City of

Bellevue

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TO: Bellevue Transportation Commission

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SUBJECT: Downtown Transportation Plan Update – Transit Speed and Reliability

INTRODUCTION

The update to the Downtown Transportation Plan will address mobility issues and challenges and support Downtown growth and urban livability looking out to 2030.

On March 14, 2013, the Downtown mobility topic will be transit speed and reliability. Staff will review or outline the following:

- Projected transit vehicle volumes on Bellevue arterials
- Identification of transit priority corridors and intersections
- Transit corridor and intersection speed and reliability tools

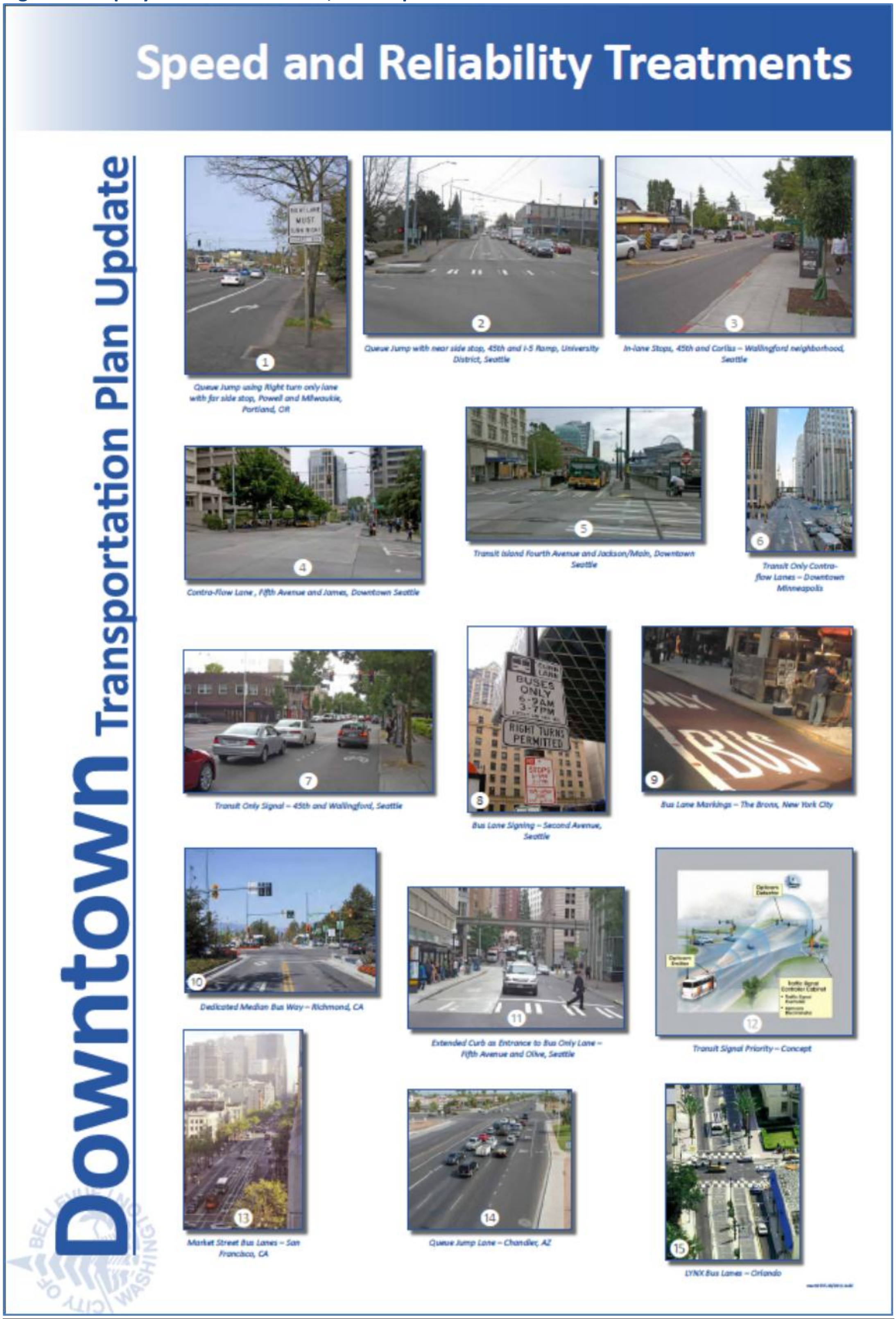
DOWNTOWN TRANSIT CAPACITY SUMMARY

On February 14, 2013 the Commission reviewed the topic of Downtown Bellevue Transit Capacity. In 2010, there were about 1,150 daily Downtown bus trips, with 1,750 projected by 2030. In the 2030 PM Peak hour in Downtown, there are expected to be about 210 buses per hour. These will be concentrated near the Transit Center. 