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MEMORANDUM

To: Transportation Commission

From: David Godfrey, P.E., Transportation Engineering Manager

Date: January 26, 2015

Subject: Transportation Master Plan Update

This memo is a draft of the memo that will be in the February 17 Council packet. At your January meeting, staff will be seeking Commission comments and recommendations on this memo. Some of the material is not in final form, but all the main ideas are present.

RECOMMENDATION:

It is recommended that City Council receives a briefing and give direction on the Transportation Master Plan (TMP). Specifically, staff is seeking comment on the draft concurrency and level of service approaches. An informational briefing is planned about the BKR model.

BACKGROUND DISCUSSION:

Introduction

This is another in a series of updates on the Transportation Master Plan. Council has previously reviewed: goals and policies (2 separate briefings), 20 year project list and impact fees. The Goals and Policies portion of the Transportation Master Plan will constitute the Transportation Element of the Comprehensive Plan. These goals and policies are supplemented and amplified with other material to make up the Transportation Master Plan.

Concurrency

Introduction

Concurrency is required by the Growth Management Act. The purpose of concurrency is to ensure that land use development and construction of the transportation network are concurrent so that facilities are provided in step with new growth. Improving the City's concurrency system has been a goal since the opportunity for improvement was raised by the Transportation Commission in 2010.

Concurrency is not intended to decide whether or not development projects are "good" or "bad" but rather, whether or not the number of new trips is being added at approximately the same rate at which transportation capacity is being added. Furthermore, Concurrency will not decide whether or not the capacity being provided is the "right type" of capacity. This is decided when the transportation project list is determined and compared to the land use plan and the level of service provided by that combination is accepted.

In *Transportation Conversations*[1], recommendations for improvements to the concurrency system are offered: "Concurrency should be simplified and should consider transit, bicycling and walking…Concurrency should principally monitor the approved land use and transportation plans and insure that they are being completed in relative balance." The Transportation Master Plan lays the framework necessary to make the change from the existing system to one that better supports the Plan's goals and policies. The new system was developed through the Transportation Commission and Council was briefed on the elements of the revised concurrency plan in November 2012.

Overview of the current system

Vehicular level of service at signalized intersections is the basis of the current concurrency system. New trips from proposed land use developments are forecasted and put onto the transportation network. The number of cars turning right, left or going straight at all signalized intersections are estimated. With that forecast and characteristics of the intersection an intersection's performance can be calculated. Performance is averaged for each of four subareas and compared to a standard[2]. If the standard is met, then the development project passes concurrency.

Proponents of projects that fail concurrency have three general choices; scale back the project impact, construct mitigation and/or wait for the City to construct projects that add capacity.

Some of the drawbacks to the current system include the need to do fairly complicated forecasting before a determination can be made this means that it is difficult to understand how much capacity is left for new development. Also, the measure used for intersection performance, volume to capacity ratio, is not readily understandable. Finally, with its sole focus on auto capacity at traffic signals, the current concurrency system does not help achieve the performance measures associated with a balanced transportation plan.

The Proposed System

The future system equates the number of new trips expected over the next 20 years with the cost of providing added capacity to the transportation network across all modes. This allows an expression of capacity spending needed per new trip allowed. Spending serves as a surrogate for project completion. Available trips are subtracted from the balance when new development projects are approved and are added to the balance when capacity projects are funded. A ledger system can be set up where the number of available trips is readily apparent.

This system has the advantages over the existing system of both simplicity and importantly, accounting for improvement across all different modes, not just traffic signals. The new system is described graphically in the following set of illustrations:

