one-quarter of the increase is associated with the proposed new residential development and three-quarters with new commercial and community development. A comprehensive traffic impact assessment of the existing and projected future traffic volume conditions on the area road system has been undertaken. Additional vehicle movements associated with the Oakridge master plan are expected to be largely offset by anticipated continuing decrease in longer distance vehicle trips that use the Cambie Street and 41st Avenue corridors away to other corridors, retiming journeys and switching to other modes, in particular transit.

- Existing traffic-calming measures in neighbourhoods adjacent to Oakridge Centre have contributed to lowering the amount of Oakridge Centre traffic travelling residential streets and the Oakridge transportation plan will continue with this strategy.

- Truck access will be exclusively from Cambie St. and almost all vehicular traffic will access the site from either 41st Ave. or Cambie St. A new residential street proposed on the west and south edge of the Oakridge site is being designed specifically to limit new traffic movements through existing residential neighbourhoods, and will not allow shortcutting from 41st to 45th Avenue. Other

traffic calming measures in the surrounding neighbourhoods will be implemented as needed by the City to ensure that Oakridge Centre's local traffic impacts are minimized.

- Primary vehicle access points to Oakridge will continue to be on Cambie Street and 41st Avenue, while the vehicle access at 45th Avenue will be more limited that with the existing arrangement.

16.2 Required Future Work

As the project progresses and the site plans are fine tuned, future work is required. The following summarizes a list of items to be undertaken by Bunt:

- Oakridge Station improvements required to accommodate anticipated ridership volumes;
- Design of off-street bicycle and pedestrian facilities in connection to the Transit Plaza. This includes future bus station location, shelter design and placement, traffic calming measures and treatments at neighbouring streets (New Street and Tisdale Street);
- Site plan review to improve on-site circulation and parking operations for proposed underground parking levels;
- Analyze configurations on 45th Avenue at Cambie Street and New Street to consider future turning restrictions and discourage traffic through the residential neighbourhood;
- Compass Card opportunities for transit subsidies and other rewards.

16.3 Future Reports

TIAs required for each phase

APPENDIX A

Green Mobility Strategy

TRANSPORTATION PLANNERS AND ENGINEERS

Appendix A: Oakridge Centre Rezoning
Green Mobility Strategy

Final

Prepared for

Ivanhoe Cambridge & Westbank Projects Corporation

Date

October 25th ,2013

Prepared by

Bunt & Associates

Project No.

4241.26

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EXHIBITS

TABLES

1. INTRODUCTION

In 2008, Vancouver City council unanimously voted to pass the EcoDensity Initiative, an all-inclusive vision/policy document, where increased density and high performance green design are strategically used to enhance the sustainability, livability and affordability in Vancouver. In the context of the EcoDensity policy, sustainability refers to the reduction of greenhouse gas via increased density and the encouragement of green design predominately through efficient energy use and a reduced reliance on automobiles.

The Sustainable Large Development Rezoning Policy, established in 2012 when the EcoDensity initiative was revised, obliges developers of sites greater than two acres or 500,000 sq ft of development floor area, to meet the sustainability standards set out in this policy and the Greenest City 2020 goals and targets, as part of the rezoning process. It involves submission to the City of the following studies:

- Sustainable Site Design
- Access to nature
- Sustainable Food Systems
- Green Mobility
- Rainwater Management
- Zero Waste Planning
- Affordable Housing
- Low Carbon Energy Supply

This report presents the Green Mobility Strategy for the Oakridge redevelopment, located at 41st Avenue and Cambie Street in Vancouver. It has two key objectives:

- Provide strategies to promote use of sustainable transportation modes, to and from the site, and;
- Address how the site will contribute to the Greenest City 2020 transportation targets of: 50% of trips made by walking, cycling and public transit modes, and the reduction of motor vehicle trip distance made per resident by 20% from 2007 levels.

An assessment of the site's transportation infrastructure and programming will be carried out, and opportunities to promote the use of sustainable transportation modes, that go well beyond the minimum requirements set out in the City of Vancouver's standard transportation by-law and zoning requirements, will be identified.

2. SITE LOCATION AND ACCESSIBILITY

2.1 Site Location and context

Ivanhoe Cambridge and Westbank Projects Corporation are planning on a major redevelopment of the existing Oakridge Mall, located at 41st Avenue and Cambie Street in Vancouver, BC. Oakridge Mall is currently dominated by commercial use, with some supporting office and residential. Driving the planning and scale of this mixed-use community is the central location in the City of Vancouver and its direct connection to the Canada Line and broader transit system.

2.2 Pedestrian Accessibility

One of the main transportation targets in the *Greenest City 2020 Action Plan, 2011 -2012 Implementation Update*, is for the majority of trips made to be by foot, bicycle and public transit. Key strategies include the planning of complete communities, where goods and services are supplied within a 10-min walk from where people live and which encourages walking, cycling and transit as primary modes of travel

This site is located within an established urban environment, conducive to pedestrian accessibility and mobility. People are typically willing to walk an average distance of 400-800 m, or a 5 to 10-minute walk. The existing site has a range of amenities available to residents, workers and visitors. Outside the site, there are local shops that serve the community, along with community parks and recreational facilities.

The existing layout of Oakridge Centre, with expansive areas of surface parking separating the building from the street edges, has long presented a physical barrier to the continuity of walking and cycling routes in the neighbourhood. However, the proposed Oakridge Centre presents a pivotal opportunity to place new commercial and residential density in this location and encourage sustainable modes of transportation.

2.3 Transit

On the northwest corner of the site is the Oakridge/ 41st St Avenue Canada Line Station, where a plaza location has easy access to rapid transit via the Canada Line, where a plaza area leads to the main pedestrian entrance. The 19 km rapid transit Canada line connects Vancouver to Richmond Centre and the Vancouver International Airport. In the context of the site, the line runs underneath Cambie Street.

Given the site's proximity to the Canada Line, it forms a key component of the Cambie Corridor Plan; the focus of which is the implementation of policies that will support a greener and more liveable future, along the corridor and neighbouring communities. The Cambie corridor, along with Broadway and the downtown core, has the opportunity to become one of the key strategic areas of urbanism within the Vancouver Region. The plan focuses on prioritizing walking and cycling, and the integration of energy, transportation and land use concepts for the future communities.

2.4 Cycling

Cycling in Metro Vancouver is up 28% since 2008 (*Greenest City 2020 Action Plan, 2011 -2012 Implementation Update*). *Transportation 2040* includes strategies to continue and improve upon this trend, upgrading and expanding of cycling systems, while catering to cyclists of all ages and abilities.

There are several existing bikeways within close proximity of the site, and include:

- **Heather Street Bikeway**: a north-south bikeway that connects South East False Creek to the north and Cambie Bridge to the south. Currently this bikeway is not connected between W 37th Ave to W 41st Ave and diverts via Willow Street to the west to avoid Oakridge.
- **45th Avenue Bikeway**: a west-east bikeway connecting the Balaclava Street bike lane to the west and the Ontario Street bikeway to the east.
- **Cambie Street bike lanes**: Cambie Street painted bike lanes connect to the Marine Drive Canada Line Station to the south and W 29th Ave, at which point cyclists must divert to either the Heather Street or Yukon Street bikeways, which terminate close to the Cambie Street Bridge.
- **41st Avenue bike lane**: A minor painted bike lane is located along 41st Ave, between Willow St and Cambie St. This bike route is one way only and provides a west-east connection to Cambie St.

Exhibit 2.1 illustrates the existing bikeways in the vicinity of the site.

With the variety of existing and proposed cycling infrastructure in the vicinity of the site, cycling should be considered an attractive and viable mode of travel for residents, visitors and employees.

Exhibit 2.1

Existing Bikeways

Oakridge Centre Rezoning
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3. PROPOSED DEVELOPMENT

3.1 Development Content

Oakridge currently occupies 825,000 sq ft in size (GFA). **Table 3.1** outlines the estimated statistics for the redeveloped site, which includes some existing spaces.

Table 3.1: Development Statistics

Use	GFA sq ft
Retail	1,470,000 (1.2m GLA)
Office	420,000
Community	70,000
Sub-Total	*1,960,000 (1.6m GLA)*
Residential	2,700,000 (2,914 units)
Total	**4,660,000**

Note: Rounded to nearest 10,000 sq ft.

Nearly 4.7m sq ft of development is proposed on the site and this is nearly seven times the size of the current development on site. Retail alone is approximately twice what is currently provided and the residential component represents nearly 60% of the new density on the site with office at 10% and retail and amenity areas approximately 30%. Office and community facilities will include a library, a senior's centre and a daycare.

3.2 Bicycle Parking

The cycling component of the active transportation strategy at Oakridge is expected to be holistic and organic, bringing increased external and internal site accessibility with well-designed routes and parking facilities.