108th Avenue NE and NE 6th Street near the Transit Center are expected to carry the most buses, with about 120 to 150 buses per hour. Segments of Main Street, will have about 60 to 90 buses per hour, parts of NE 4th Street and Bellevue Way will each have about 30-50 buses per hour, and NE 8th Street will have about 15 to 30 buses per hour. Buses are expected to represent about 7.8% of the total traffic volume on 108th Avenue NE between NE 4th Street and NE 6th Street. Bus volume is projected to be 5.4% of the total traffic on NE 6th Street between 110th Avenue NE and 112th Avenue NE. It is not expected that these roadways would be unable to support this level of bus activity, however some speed and reliability improvements may be needed as bus volumes increase.

DOWNTOWN TRANSIT SPEED AND RELIABILITY

While Bellevue does not directly supply transit service, the City does manage the right-of-way on which the buses operate. Bellevue may invest in capital improvements or traffic operations changes to the benefit of transit passengers and overall mobility. Figure 1 is a display board from the November 1, 2011 Downtown Transportation Pan Update open house showing an assortment of transit speed and reliability treatments

Figure 1. Display Board November 1, 2011 Open House



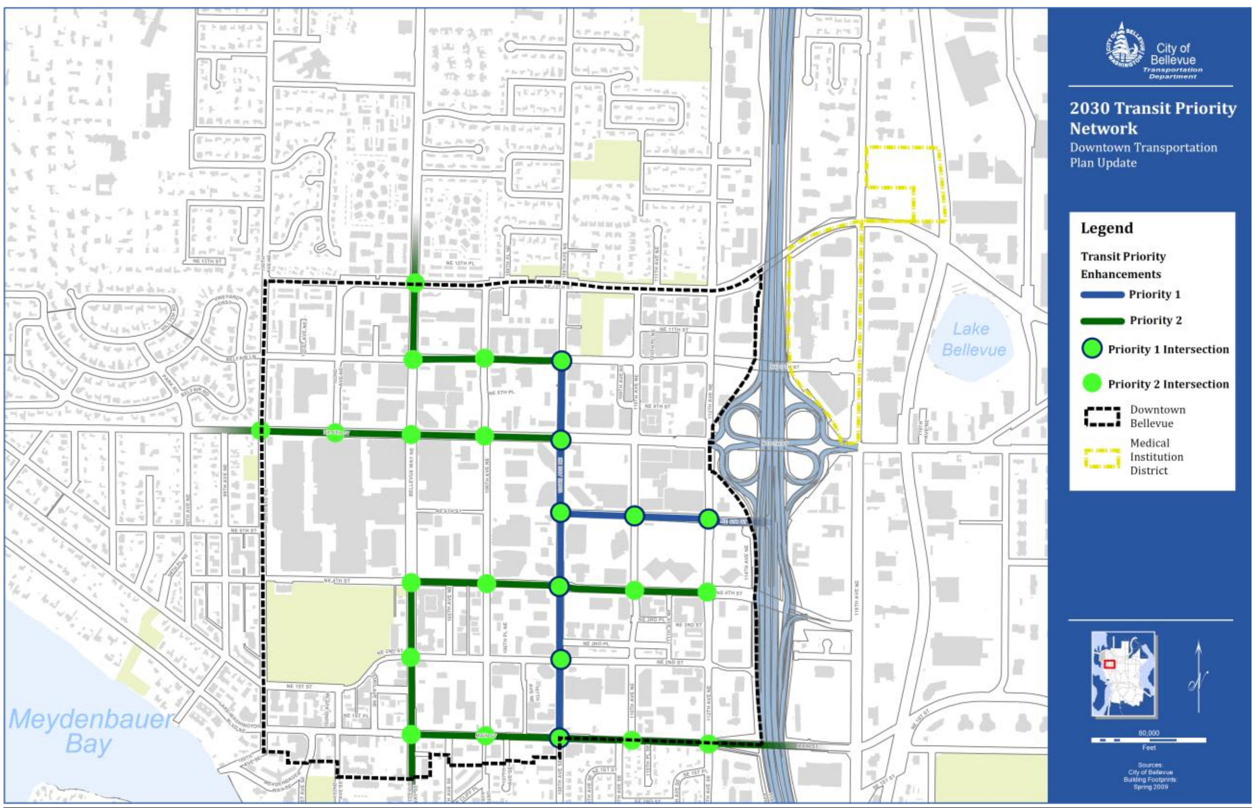
Transit Priority Corridors and Intersections