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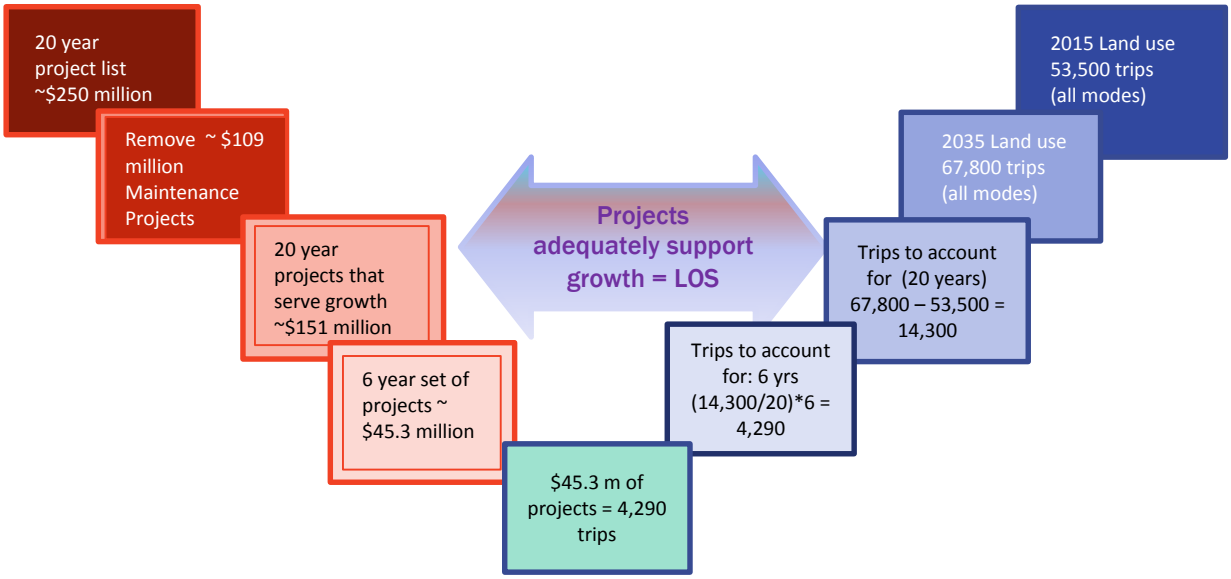
[1] Transportation Conversations is a transportation policy document written by the Transportation Commission in 2010. It is available on line.

[2] There are two standards for passing concurrency. One is a subarea standard that compares the project to



The number of total new trips is assigned to be equal to the new capacity of the total project list. This translation between trips and projects means that the capacity (in trips) can be determined for a given list of projects, such as funded projects on the 6-year CIP.

The number of total new PM peak person trips is assigned to be equal to the new capacity of the total project list as shown by the arrow in the chart above. This is an important concept because this is the point where the plans for land use and transportation are joined. Success requires having strong plans that are supported by the community.

Equating trips and projects means that the capacity (in trips) can be determined for a given list of projects, such as funded projects on the following hypothetical 6-year CIP.

A ledger system can be set up, with a balance of trips "available" based on funded projects. As new land development projects are considered, the trips being proposed are compared to the trips available. If more trips are available than are being proposed by the new land development project, the project passes concurrency. If a project passes concurrency, it's future trips are subtracted from the balance. Trips are added to the balance when transportation projects are added to the funded CIP. This system requires that if concurrency is to be maintained the 20-year project list needs to be implemented at a rate equal or faster than the rate of development.

Table 1 Hypothetical 6 year funded list (excluding maintenance projects)		
Project	Cost	New person trips
Juanita Drive	$20,000,000	1,886
ITS project	$1,400,000	132
School walk routes	$4,400,000	415
Crosswalks	$6,400,000	603
ADA transition	$7,000,000	660
Shelters/stop amenities	$1,300,000	123
New traffic signals	$3,000,000	283
Flashing yellow arrows	$1,000,000	94
Neighborhood Traffic Control	$1,000,000	94
TOTAL	$45,500,000	4,290

Table 2 Sample Trip rates for various land uses		
Example Land use	Unit	Trips
Attached and stacked housing	Dwelling	0.56
Restaurant	1000 sq ft	7.49
Drive-in bank	1000 sq ft	45.74
Shopping Center	1000 sq ft	3.75
General Office Building	1000 sq ft	1.49
Supermarket	1000 sq ft	10.45

If fewer trips are available than what are required by the development, the development can:

- construct transportation improvements that add trip capacity
- wait until more trip capacity is built by the City

- scale back the development scope so that it requires less trip capacity.

One of the advantages of this system is its simplicity. It's clear to developers, staff and the public how many trips are available for development at any given time. Because many land uses have standard trip rates associated with them, a table showing the number of trips a given size of development will contribute can be made. This allows anyone to understand the implications of a development to concurrency, and it streamlines the development review process.

Table 3 Sample ledger system for Concurrency

Date	Item	Trips	Balance	Pass?
1/1	Start with 6 years of funded projects	+4290	4290	n/a
Throughout the year	Development 1 (10,000 sq. ft. retail; 100 units residential)	-124	4166	Yes
	Development 2 (200 units residential)	-109	4057	Yes
	Development 3 (Retail store expansion)	-65	3992	Yes
	Other projects (details omitted here) total	-200	3792	Yes
12/31	New CIP approved resulting in another year of funded projects	+525	3267	n/a

Some options to the basic system

The above system describes a simple dollar-based method, which discriminates only based on project cost, rather than other policy objectives, such as modal accommodation or geographic equity. Below, we provide a high-level summary of how a dollar-based concurrency system might work compared with two other potential options.