A total of 4,310 bicycle parking spaces will be provided including over 3,600 for the new residents and 570 for customers and employees of the commercial and community uses.

A bike share program for residents with 100 bicycles will also be in place, providing access to a bicycle whenever required.

A bike valet drop-off service accessed from Cambie Street will provide a convenient option for cyclists visiting the area to store their bicycles securely while spending time shopping, dining or visiting the park or community centre.

The bylaw requirements and proposed strategy for providing bicycle parking for the different users of the site is illustrated in **Table 3.2.**

Table 3.2: Residential Bicycle Parking Supply and Bylaw Requirements

Housing Type	Units	Class A Requirements	Class A Provided
Family Non Market	64	80	3,640
Rental	393	491	
Affordable Ownership	100	125	
Sustainable TO Market	1,460	1,825	
Traditional Market	715	894	
Seniors Non-Market	120	12	
VRS Units (Low Income)	12	15	
HL Rate Rental Micro (Low Income)	50	63	
Total	**2,914**	**3505**	**3,640**

Over 3,500 Class A bicycle stalls are proposed for the 2,914 residential units. It slightly oversupply the Class A bicycle storage, compared to what is required in the bylaw, and the ease of access and quality of layout of the parking will be a critical component of the design to encourage active transportation modes at Oakridge.

Class B bicycle parking spaces has not been determined at this time, and will be depended upon for each phase of development, along with discussions with the City of Vancouver. It is expected to meet best practices with respect to accessibility, visibility, weather protection and security.

The provision of Class A bicycle parking spaces, for all proposed non-residential uses is illustrated in **Table 3.3**

Table 3.3 Non-Residential Class A bicycle Parking Requirements and Provision

Land Use	Area (m GFA)	Class A Requirements	Class A Provided
Commercial	136,279	273	570
Office	39,488	79	
Community	3,252	7*	
Library	2,415	5*	
Childcare	836	0	
Total	**182,270**	**364**	**570**

* By-law rate calculation uses the assembly area, which is not known at this time. For the purposes of a conservative estimate, GFA was used to calculate the required spaces, and therefore results in an over estimate.

Over 200 Class A parking spaces proposed, over the required amount, for for non-residential uses, and this is over 50% above the City's advice.

The majority of the Class A parking spaces will be located on the P4 level, however, in order to provide efficient and convenient access to this parking, as per the by-law, 3 high speed, bicycle elevators are planned to transport cyclists and their bikes directly to P4. The locations of these elevators are proposed for the north-west corner, the north-east corner and east region of this site, providing convenient access to the Heather Street Bikeway, the proposed bike lane on 41st as well as the corner of W 41st Ave and Cambie Street.

For additional details on bicycle parking, please refer to Section 6- Pedestrian and Bicycle Facilities, in the main report.

3.3 Vehicle Parking

3.3.1 Residential Parking

The proposed residential parking ratios are low relative to other developments in the City. Overall, 2,914 units are proposed with approximately 1,375 parking stalls with an overall ratio of 0.47 stalls per unit. Policy context and social trends support this low ratio to be assigned to the different unit types.

Refer to Section 9- Residential Parking, in the main report, for more information.

3.3.2 Commercial, Office and Community Parking

Commercial parking rates will also be reduced from the existing ratio of 4.7 stalls per 100 sq ft GLA, to 3.3 stalls per 1000 sq ft.

Please refer to Section 8- Commercial, Office and Community Parking, in the body of the report for a more detailed review.

4. PROPOSED CYCLING AND PEDESTRAIN CONNECTIONS

The existing layout of Oakridge, prioritizes surface vehicle parking. This has acted as a barrier to pedestrian accessibility and the main cycling routes in the neighbourhood. Relocating the majority vehicle parking underground would remove these barriers and create active transportation connections.

More information on the subjects covered in this section may be found in the main report in sections: 5- Site Plan review & 6- Pedestrian and Bicycle Connections

4.1 Proposed Site Design

In answer to the Oakridge Policy Statement, which advocates for a public street to run through the centre of the site, the project team has responded to the challenges of high vehicle volumes being incompatible with a high quality pedestrian experience (in this instance) by separating the pedestrians and vehicles. The High Street is proposed to be for pedestrians and only, while beneath this street, a high quality underground parkade with clear drive aisles for vehicles are proposed. ***Exhibit ES1 in the main report outlines the main features of the proposed site plan in terms of access and transportation***. In summary, the main features are:

- A new pedestrian 'High Street' running south-east to north-west through the site.
- A new public, no through, local street, 'New Street', on the western and southern side of the site to provide better integration with the existing neighbourhood.
- Numerous and high quality pedestrian routes across the site. This will include both indoor and outdoor spaces, with connections to both urban and 'green' spaces, notably The Commons on the roof of the existing mall.
- An increased number of controlled crossing points along 41st Avenue and Cambie Street, reducing severance issues caused by these arterial streets.
- An extension to the existing bicycle network through the site. It will connect with the Heather St and 45th Avenue bicycle routes via New Street.
- Eight inbound lanes and nine outbound lanes to serve the commercial component of the development. These will mainly be located off 41st Avenue and Cambie Street, with one access indirectly off 45th Avenue.

These features, along with the overall site plan support the proposed density as well as the objective to achieve LEED Platinum ND. A few of these key features, are outlined below.

4.1.1 Pedestrian Street

A pedestrian only street will create a high quality pedestrian experience, where outdoor pedestrian space is a key objective of the project and is in keeping with the Policy Statement.

The high street could be thought of in terms of being the heart of the development, while the other pedestrian connections are the arteries, filling it with life. It will offer visitors an outdoor, attractive, car free, urban environment. From here there will be connections to a 'commons' on the roof of the existing mall which will offer a landscaped green space, contrasting with the urbanity of the High Street. The lack of motorised vehicles on the surface means that pedestrians will be able to relax and experience a more human scale urban space. This would not be possible if vehicles bisect the site.

4.1.2 New Street

Another key element of the site plan is the creation of a new surface street (New Street) on the western edge of the site where it interfaces with neighbouring properties. It would connect to the area's street system at 41st Avenue and 45th Avenue, although critically, it would not connect in the centre, so as to eliminate the chance of traffic using it as a short-cut. Two loops would essentially be created, with the southern street connecting to Tisdale Street via an existing laneway. Details of this connection are still to be developed in detail.

New Street will provide access to the existing neighbourhood and also access to the proposed residential development via a ramp leading directly to the P4 residential parking field as well as the townhomes fronting the New Street. It is planned to be low-speed and low-volume in character and would not provide access to any of the retail or office components at Oakridge.

The street will have high quality facilities for pedestrians and cyclists, being the main connection between the Heather Street and 45th Avenue bike routes..

4.1.3 Bicycle Access

A dedicated bicycle and pedestrian signalised crossing of 41st Avenue is planned at Heather Street, a City of Vancouver bikeway. It allows for a safer more efficient crossing for pedestrians and cyclists at this point, with a dedicated crossing phase, without vehicles. On the southern side, the bikeway feeds directly into the top of the High Street in a prominent location and makes a strong design statement that bicycles are important to the development of success.

4.1.4 On-Site Bicycle Connections

As indicated in Exhibit ES1, the Heather Street bikeway crosses 41st Avenue at a dedicated signalised crossing and runs south through the site for a short period before turning to run along New Street. The bikeway has been designed to minimise the number of times it crosses a street or driveway. Although vehicles will not be permitted to travel from one end of New Street to the other, bicycles will be able to do this, connecting in the south to 45th Avenue.

4.1.5 Access Points

The four main vehicular access points are located at follows:

- On 41st Avenue at Manson Street (full movement, signalised);

- On 41st Avenue at the existing angled access between Manson Street and Ash Street (right in/ right out with left-out via the underground tunnel);
- On Cambie Street at the existing access between 42nd Avenue and 43rd Avenue (full movement, signalised); and
- On Cambie Street at 44th Avenue (full movement, signalised).

An additional access at the southern end of the New Street would provide for use of 45th Avenue to access commercial parking.

Consolidation of access points means less breaks in the sidewalk and provides a greater number of signalised access points and controlled crossing opportunities on Cambie Street and 41st Avenue than currently available.

4.1.6 Transit Plaza

The Transit Plaza at Cambie St and 41st Avenue is a key public space and arrival point for Canada Line Station passengers to Oakridge and will continue to be the case in the future. An underground connection from the station into the mall was briefly considered, but design challenges with the location of the parking garage for the existing Terraces residential strata and the desire to animate the plaza with people and energy led the team to retain and enhance the current access point from the station to the plaza.

In addition to the Canada Line, important bus stops are also located here, and requirements for shelter design and sheltered waiting and queuing areas will also be incorporated into the space. Off-street bicycle routes will use this area, so careful design will be required to ensure interactions are minimized.