As noted in the Transit Capacity section, daily and PM Peak Hour transit volumes are expected to increase on arterials in Downtown Bellevue. Overall traffic volume is also expected to increase, creating a higher level of congestion and potentially causing delay for transit passengers.

Factors that may be considered in identifying a transit priority corridor include bus and passenger volumes, and schedule reliability. Intersection level of service may be an additional factor used to determine priority. For purposes of the Downtown Transportation Plan Update, a hierarchy of transit priority corridors may be appropriate related to the current or anticipated transit volume are described as follows and shown in Figure 2:

- Priority 1 Transit Corridors: Greater than 90 bus trips in PM Peak hour
- Priority 2 Transit Corridors: Generally 15 or more bus trips in PM Peak hour
- Priority 1 Intersections: An intersection along a Priority 1 Transit Corridor
- Priority 2 Intersections: An intersection along a Priority 2 Transit Corridor

Figure 2. Proposed Transit Priority Corridors and Intersections



Corridor and Intersection Implementation Components

Best practices for transit speed and reliability emphasize the application of appropriate tools in the context of the roadway corridor or intersection. Along corridors, tools include transit priority lanes, peak hour transit-only lanes, bus/bicycle lanes on transit priority arterials, and business access and transit (BAT) lanes. Other tools may include improvements to the pedestrian environment, transit stop consolidation, and off-board fare payment. At signalized intersections, transit signal priority may be implemented – coordinated with the demands of other modes to ensure the greatest efficiency of mobility.

<u>Tools for Transit Priority Corridors</u>

Along transit priority corridors, individual tools noted above may be used to reduce potential delay for bus passengers and to help transit vehicles maintain a schedule. Each tool is described below:

- Transit priority lane: Where bus volumes are consistently high throughout the day, a permanent lane is reserved for transit using pavement markings and signage, and supported by enforcement
- Peak hour transit-only lane: In areas where peak hour bus volumes are very high, a lane is reserved for buses at peak hours only
- Bus/bicycle lane on transit priority arterial: Along a corridor where both bicycles and buses need to share the same space on the roadway, pavement markings and signage are used to define the use of the lane
- Business access and transit (BAT) lane: Roadway lane use is restricted to buses and bicycles except for drivers who intend to make a right turn at the next intersection, or if entering a business driveway. BAT lane restrictions may be enforced by time of day – for example during the peak hour only
- Queue-jump lane: Typically an outside lane which may be a right turn lane for general traffic – that allows a bus to bypass a queue of general traffic at a signalized intersection, then serve a bus stop in the travel lane on the far side of an intersection
- In-lane stop: A bus stop in the travel lane or at a curb extension to allow a bus to remain in the travel lane thus speeding up the process of stopping and re-entering traffic
- Transit stop consolidation: Appropriate spacing between bus stops that provides transit service coverage but avoids a significant overlapping of bus stop walksheds and the potentially degraded transit service from too many bus stops with overlapping coverage
- Off-board fare payment: Before boarding a bus, a rider pays their fare at a card reader or a ticket vending machine so when the bus comes, a rider can enter through any of the doors, holding on to their card or receipt as proof of payment

- Improvements to the pedestrian environment: Passenger comfort, access and information along a transit corridor - especially wayfinding and real time information- can improve overall efficiency of the system

Tools for Transit Signal Priority

Transit signal priority allows buses to arrive and travel through select intersections with little or no delay. Detectors identify and distinguish buses from other vehicles and modify the signal phase to provide a bus with a green light.