1. **Dollar-based method:** This is perhaps the most straightforward approach to tracking concurrency. Since the TMP will yield a project list that includes overall cost and the City's target for new households and employees by 2035 is known, concurrency could be tracked by assessing how expenditures towards projects on the TMP project list is keeping pace with residential and employment growth. Concurrency would be measured by calculating whether the percent of the TMP project list completed (as measured in dollars) equals or exceeds the percent of planned development that has occurred (as measured in trips).
    - **Advantages:** Straightforward tracking and administration
    - **Disadvantages:** May favor large dollar value projects, does not provide guidance on priorities amongst modes
2. **Catch-up method**: Start with the dollar-based method, but weight the value of projects based on the relative gap between the current network and what is envisioned by 2035 (completion of the TMP). This "catch-up" method weights pedestrian, bicycle, and transit infrastructure more heavily since Kirkland's road network is relatively complete, yet the City has a long way to go to completing the bike, pedestrian, and transit networks. The weight is based on how much of a gap each mode has to close by 2035, as measured by a TMP build out perspective. Using hypothetical numbers, the auto/freight system may already be at 95 percent of its TMP envisioned network (since we are recommending very few roadway projects), but the bicycle system may only be 60 percent complete. This would translate into the need for the bicycle network to be built at eight times the rate of the auto/freight system from the perspective of closing the gap in ultimate system completion (e.g., closing a 40% bicycle network gap vs. a 5% auto/freight network gap). The relative weights for each mode would be based on the gap between what is on the ground today and the ultimate network as identified in the TMP.
    - **Advantages:** Provides guidance on modal priorities, weights can be updated over time to reflect the uneven pace of modal network completion
    - **Disadvantages:** Not as straight forward to implement and weights may be subject to debate
3. **Policy-based method**: An alternative to the quantitative basis of the two prior methods is a policy-based approach that weights projects on how well they align with key City policies. This is an approach that has recently been considered in Redmond and to a certain extent in Bellingham. In Redmond, projects are prioritized for concurrency in a two-step process. First, projects are prioritized by the mode they serve with "policy points" developed to mirror the catch-up method's modal weights (in that system, pedestrian and transit projects are given the highest points and

auto/freight projects are given the lowest points). Then, individual projects within modal networks are rated based on how well a project advances the key transportation goals. For Kirkland, this could be adherence to the adopted goals in the Transportation Element.

- **Advantages:** Provides guidance on modal priorities, provides a clear nexus between the adopted goals and projects that move forward
- **Disadvantages:** Not as straightforward to implement; "policy points" may feel arbitrary and will be subject to debate

Some common questions and handy tips
It's not how you measure it it's where you set the targets.
Have we ever exceeded capacity?
Can you use up all the capacity?

Level of Service

Why do we have Level of Service standards?
Under the Growth Management Act, Level of Service is a requirement of transportation elements in each city's Comprehensive Plan. Level of service for various modes is still important, it serves as a useful evaluation tool. For example, it can be used as a prioritization factor for transportation projects.

Perhaps most importantly, level of service can be used to assess whether or not the proposed land use and transportation network are appropriate matches for each other. If the proposed levels of service are not acceptable, adjustments to either the network or land use plan have to be made, and, if necessary, revisit goals and policies that underpin the network and land use choices that have been made previously. The level of service choices made for each mode are aligned with the proposed 20 year project list as discussed at the October 21, 2014 Council meeting. Most levels of service will be red to start with but green at the end of 20 years.

The table below shows the level of service in the current Transportation Element of the Comprehensive Plan and the proposed level of service.

Mode	**Existing**	**Proposed**
Walking	By 2022, 155 miles of pedestrian facilities; six east-west and four north-south completed corridors	Completion of various sidewalk types, number of crosswalks improved.
Biking	By 2022, 59 miles of bicycle facilities; four east-west and 2 north-south completed corridors	% of bike networks (greenways and other) complete
Transit	by 2022 35% transit/bike/ped modes split for peak-hour trips between work and home	Working on this section
Auto	V/C ratio at signalized intersections in four subareas, and no intersection with V/C ratio greater than 1.4.	Number of corridors exceeding target delay values

Proposed system

For each mode, a red, yellow, green system is proposed based on various factors as described in more detail below.

Walk

The walk related level of service is based on the completion of various network components. Higher percentages of completion result in higher levels of service. The levels between green yellow and red are based on the proposed 20 year project list and if that list changes, corresponding changes should be made in the levels of service.