4.2 Proposed Off-Site Bicycle and Pedestrian Connections

Please refer to Section 6 of the main report for additional information regarding future bicycle connections to, from and around the site as well as within it.

4.2.1 Future Pedestrian Connections

Two pedestrian controlled crossings are proposed along 41st Avenue. A new bike and pedestrian specific control signal will be installed at 41st and Heather Street.; there will also be a new signalized intersection on Manson Street and 41st Avenue. A full signal will be located at 41st Avenue and Cambie Street. There will be three signalized intersections along Cambie Street between 41st Avenue and 45th Avenue. These signalized intersections will be located at the following locations: midblock on Cambie Street between 42nd Avenue and 43rd Avenue, on Cambie Street and 44th Avenue and one at Cambie and 45th Avenue. Exhibit ES 1 shows all pedestrian crossings for the site.

To encourage pedestrian oriented street design and support a sustainable urban environment, multiple pedestrian access points will be implemented throughout the site and along 41st Avenue, Cambie Street and New Street. New Street runs from the north-west side of the development down to the south-east and

connects at 45th Avenue. Multiple accesses are designed between New Street and the High Street and pedestrians can travel the length of New Street. This new public local street will be implemented to provide a better integration with the existing neighbourhood and allow pedestrians to access the site at 41st Avenue and neighbouring residential laneways to the west.

Currently, Oakridge Centre is surrounded to the west by on-site parking spaces with minimal pedestrian access to the site. High Street is proposed for this development to act as a pedestrian oriented connector to increase attractiveness to the site. High Street connects Heather Street from 41st Avenue to 45th Avenue and will facilitate an effective interface between the existing neighborhood and local services as it runs right through the site allowing access to various store frontages. It will be characterized by an open-air urban environment to provide a high quality pedestrian experience. Exhibit ES 1 depicts these access points.

4.2.2 Future Bicycle Connections

There are currently multiple existing cycling routes within the local context of Oakridge, including the Heather Street Bikeway, which is a key north-south connection for cyclists in Vancouver. Currently this bikeway is not connected between W 37th Ave to W 41st Ave and diverts via Willow Street to the west to avoid Oakridge. The proposed development includes provision for a new bicycle path to be constructed across the western portion of the site providing a continuation of the Heather Street bike route, north-south across the development. This will enable Heather Street between 37th Avenue and 41st Avenue to become a designated bicycle route in conjunction with the bicycle and pedestrian signal at Heather Street and 41st Avenue. The Heather Street bike route realignment will take advantage of the New Street, and should increase cyclist use locally, and within a larger extent.

Currently Cambie Street does not function as a two way cycle route, but instead offers various cycling lane provision between its north and south terminus. Within the context of the development site, there is currently only a northbound, on-street lane.

Exhibit 4.1 illustrates the proposed on-street, separated one-way bike lane, which will run alongside the site, on Cambie Street.

The cross section shown in Exhibit 4.1 represents an illustration of a potential cross section, at the south end of the site, by W 45th Ave. In this location, the illustration depicts a generous sidewalk and the separated cycle lane, with a 1 m buffer separation between the sidewalk, and a 2m boulevard buffer between Cambie Street. Given the change in land use and access points between W 41st Ave and W 45th Ave, this is likely to change along the site, but is overall a good reflection of the intended landscape.

The existing on-street bicycle lane on W 41st, connecting Willow Street to Cambie Street is also going to be upgraded under the proposed development plan, to a separated, two-way, off-street bicycle lane. A potential cross section is illustrated in **Exhibit 4.2.**

The cross section shows a location outside The Bay, where the proposal is to provide a wide sidewalk and a 1 m buffer, before the separated bicycle lane, similar to that proposed for Cambie Street. It should be noted that this example is illustrative only and given the range of land-use and building form along W 41st Ave, the landscaping and dimensions of the cross section will differ, along the extent of the site.

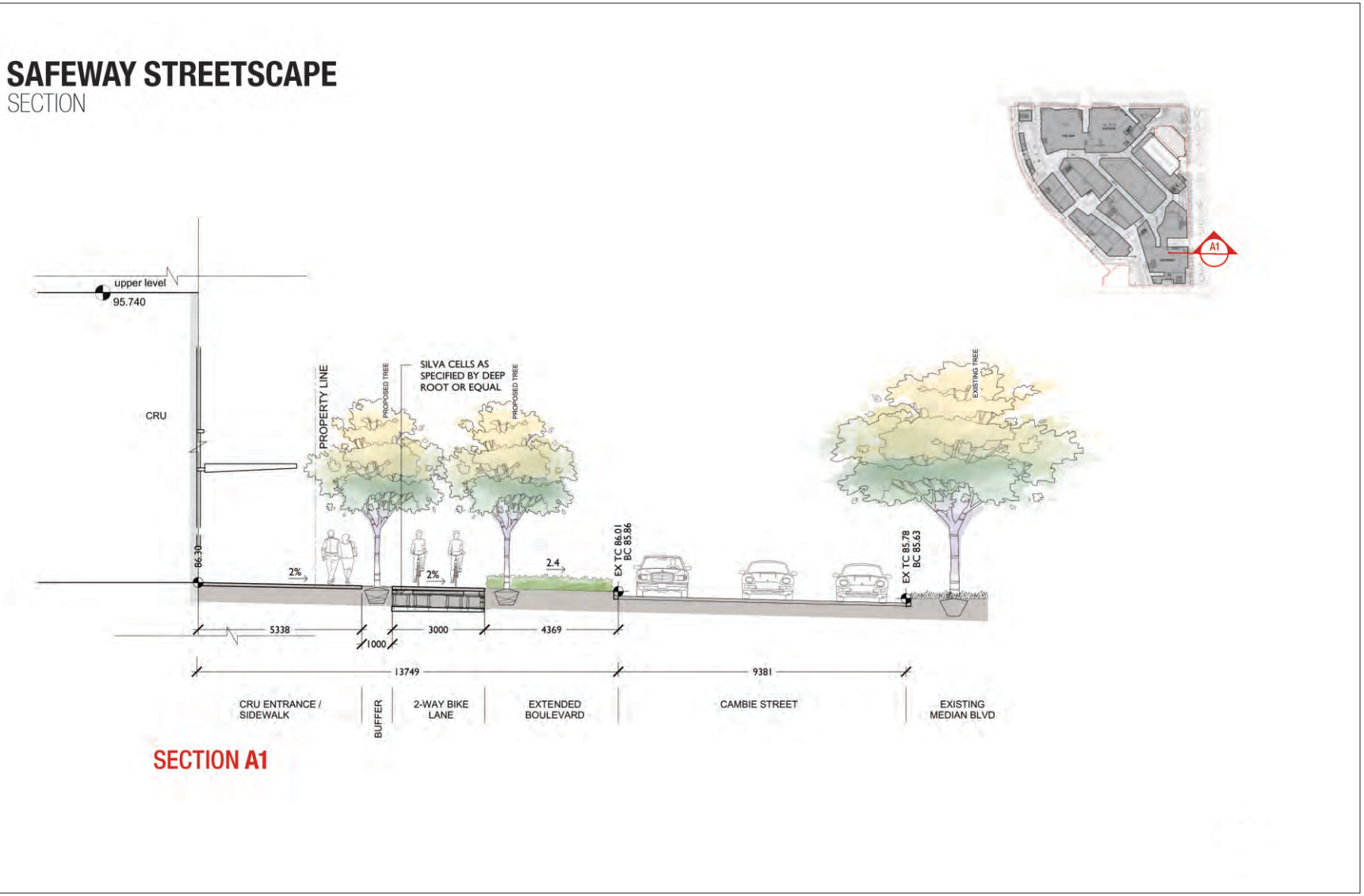

Exhibit 4.1

Proposed Cross Section on Cambie Street

Oakridge Centre Rezoning
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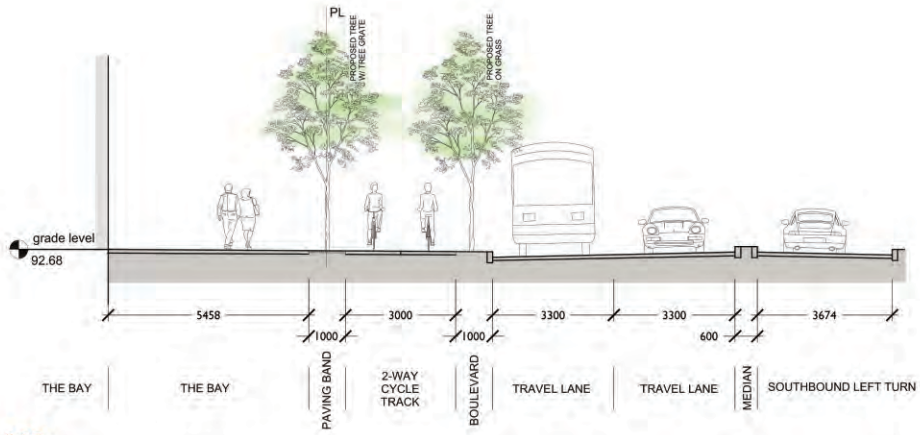
41st AVENUE - THE BAY STREETSCAPE
SECTION



SECTION A10

Exhibit 4.2

Proposed Cross Section on West 41st Ave

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5. PROPOSED TRANSIT CONSIDERATIONS

The existing Oakridge-41st SkyTrain Station is an underground station with a single access near the southwest corner of the Cambie Street and 41st Avenue intersection. Pedestrians to and from Oakridge Centre typically access the Station via the streetside plaza. The Station provides side platforms on opposite sides of the SkyTrain tracks, with an "inbound" platform heading north towards Downtown and an "outbound" platform heading south to Richmond and Vancouver International Airport.