There are multiple methods to achieve signal priority, most using the same technology that provides signal pre-emption to emergency vehicles. Although, typically a transit vehicle would not pre-empt a traffic signal – as would an emergency vehicle - the concept is that the bus would communicate with the signal controller to let it know it is approaching an intersection. When a bus has been detected the signal controller is programmed to provide some level of priority to the transit vehicle. Four methods are typically employed either alone or in combination:

- Green Extension: An extended green time to allow the transit vehicle to pass through the intersection
- Early Green: If the signal phase is presently red along the transit vehicle pathway the controller could be programmed to use the minimum green time for each phase in the cycle to serve the transit vehicle faster
- Phase Rotation or Phase Skipping: If the current signal phase is red for the transit vehicle, the current green phase is served at minimum green time, then all intervening phases are skipped or the transit phase is rotated to a different order to serve the waiting transit vehicle.
- Actuated Transit Phase: A special phase used only when a transit vehicle is detected. This is typically used only for queue jumps and special turning movements. Conditions of the phase on other intersection approaches depend on the transit movement required and the intersection geometry.

When transit signal priority in an urban setting drives green time to a minimum, the length of the green time is normally controlled by the minimum time necessary to allow for the safe crossing of pedestrians.

Transit Speed and Reliability Improvements – Implementation and Evaluation

Considerations for the implementation of transit speed and reliability tools to any transit corridor would be related to specific metrics. Data-driven decisions on where and when to implement transit corridor tools or transit signal priority may be tied to degraded travel time for transit passengers. Infrastructure improvements may be linked to transit service enhancements or they may be embedded into programmed roadway or traffic signal operations improvements.

A potential project evaluation methodology would consider the number of bus passengers carried along a corridor relative to the number of private vehicle passengers – this methodology would be consistent with the adopted measures of effectiveness. The BKR travel demand projects the number of vehicles traveling in each direction and the assumed number of passengers per vehicle in the PM Peak hour is averaged. For example, on 108th Avenue NE between NE 4th Street and NE 8th Street which is a proposed priority 1 transit corridor, the total 2030 PM Peak hour vehicle traffic is roughly 2,700 vehicles with 1.4 passengers per vehicle – resulting in 3,800 people transported in private vehicles. On the same segment of 108th Avenue NE over 60 buses per hour would be expected, with an average passenger count of 73.5 – resulting in 4,400 people transported by bus. Therefore investments that support transit speed and reliability would support 4,400 bus passengers and potentially the 3,800 private vehicle passengers traveling along the corridor as well. Intersection transit signal priority investments would be evaluated for all modes in all directions.

Transit Speed and Reliability – Conclusions and Preliminary Recommendations

Anticipated transit volumes along Downtown Bellevue arterials may trigger some corridor or intersection improvements if passenger delay becomes significant or bus schedule reliability is degraded. Priority 1 and Priority 2 transit corridors and intersections could be designated based on peak hour bus volume. A suite of tools could be applied along corridors or at intersections to maintain or improve transit speed and reliability. Prior to initiating transit priority enhancements, a corridor or intersection evaluation would consider potential improvements to passenger travel time and transit schedule reliability relative to other mobility demands for the corridor, including private vehicles, freight, pedestrians and bicyclists.

NEXT STEPS

On April 24, a Spring EXPO will be held in City Hall to showcase and gather input on current city projects – the Downtown Transportation Plan Update will have a significant presence at this event. At the next scheduled Commission meeting on May 9, 2013 staff will continue the discussion of Downtown transit service. Findings and preliminary recommendations regarding transit passenger comfort, access, and information will be presented and discussed.