Based on the methodology described in Section 7 of the main report, the projected Oakridge-41st Station conditions in the future with full Oakridge Centre build-out were calculated. It was determined that measures to mitigate delays on the up escalator to the plaza, the faregates, and the outbound platform may need to be addressed. The analysis also indicates that these improvements would be required upon completion of the initial phase redevelopment of the Oakridge expansion.

Ivanhoe Cambridge and Westbank Projects Corporation have committed to financing the station upgrade costs.

6. SUSTAINABLE TRANSPORTATION STRATEGIES

Sustainable transportation strategies, or Transportation Demand Management (TDM) refers to strategies that affect travel behaviour in a manner that lowers vehicle traffic congestion, reduces the need for road and parking space construction and minimizes GHG emissions, accomplished though the conservation of energy and the provision of efficient and equitable choices for moving through the city. These strategies are applied to how, when and where people travel and when successfully implemented lead not only to the mentioned benefits for the larger community, but also the individual, including:

- Time and cost savings
- Health benefits related to cycling and walking trips
- Improved productivity and a more attractive work place

The following outlines a number of strategies consistent with the site's current high accessibility for walking, bicycling, and transit along with the physical measures planned to support these modes. These strategies will support the Greenest City 2020 Action Plan transportation targets

- Make the majority (over 50%) of trips by foot, bicycle, and public transit.
- Reduce average distance driven per resident by 20% from 2007 levels.

The information here is also presented in Section 4- Transportation Demand Management, in the main report.

6.1 Residential TDM Strategies

As outlined in detail in Section 9 of the main report, the residential component of the project is planned to be provided with a relatively low parking supply compared to conventional practices. Although several different types of residential unit are planned, the overall parking ratio is planned to be 0.47 stalls per unit. In order for this parking ratio to be supported across over 2,900 units, a strong TDM program will be required. Measures for consideration are outlined below

6.1.1 Multi-Modal Access Guide

A Multi-Modal Access Guide provides concise information, which has been customized to the location and travel needs of the residents, visitors or employees of the development. Access to anticipated destinations by various travel modes should be highlighted with major consideration given to sustainable modes such as walking, cycling, and transit.

This guide may be provided in various forms, including: the building/strata's website, entrance/social space bulletin boards, and/or as a welcome package when a tenant moves into the building. Particular attention should also be given to locations where visitors or employees can obtain the information; an outdoor kiosk or public space is recommended. Moreover, different information resources may be needed

to accommodate different types of users, including special versions for people with disabilities, who speak a different language, who travel by a particular mode, or who travel from a particular area.

The guide provided for residents, visitors and employees of Rogers Arena Towers could include the following elements:

- A map of the area, showing the local amenities, near transit stops and stations and cycling and walking routes to key destinations;
- Information about transit service frequency, fares, first and last runs, plus phone numbers and web addresses for transit service providers and taxi companies;
- Isochrones or other details relating time required to access key destinations, including transit stops;
- Access arrangements for people with disabilities;
- Carpool program hotline number; and,
- Car Share/bike share program policies.

6.1.2 Bicycle Co-op

To complement the bicycle parking provision for the site, residents will also have access to a bicycle cooperative which will store and maintain a large number of bicycles for residents to use. One of the advantages of this system is that a high number of bicycles can be stored in a relatively small space. For those residents with their own bicycle, the bike coop will also act as an on-site bicycle repair shop and be a general community benefit.

6.1.3 Discounted Transit Passes

Subsidised transit passes could be provided as part of a 'welcome pack' when residents move in. Other parts of the welcome pack could include outlining to them transit services and schedules, bicycle routes in the area, local services within walking distance, and discount coupons for bicycle or walking stores.

TransLink's new Compass Card offers opportunities through advanced technology to offer specific rewards for transit travel behaviour. Opportunities for this, as well as limits of the technology are still being discussed with Translink but there would appear to be potential in the future to go beyond a simple monthly discount system and offer specific rewards (credit at Oakridge stores, for example) for specific transit behaviour (travelling early in the morning before peak-hours, for example).

6.1.4 TravelSmart

This is a division of Translink which focuses on ravel demand management measures and reducing the need to travel. The size and characteristics of the Oakridge development would make this an attractive target for Travelsmart. Programs could include individualised travel planning, an on-site 'welcome' person and work place travel plans.

Travelsmart would need to be engaged as individual residential phases are progressed, as to whether and to what degree they can become involved. They could also need funding to do this.

6.1.5 Residential Car Club

The main TDM measure designed to enable the majority of households at Oakridge to live without a private vehicle is the creation of a residential 'car club'. This car sharing concept is similar to commercial car share programs but is limited to only residents of Oakridge and not for members of the public. Up to 100 vehicles could be included in the car club, dependant on demand, offering a much higher ratio between vehicles and potential users than would be found with a typical car share organisation.

A range of high quality vehicles would be offered with possible valet service to bring a vehicle to an individual's residential lobby area. The higher ratio of vehicles to users means there should be no problem securing a vehicle the vast majority of the time. These features that go beyond the operation of a typical car share organisation are designed to appeal to those who may not have previously considered car sharing.

6.1.6 Public Car Share

Currently offered by Modo, Zipcar and Car2Go in Vancouver who provide a fleet of vehicles at various locations for individuals registered in the program at an hourly or daily rate. Car sharing has been shown to reduce the demand for ownership of private vehicles. A number of these vehicles are likely to be located at Oakridge in prominent, easily accessible locations and will be for the benefit of the community as a whole. Details regarding the number and location of vehicles are anticipated to occur at the Development Permit stage of each build-out phase.

6.2 TDM for Office and Mall Employees

A wide range of policies, services and programs are available to influence the transportation mode of Oakridge employees. This would include both officer workers and retail employees. The following lists some examples that could be implemented for the future site:

6.2.1 Travel Plan

For larger office employers, TravelSmart may be interested in working on a Work Place Travel Plan. This would look at maximising the benefits of the site with regards to transit and other more sustainable modes.

6.2.2 Parking Pricing

Parking management, including pricing, is the biggest influence on travel behaviour. Currently, employees park for free all day with an employee pass. In the future, consideration should be given for instigating more active management of the parking supply. For example, vehicles could be parking for free for up to four hours, but paid parking would be required if you stay any longer than this. Employees should also have their own designated parking areas to ensure the most popular areas remain available to shoppers. It will be important that monthly or weekly parking passes are not made available and that employees have to pay on a daily basis. This incentivises the use of alternative modes when the use of a vehicle is not required.

6.2.3 Transit Pass Subsidy

Although Translink's Employer Pass Program is closing at the end of the year, there is no reason why individual companies cannot offer transit discounts to employees. The new Compass Card offers an opportunity for this which is still being explored.

6.2.4 Jack Bell Ride-Share

This program provides GVRD residents with free online ride-matching that connects commuters (drivers or passengers) with other commuters ("casual ride-share") or by providing ridesharing through a fleet of vehicles ("formal ride-share"). There are a number of formal rideshares from, to, and through the Vancouver area.

6.2.5 Car-Share

These programs provide vehicles rentals at various locations for employers and registered in the program at an hourly or daily rate (Modo, Car2Go and Zipcar) as described above. In the case of office workers, access to a car share vehicle at work can avoid the need to bring their own vehicle if needed for company business during the day. Modo, for example, have a specific subsidiary called Company Car for this purpose.

6.2.6 Teleworking

These programs are usually driven by the employee with the support of the employer and have potential benefits that include cost savings for employers, improved work conditions for employees, reduced trip-making, and lower vehicle ownership rates. It is acknowledged that many jobs (customer facing) at Oakridge are not suitable candidates for this.

6.2.7 Bicycle Facilities

Facilities should be provided to encourage employees to bike to work. This may include bike racks, showers and lockers. These end-of-trip facilities are required as part of the City's bylaws and complement the increased number of bicycle routes planned within the community.

6.3 TDM for Retail and Community Use Customers

This category of trips has traditionally been the hardest to target with TDM measures. The good news is that the opening of the Canada Line resulted in a change of mode split of visitors, in favour of transit. Some small measures which can be put in place are:

- Priority stalls for car share vehicles brought to the site;
- Bicycle valet parking and on-site maintenance shop; and
- Consideration of a home delivery service at the mall.

For special events held at Oakridge in the future, where the purchased of a ticket is involved, the cost of a transit ticket could be included within the purchase price.

7. CONCLUSION

The City of Vancouver, through the 2020 Greenest City Action Plan and Transportation 2040, has set a course towards a more sustainable and efficient transportation network over the next decade. This vision will require bold decisions on land use and density to provide as many people as possible with the opportunity to choose transit, cycling or walking over the automobile as their primary mode of transportation. Oakridge Centre presents a pivotal opportunity to place commercial and residential density in a location that will encourage alternative modes of transportation.

The proposed redevelopment for Oakridge, is inherently promoting the uses of sustainable transportation modes, and contributing to the goals of the Greenest City 2020 transportation targets given its apartment residential development with a mixed use urban community, which is steps away from the Canada Line.

An assessment of the site's transportation infrastructure and programming illustrates Ivanhoe Cambridge and Westbank's commitment to promote the use of sustainable transportation modes, beyond the minimum requirements set out in the City of Vancouver's transportation by-law and zoning requirements.

Among the specific transportation initiatives proposed in the Oakridge Centre master plan:

- Tremendous improvements to pedestrian accessibility of the site via :a new pedestrian 'high street' running south-east to north-west through the site, numerous additional high quality pedestrian routes across the site, and the new public, 'New Street';
- Separated two-way bicycle paths will be provided along both the Cambie Street and 41st Avenue frontages of the Oakridge Centre site and new bicycle path across the western portion of the site providing a continuation of the Heather Street bike route north-south across the development;
- A total of 4,300 bicycle parking spaces will be provided including over 3,600 for the new residents and 570 for customers and employees of the commercial and community uses. In addition, an innovative bike valet service is proposed with customer access to Cambie Street that will provide a convenient option for cyclists visiting the area to store their bicycles securely
- A bike share program for residents, a bike valet for visitors and significant improvements to the designated bike routes that pass by or through Oakridge Centre.
- Upgrades to the Canada Line station and plaza to ensure the design of the new Oakridge Centre encourages and optimizes transit use;
- A substantially reduced parking count for the residential component compared to typical developments and a one-third lower commercial parking ratio than exists today;
- A "Car Club" to provide Oakridge residents with access to vehicles when needed; and,
- Multiple additional TDM Measures, including; transit subsidies and travel planning.,

APPENDIX B

Traffic Operations Output Summary

Oakridge Centre
4241-26

Existing (2011) Traffic Operations - Weekday PM Peak Hour (Friday)

Year/ Scenario	Control Type	Improvements from Existing / Background	Performance Measure	Overall Performance	Individual Movements Performance (HCM)											
Access Locations																
North Access 1 / 41st Ave																
					North Access 1			N/A			41st			41st		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WTL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	2532			171					839	312		1210	
			Laning				1					2	1		2	
			Storage (m)									*	30		*	
			V/C	N/A			0.33					0.27	0.20		0.39	
			Overall/Mvmt LOS	N/A			B					-	-		-	
			Avg.Delay (s/v)	N/A			14					-	-		-	
			95th %-tile Q (m)				11					-	-		-	
North Access 2 / 41st Ave																
					North Access 2			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	2294			227					907	103	214	843	
			Laning				1					3	1	1	2	
			Storage (m)									*	75	40	*	
			V/C	N/A			0.37					0.19	0.07	0.37	0.27	
			Overall/Mvmt LOS	N/A			B					-	-	B	-	
			Avg.Delay (s/v)	N/A			14					-	-	14	-	
			95th %-tile Q (m)				13					-	-	13	-	
East Access 1 / Cambie St																
					Cambie			Cambie			East Access 1			N/A		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	3129	69	1256			1496	175			133			
			Laning		1	2			2	1			1			
			Storage (m)		45	*			*	*						
			V/C	N/A	0.21	0.40			0.38	0.30			0.18			
			Overall/Mvmt LOS	N/A	C	-			-	-			B			
			Avg.Delay (s/v)	N/A	18	-			-	-			10			
			95th %-tile Q (m)		6	-			-	-			5			
East Access 2 / Cambie St																
					Cambie			Cambie			East Access 2			N/A		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Signalized	None	Volume (vph)	3055		1273			1584	45	92		61			
			Laning			2			3	1	1		1			
			Storage (m)			*			*	*						
			V/C	0.50		0.55			0.39		0.30		0.17			
			Overall/Mvmt LOS	A		A			A		C		C			
			Avg.Delay (s/v)	6		5			4		24		24			
			95th %-tile Q (m)			92			50		21		13			
Safeway Surface Access 1 / Cambie St - 2 Minor Driveways (1 Right-In Only, 1 Right-Out Only) have been reported as a single intersection for analysis purposes																
					Cambie			South Access 1			45th			45th		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	3096		1313			1495	150			138			
			Laning			2			3	1			1			
			Storage (m)			*			*	*						
			V/C	N/A		0.42			0.27	0.27			0.18			
			Overall/Mvmt LOS	N/A		-			-	-			B			
			Avg.Delay (s/v)	N/A		-			-	-			10			
			95th %-tile Q (m)			-			-	-			5			
South Main Access / 45th Ave																
					N/A			South Main Access			45th			45th		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WTR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	663				264				149			25	225
			Laning					1				1				1
			Storage (m)									*				*
			V/C	N/A				0.42				0.10				0.16
			Overall/Mvmt LOS	N/A				B				-				-
			Avg.Delay (s/v)	N/A				14				-				-
			95th %-tile Q (m)					16				-				-
Immediate Street Intersections																
41st Ave / Willow St																
					Willow			Willow			41st			41st		
					NL	NT	NR	SL	ST	SR	ETL	ET	ETR	WTL	WT	WTR
2011 Existing Weekday PM (Friday)	Signalized	Due to Synchro's inability to model a pedestrian-actuated signal, this intersection has been modelled as a semi-actuated signal for the purposes of analysis.	Volume (vph)	2512	40	12	58	28	14	26	20	1062	48	52	1130	22
			Laning			1			1		1		1	1		1
			Storage (m)			*			*		*		*	*		*
			V/C	0.55		0.19			0.14			0.59			0.68	
			Overall/Mvmt LOS	A		C			C			A			A	
			Avg.Delay (s/v)	9		21			21			8			9	
			95th %-tile Q (m)			14			11			62			76	
41st Ave / North Residential Lane																
					North Residential Lane			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ETR	WL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	2355			3					1148	0		1204	
			Laning				1					1	1		2	
			Storage (m)				*					*	*		*	
			V/C	N/A			0.01					0.29	0.15		0.38	
			Overall/Mvmt LOS	N/A			B					-	-		-	
			Avg.Delay (s/v)	N/A			11					-	-		-	
			95th %-tile Q (m)				0					-	-		-	
41st Ave / Cambie St																
					Cambie			Cambie			41st			41st		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WTR
2011 Existing Weekday PM (Friday)	Signalized	None	Volume (vph)	5117	169	841	207	274	1212	135	171	803	160	299	753	93
			Laning		1	1	1	1	2	1	1	2	1	1	2	1
			Storage (m)		50	*	80	80	*		75	*	*	170	*	
			V/C	0.99	0.82	0.82	0.16	0.97	0.83		0.68	0.87	0.17	>1.0	0.55	
			Overall/Mvmt LOS	D	D	D	C	E	D		C	D	C	F	C	
			Avg.Delay (s/v)	45	47	43	30	78	38		34	49	32	103	33	
			95th %-tile Q (m)		70	131	17	115	136		45	132	18	134#	81	
45th Ave / Cambie St																
					Cambie			Cambie			45th			45th		
					NL	NT	NTR	SL	ST	SR	ELT	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Signalized	None	Volume (vph)	3530	200	1153	20	42	1497	102	142	70	201	15	70	18
			Laning		1	1	1	1	3	1	1		1		1	
			Storage (m)		70	*	*	10	*(114)	*	*		30		*	
			V/C	0.71	0.58	0.60		0.29	0.82	0.07	0.56		0.28		0.20	
			Overall/Mvmt LOS	B	B	A		B	C	B	C		B		B	
			Avg.Delay (s/v)	16	13	9		15	21	13	22		12		18	
			95th %-tile Q (m)		43	101		20	125	10	41		25		18	
45th Ave / South Residential Lane																
					N/A			South Residential Lane			45th			45th		
					NL	NT	NR	SL	ST	SR	ELT	ET	ER	WL	WT	WTR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	227				3		3	0	109			104	8
			Laning					1			1					1
			Storage (m)								*					*
			V/C	N/A				0.01			0					0.07
			Overall/Mvmt LOS	N/A				A			A					-
			Avg.Delay (s/v)	N/A				9			0					-
			95th %-tile Q (m)					0			0					-
Tisdall St / West Residential Lane																
					Tisdall			Tisdall			N/A			West Residential Lane		
					NL	NT	NTR	STL	ST	SR	EL	ET	ER	WL	WT	WR
2011 Existing Weekday PM (Friday)	Unsignalized	None	Volume (vph)	107		49	3	0	52					1		2
			Laning				1	1						1		
			Storage (m)				*	*						*		
			V/C	N/A			0.03	0.0						0.0		
			Overall/Mvmt LOS	N/A			-	A						A		
			Avg.Delay (s/v)	N/A			-	0						9		
			95th %-tile Q (m)				-	0						0		

Table Notes:

Cells highlighted do not meet Performance Thresholds

Directions:

"L" = Left
"T" = Through
"R" = Right
TR" = Through + Right
"TL" Through + Left
"N" = Northbound
"S" = Southbound
"E" = Eastbound
"W" = Westbound

Typical Max Acceptable Performance Thresholds for Signalized Intersections:

	V/C	LOS	Delay
Overall:	0.85	D	55
Individual Movements:	0.90	E	80
95th %-tile Q:	does not exceed available storage		

Typical Max Acceptable Performance Thresholds for Unsignalized Intersections:

	LOS	Delay
Overall:	D	35
Individual Movements:	E	50
95th %-tile Q:	does not exceed available storage	

Note:

Volumes reported in a shared "Through + Left" or "Through + Right" (ie. "ETR" or 'ETL") column are for the turning movements only, with the through volumes reported in the Through column (ie. "ET").

Storage / Queues:

* = Storage is distance to next intersection. If queue extends past next intersection, the distance has been indicated in brackets.
"#" = 95th percentile Q exceeds capacity; actual Q may be longer than indicated
"m" = Volume for 95th percentile Q is metered by upstream signal

General:

"-" Represents an unopposed movement, therefore, no Level-of-Service or Queue is reported in Synchro.
Represents a value which is not relevant to this particular movement/scenario.

Additional Analysis

41st Ave / Willow St

This intersection currently operates with a pedestrian-actuated signal. However, as Synchro is unable to model this particular signal type, a semi-actuated signal has been modelled for the purposes of analysis. A semi-actuated signal results in a conservative analysis of the eastbound and westbound operations, but reports better operations for the northbound and southbound than what may be observed in practice.

Oakridge Centre
4241-26

Existing (2011) Traffic Operations - Saturday Mid-Day Peak Hour

Year/ Scenario	Control Type	Improvements from Existing / Background	Performance Measure	Overall Performance	Individual Movements Performance (HCM)											
Access Locations																
North Access 1 / 41st Ave																
					North Access 1			N/A			41st			41st		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WTL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	2152			171					628	261		1092	
			Laning				1					2	1		2	
			Storage (m)									*	30		*	
			V/C	N/A			0.28					0.2	0.17		0.35	
			Overall/Mvmt LOS	N/A			B					-	-		-	
			Avg.Delay (s/v)	N/A			13					-	-		-	
			95th %-tile Q (m)				9					-	-		-	
North Access 2 / 41st Ave																
					North Access 2			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	2044			272					687	112	296	677	
			Laning				1					3	1	1	2	
			Storage (m)									*	75	40	*	
			V/C	N/A			0.39					0.15	0.07	0.42	0.22	
			Overall/Mvmt LOS	N/A			B					-	-	B	-	
			Avg.Delay (s/v)	N/A			13					-	-	13	-	
			95th %-tile Q (m)				14					-	-	16	-	
East Access 1 / Cambie St																
					Cambie			Cambie			East Access 1			N/A		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	2978	216	1093			1405	117			147			
			Laning		1	2			2	1			1			
			Storage (m)		45	*			*	*						
			V/C	N/A	0.57	0.36			0.36	0.25			0.19			
			Overall/Mvmt LOS	N/A	C	-			-	-			B			
			Avg.Delay (s/v)	N/A	25	-			-	-			10			
			95th %-tile Q (m)		26	-			-	-			5			
East Access 2 / Cambie St																
					Cambie			Cambie			East Access 2			N/A		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Signalized	None	Volume (vph)	2942		1241			1498	54	92		57			
			Laning			2			3	1	1		1			
			Storage (m)			*			*	*						
			V/C	0.50		0.55			0.37		0.30		0.15			
			Overall/Mvmt LOS	A		A			A		C		C			
			Avg.Delay (s/v)	6		5			4		24		23			
			95th %-tile Q (m)			91			47		21		12			
Safeway Surface Access 1 / Cambie St - 2 Minor Driveways (1 Right-In Only, 1 Right-Out Only) have been reported as a single intersection for analysis purposes																
					Cambie			South Access 1			45th			45th		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	2924		1265			1421	134			104			
			Laning			2			3	1			1			
			Storage (m)			*			*	*						
			V/C	N/A		0.40			0.26	0.26			0.13			
			Overall/Mvmt LOS	N/A		-			-	-			A			
			Avg.Delay (s/v)	N/A		-			-	-			10			
			95th %-tile Q (m)			-			-	-			4			
South Main Access / 45th Ave																
					N/A			South Main Access			45th			45th		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WTR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	718				281				81			68	288
			Laning					1				1				1
			Storage (m)									*				*
			V/C	N/A				0.45				0.05				0.23
			Overall/Mvmt LOS	N/A				B				-				-
			Avg.Delay (s/v)	N/A				15				-				-
			95th %-tile Q (m)					18				-				-
Immediate Street Intersections																
41st Ave / Willow St																
					Willow			Willow			41st			41st		
					NL	NT	NR	SL	ST	SR	ETL	ET	ETR	WTL	WT	WTR
2011 Existing Saturday Mid-Day	Signalized	Due to Synchro's inability to model a pedestrian-actuated signal, this intersection has been modelled as a semi-actuated signal for the purposes of analysis.	Volume (vph)	2075	21	17	56	4	4	11	15	811	44	42	1039	11
			Laning		1			1			1		1	1		1
			Storage (m)		*			*			*		*	*		*
			V/C	0.46	0.14			0.23			0.44			0.58		
			Overall/Mvmt LOS	A	C			C			A			A		
			Avg.Delay (s/v)	8	22			21			6			8		
			95th %-tile Q (m)		12			5			42			61		
41st Ave / North Residential Lane																
					North Residential Lane			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ETR	WL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	1984			21					868	3		1092	
			Laning				1					1	1		2	
			Storage (m)				*					*	*		*	
			V/C	N/A			0.03					0.22	0.11		0.35	
			Overall/Mvmt LOS	N/A			B					-	-		-	
			Avg.Delay (s/v)	N/A			11					-	-		-	
			95th %-tile Q (m)				1					-	-		-	
41st Ave / Cambie St																
					Cambie			Cambie			41st			41st		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WTR
2011 Existing Saturday Mid-Day	Signalized	None	Volume (vph)	4522	118	795	156	174	1024	181	194	575	190	308	674	133
			Laning		1	1	1	1	2	1	1	2	1	1	2	1
			Storage (m)		50	*	80	80	*		75	*	*	170	*	
			V/C	0.79	0.66	0.73	0.12	0.66	0.72		0.73	0.68	0.18	0.91	0.56	
			Overall/Mvmt LOS	C	C	C	C	C	C		D	D	C	D	C	
			Avg.Delay (s/v)	34	31	34	25	26	31		35	38	32	48	32	
			95th %-tile Q (m)		35	122	15	47	117		54	89	19	111	76	
45th Ave / Cambie St																
					Cambie			Cambie			45th			45th		
					NL	NT	NTR	SL	ST	SR	ELT	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Signalized	None	Volume (vph)	3395	293	1132	13	44	1370	111	123	34	205	16	44	10
			Laning		1	1	1	1	3	1	1		1		1	
			Storage (m)		70	*	*	10	*(114)	*	*		30		*	
			V/C	0.63	0.69	0.54		0.29	0.74	0.08	0.51		0.29		0.18	
			Overall/Mvmt LOS	B	B	A		B	B	B	C		B		B	
			Avg.Delay (s/v)	13	15	6		14	18	12	21		12		19	
			95th %-tile Q (m)		76	97		19	116	11	31		24		14	
45th Ave / South Residential Lane																
					N/A			South Residential Lane			45th			45th		
					NL	NT	NR	SL	ST	SR	ELT	ET	ER	WL	WT	WTR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	115				2		2	2	47			57	5
			Laning					1			1					1
			Storage (m)					*			*					*
			V/C	N/A				0.0			0.0					0.04
			Overall/Mvmt LOS	N/A				A			A					-
			Avg.Delay (s/v)	N/A				1			0					-
			95th %-tile Q (m)					0			0					-
Tisdall St / West Residential Lane																
					Tisdall			Tisdall			N/A			West Residential Lane		
					NL	NT	NTR	STL	ST	SR	EL	ET	ER	WL	WT	WR
2011 Existing Saturday Mid-Day	Unsignalized	None	Volume (vph)	85		49	0	0	31					2		3
			Laning				1	1						1		
			Storage (m)				*	*						*		
			V/C	N/A			0.03	0.0						0.0		
			Overall/Mvmt LOS	N/A			-	A						A		
			Avg.Delay (s/v)	N/A			-	0						9		
			95th %-tile Q (m)				-	0						0		

Table Notes:

Cells highlighted do not meet Performance Thresholds

Directions:
"L" = Left
"T" = Through
"R" = Right
TR" = Through + Right
"TL" Through + Left
"N" = Northbound
"S" = Southbound
"E" = Eastbound
"W" = Westbound

Typical Max Acceptable Performance Thresholds for Signalized Intersections:

	V/C	LOS	Delay
Overall:	0.85	D	55
Individual Movements:	0.90	E	80
95th %-tile Q:	does not exceed available storage		

Typical Max Acceptable Performance Thresholds for Unsignalized Intersections:

	LOS	Delay
Overall:	D	35
Individual Movements:	E	50
95th %-tile Q:	does not exceed available storage	

Note:

Volumes reported in a shared "Through + Left" or "Through + Right" (ie. "ETR" or 'ETL") column are for the turning movements only, with the through volumes reported in the Through column (ie. "ET").

Storage / Queues:
" = Storage is distance to next intersection. If queue extends past next intersection, the distance has been indicated in brackets.
"#" = 95th percentile Q exceeds capacity; actual Q may be longer than indicated
"m" = Volume for 95th percentile Q is metered by upstream signal

General:
"-" Represents an unopposed movement, therefore, no Level-of-Service or Queue is reported in Synchro.
Represents a value which is not relevant to this particular movement/scenario.

Additional Analysis

41st Ave / Willow St

This intersection currently operates with a pedestrian-actuated signal. However, as Synchro is unable to model this particular signal type, a semi-actuated signal has been modelled for the purposes of analysis. A semi-actuated signal results in a conservative analysis of the eastbound and westbound operations, but reports better operations for the northbound and southbound than what may be observed in practice.

Oakridge Centre
4241-26

Future (2030) Total Traffic Operations - Weekday PM Peak Hour (Friday)

Year/ Scenario	Control Type	Improvements from Existing / Background	Performance Measure	Overall Performance	Individual Movements Performance (HCM)											
Access Locations																
New Street / 41st Ave																
					New Street			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Unsignalized	None	Volume (vph)	2509			71					1114	85		1239	
			Laning				1					2	1		2	
			Storage (m)									*	*		*	
			V/C	N/A			0.14					0.36	0.05		0.26	
			Overall/Mvmt LOS	N/A			B					-	-		A	
			Avg.Delay (s/v)	N/A			13					-	-		-	
			95th %-tile Q (m)				4					-	-		-	
North Access 1 / 41st Ave (Manson Street Access)																
					North Access 1			N/A			41st			41st		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Signalized	Intersection Signalized (Semi-actuated)	Volume (vph)	3020	206		305					809	317	350	1033	
			Laning		1		1					2	1	1	3	
			Storage (m)									*	*	70	*	
			V/C	0.68	0.65		0.21					0.57	0.22	0.71	0.32	
			Overall/Mvmt LOS	B	C		C					B	B	B	A	
			Avg.Delay (s/v)	13	30		24					16	13	13	5	
			95th %-tile Q (m)		46		18					72	16	55	26	
North Access 2 / 41st Ave																
					North Access 2			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Unsignalized	None	Volume (vph)	2414			290					1007	280		837	
			Laning				1					2	1		2	
			Storage (m)									*	*		*	
			V/C	N/A			0.55					0.36	0.36		0.32	
			Overall/Mvmt LOS	N/A			C					-	-		A	
			Avg.Delay (s/v)	N/A			19					-	-		-	
			95th %-tile Q (m)				25					-	-		-	
East Access 1 / Cambie St																
					Cambie			Cambie			East Access 1			N/A		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Signalized	Intersection Signalized (Semi-actuated). Eastbound Left-Turn Movement and East-West Ped Crossing (both sides of intersection) added. Northbound left-turn storage slightly extended. East-west ped crossing time has been timed with only enough FDW time to allow pedestrians to get from sidewalk to centre median, not across entire street.	Volume (vph)	3283	240	1145			1240	270	195		194			
			Laning		1	2			2	1	1		1			
			Storage (m)		70	*			*120	30						
			V/C	0.75	0.86	0.54			0.79	0.18	0.53		0.17			
			Overall/Mvmt LOS	B	D	A			B	A	C		C			
			Avg.Delay (s/v)	14	34	7			16	10	22		20			
			95th %-tile Q (m)		63	63			104	12	40		16			
East Access 2 / Cambie St																
					Cambie			Cambie			East Access 2			N/A		
					NL	NT	NR	SL	ST	SR	EL	ET	ELR	WL	WT	WR
2030 Total Weekday PM (Friday)	Signalized	Northbound Left-Turn Movement Added (Assumed 70m Storage). Location moved further south, lining up with 44 Ave. East-west ped crossing time has been timed with only enough FDW time to allow pedestrians to get from sidewalk to centre median, not across entire street.	Volume (vph)	3450	303	1058			1166	270	357		296			
			Laning		1	2			2	1	1		1			
			Storage (m)		70	*85			*120	30						
			V/C	1.78	0.72	0.49			0.87	0.18	0.67					
			Overall/Mvmt LOS	B	C	A			C	B	C					
			Avg.Delay (s/v)	19	22	7			26	14	28					
			95th %-tile Q (m)		57	57			136	14	50					
New Street / 45th Avenue																
					N/A			New Street			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Unsignalized	None	Volume (vph)	664				178		11	8	160			243	64
			Laning					1			1				1	
			Storage (m)					-			*				*	
			V/C	N/A				0.33			0.01				0.2	
			Overall/Mvmt LOS	N/A				B			A				A	
			Avg.Delay (s/v)	N/A				14			-				-	
			95th %-tile Q (m)					12			-				-	
Immediate Street Intersections																
41st Ave / Willow St																
					Willow			Willow			41st			41st		
					NL	NT	NR	SL	ST	SR	ETL	ET	ETR	WTL	WT	WTR
2030 Total Weekday PM (Friday)	Signalized	Assumed to be a semi-actuated signal in the future. As this is the primary route for new residents to head west on 41st, a semi-actuated signal may be desirable, rather than a pedestrian actuated signal (as per existing).	Volume (vph)	2530	48	12	42	14	16	20	15	1084	44	52	1169	14
			Laning		1			1			1		1	1		1
			Storage (m)		*			*			*		*	*		
			V/C	0.56	0.23			0.10			0.55			0.67		
			Overall/Mvmt LOS	A	C			C			A			A		
			Avg.Delay (s/v)	9	25			25			7			9		
			95th %-tile Q (m)		19			11			60			77		
41st Ave / Cambie St																
					Cambie			Cambie			41st			41st		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WTR
2030 Total Weekday PM (Friday)	Signalized	Signal cycle length and splits adjusted to achieve optimal performance.	Volume (vph)	4700	4*4	764	356	206	919	216	329	632	164	346	698	70
			Laning		1	2	1	1	2	1	1	2	1	1	2	1
			Storage (m)		50	*125	80	80	*		75	*	75	170	*	
			V/C	0.94	0.86	0.7	0.26	0.8	0.81		0.22	0.9	0.75	0.16	0.92	
			Overall/Mvmt LOS	D	D	D	C	C	D		D	D	C	E	D	
			Avg.Delay (s/v)	39	52	36	29	33	38		48	42	33	56	36	
			95th %-tile Q (m)		77#	109	22	59#	131		108#	97	18	122#	76	
45th Ave / Cambie St																
					Cambie			Cambie			45th			45th		
					NL	NT	NTR	SL	ST	STR	ETL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Signalized	Signal cycle length and splits adjusted to achieve optimal performance.	Volume (vph)	3239	131	1276	15	32	1315	122	101	23	191	11	8	14
			Laning		1	1	1	1	2	1	1		1		1	
			Storage (m)		70	*	*	10	*80		*		30		*	
			V/C	0.56	0.58	0.59		0.20	0.58		0.45		0.36		0.07	
			Overall/Mvmt LOS	B	B	A		A	B		C		B		C	
			Avg.Delay (s/v)	11.0	11	7		9	12		24		20		22	
			95th %-tile Q (m)		27#	118		14	96		25		27		7	

Table Notes:

Cells highlighted do not meet Performance Thresholds

Directions:

"L" = Left
"T" = Through
"R" = Right
TR" = Through + Right
"TL" = Through + Left
"RL" = Left + Right

"N" = Northbound
"S" = Southbound
"E" = Eastbound
"W" = Westbound

Note:

Volumes reported in a shared "Through + Left" or "Through + Right" (ie. "ETR" or 'ETL") column are for the turning movements only, with the through volumes reported in the Through column (ie. "ET").

Max Acceptable Performance Thresholds for Signalized Intersections:

	V/C	LOS	Delay
Overall:	0.85	D	55
Individual Movements:	0.90	E	80
95th %-tile Q:	does not exceed available storage		

Max Acceptable Performance Thresholds for Unsignalized Intersections:

	LOS	Delay
Overall:	D	35
Individual Movements:	E	50
95th %-tile Q:	does not exceed available storage	

Storage / Queues:

* = Storage is distance to next intersection. If queue extends past next intersection, the distance has been indicated in brackets.
"#" = 95th percentile Q exceeds capacity; actual Q may be longer than indicated
"m" = Volume for 95th percentile Q is metered by upstream signal

General:

"-" Represents an unopposed movement, therefore, no Level-of-Service or Queue is reported in Synchro.

Represents a value which is not relevant to this particular movement/scenario.

Oakridge Centre
4241-26

Future (2030) Total Traffic Operations - Saturday Mid-Day Peak Hour

Year/ Scenario	Control Type	Improvements from Existing / Background	Performance Measure	Overall Performance	Individual Movements Performance (HCM)											
Access Locations																
New Street / 41st Ave																
					New Street			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Saturday Mid-Day	Unsignalized	None	Volume (vph)	2235			80					977	50		1128	
			Laning				1					2	1		2	
			Storage (m)									*	*		*	
			V/C	N/A			0.15					0.31	0.03		0.24	
			Overall/Mvmt LOS	N/A			B					-	-		A	
			Avg.Delay (s/v)	N/A			13					-	-		-	
			95th %-tile Q (m)				4					-	-		-	
North Access 1 / 41st Ave (Manson Street Access)																
					North Access 1			N/A			41st			41st		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Saturday Mid-Day	Signalized	Intersection Signalized (Semi-actuated)	Volume (vph)	2488	250		298					674	354	353	559	
			Laning		1		1					1	1	1	3	
			Storage (m)									*	30	70	*	
			V/C	0.71	0.71		0.2					0.48	0.24	0.72	0.18	
			Overall/Mvmt LOS	B	C		C					B	B	B	A	
			Avg.Delay (s/v)	14	29		21					14	13	12	5	
			95th %-tile Q (m)		51		17					48	14	51	14	
North Access 2 / 41st Ave																
					North Access 2			N/A			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Saturday Mid-Day	Unsignalized	None	Volume (vph)	2148			292					677	295		884	
			Laning				1					2	1		2	
			Storage (m)									*	*		*	
			V/C	N/A			0.46					0.22	0.19		0.28	
			Overall/Mvmt LOS	N/A			B					-	-		-	
			Avg.Delay (s/v)	N/A			15					-	-		-	
			95th %-tile Q (m)				18					-	-		-	
East Access 1 / Cambie St																
		Intersection Signalized (Semi-actuated). Eastbound Left-Turn Movement and East-West Ped Crossing (both sides of intersection) added. Northbound left-turn storage slightly extended. East-west ped crossing time has been timed with only enough FDW time to allow pedestrians to get from sidewalk to centre			Cambie			Cambie			East Access 1			N/A		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Saturday Mid-Day	Signalized		Volume (vph)	3184	265	1055			1163	332	183		185			
			Laning		1	2			2	1	1		1			
			Storage (m)		70	*			*120	15						
			V/C	0.71	0.67	0.47			0.80	0.23	0.54		0.13			
			Overall/Mvmt LOS	B	B	A			B	B	C		C			
			Avg.Delay (s/v)	15	18	6			20	13	27		23			
			95th %-tile Q (m)		57	76			114	15	26		-			
East Access 2 / Cambie St																
		Northbound Left-Turn Movement Added (Assumed 70m Storage). Location moved further south, lining up with 44 Ave. East-west ped crossing time has been timed with only enough FDW time to allow pedestrians to get from sidewalk to centre median, not across entire street.			Cambie			Cambie			East Access 2			N/A		
					NL	NT	NR	SL	ST	SR	EL	ET	ELR	WL	WT	WR
2030 Total Saturday Mid-Day	Signalized		Volume (vph)	3303	323	978			1048	300	360		294			
			Laning		1	2			2	1	1		1			
			Storage (m)		*90	*(86)			*120	70						
			V/C	0.75	0.74	0.45			0.81	0.42	0.67					
			Overall/Mvmt LOS	B	C	A			C	B	C					
			Avg.Delay (s/v)	20	24	7			25	18	29					
			95th %-tile Q (m)		83	61			120	52	55					
New Street / 45th Avenue																
					N/A			New Street			41st Ave			41st Ave		
					NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR
2030 Total Weekday PM (Friday)	Unsignalized	None	Volume (vph)	682				199		11	5	135			100	232
			Laning					1			1				1	
			Storage (m)					-			*				*	
			V/C	N/A				0.37			0.01				0.21	
			Overall/Mvmt LOS	N/A				B			A				A	
			Avg.Delay (s/v)	N/A				15			-				-	
			95th %-tile Q (m)					13			-				-	
Immediate Street Intersections																
41st Ave / Willow St																
		Assumed to be a semi-actuated signal in the future. As this is the primary route for new residents to head west on 41st, a semi-actuated signal may be desirable, rather than a pedestrian actuated signal (as per existing).			Willow			Willow			41st			41st		
					NL	NT	NR	SL	ST	SR	ETL	ET	ETR	WTL	WT	WTR
2030 Total Saturday Mid-Day	Signalized		Volume (vph)	2228	20	17	26	3	7	8	11	969	38	36	1088	5
			Laning		1			1			1		1	1		1
			Storage (m)		*			*			*		*	*		*
			V/C	0.46	0.15			0.04			0.46			0.54		
			Overall/Mvmt LOS	A	C			C			A			A		
			Avg.Delay (s/v)	6	27			27			5			6		
			95th %-tile Q (m)		11			5			53			65		
41st Ave / Cambie St																
		Signal cycle length and splits adjusted to achieve optimal performance.			Cambie			Cambie			41st			41st		
					NL	NT	NR	SL	ST	STR	EL	ET	ER	WL	WT	WTR
2030 Total Saturday Mid-Day	Signalized		Volume (vph)	4486	141	751	328	131	880	218	305	492	172	443	525	100
			Laning		1	2	1	1	2	1	1	2	1	1	2	1
			Storage (m)		50	*125	80	80	*		75	*	75	170	*	
			V/C	1.00	0.81	0.66	0.24	0.55	0.68		0.79	0.6	0.33	1.00	0.45	
			Overall/Mvmt LOS	C	D	C	C	C	C		C	D	C	E	C	
			Avg.Delay (s/v)	34	45	29	24	22	28		32	34	31	75	29	
			95th %-tile Q (m)		47#	98	20	30	86		70#	66	31	143#	51	
45th Ave / Cambie St																
		Signal cycle length and splits adjusted to achieve optimal performance.			Cambie			Cambie			45th			45th		
					NL	NT	NTR	SL	ST	STR	ETL	ET	ER	WL	WT	WR
2030 Total Saturday Mid-Day	Signalized		Volume (vph)	3038	155	1214	10	29	1171	141	101	4	191	12	5	5
			Laning		1	1	1	1	2	1	1		1	1		
			Storage (m)		70	*	*	10	*80	15	*		30	*		
			V/C	0.52	0.56	0.56		0.16	0.56		0.39		0.34	0.06		
			Overall/Mvmt LOS	B	A	A		A	B		C		B	C		
			Avg.Delay (s/v)	10.0	10	7		10	12		23		18	21		
			95th %-tile Q (m)		29#	108		13	88		22		25	6		

Table Notes:

Cells highlighted do not meet Performance Thresholds

Directions:

"L" = Left "N" = Northbound

Max Acceptable Performance Thresholds for Signalized Intersections:

V/C LOS Delay