School walk routes completion

Level of Service	Miles of arterials and collectors streets without sidewalk on one side
Green	0
Yellow	Less than 1.25
Red	1.25 or more

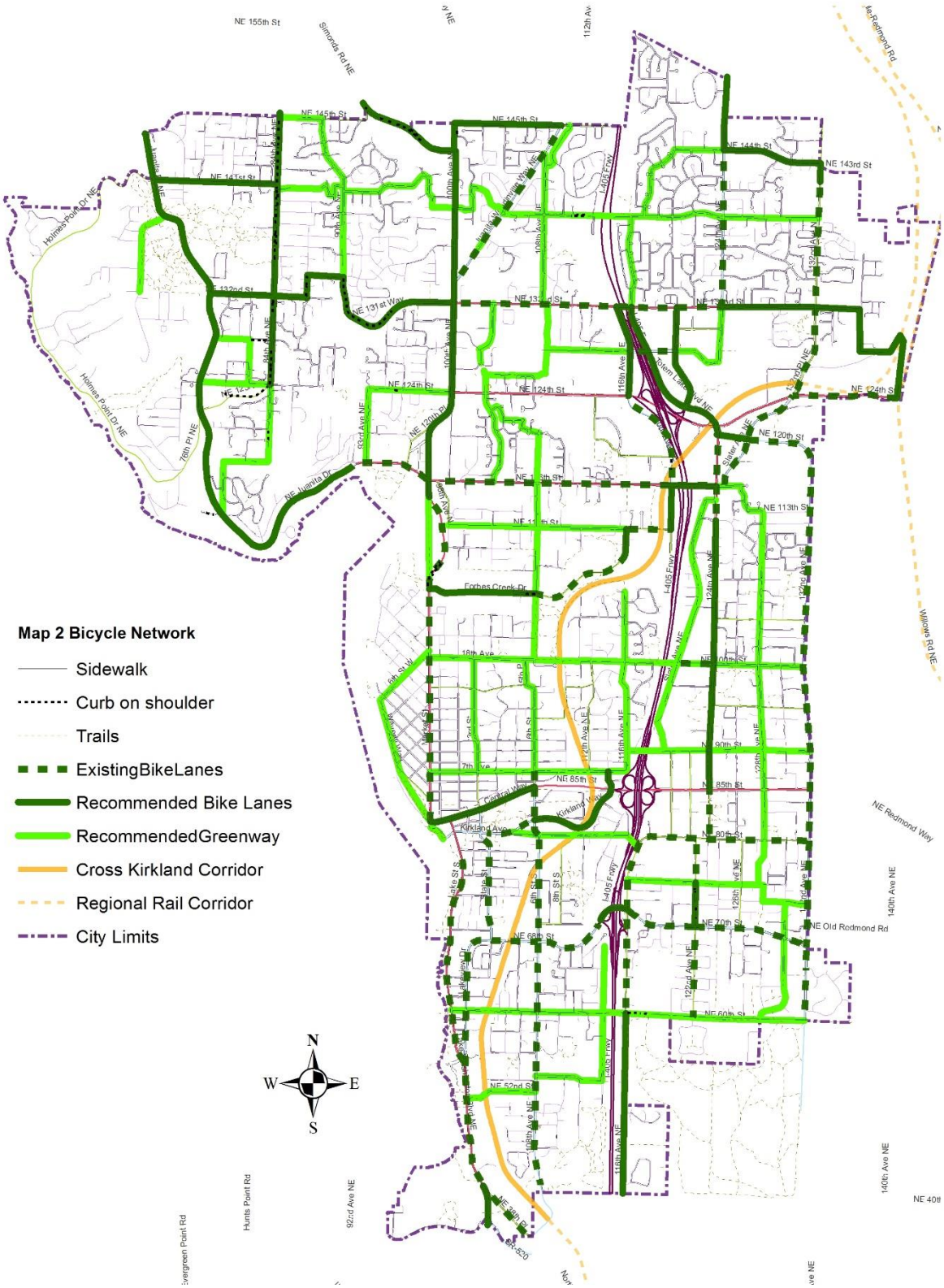
Sidewalk completion	
Level of Service	Levels of 10 minute neighborhoods with sidewalk complete on one side of arterials and above
Green	More than the highest two levels
Yellow	Highest category is complete
Red	Highest two levels are not complete

Crosswalk improvements	
Level of Service	Number of crosswalks on non-local streets that have been improved (better lighting, crossing treatments, etc.)
Green	More than 100
Yellow	50 to 100
Red	Less than 50

Bike
There are two main elements of the bicycle network as shown on the map on the follow page. The level of service reflects completion of these elements

Greenways	
Level of Service	% of greenway network complete
Green	More than 75
Yellow	25 to 75
Red	Less than 25

Bike network	
Level of Service	% of bike network with better than 5’ un buffered bike lanes
Green	More than 75
Yellow	25 to 75
Red	Less than 25


Map 2 Bicycle Network
Sidewalk
Curb on shoulder
Trails
ExistingBikeLanes
Recommended Bike Lanes
RecommendedGreenway
Cross Kirkland Corridor
Regional Rail Corridor
City Limits
N
S
E
W
NE 155th St
Simonds Rd NE
NE 145th St
NE 144th St
NE 143rd St
NE 131st Way
NE 124th St
NE 120th St
NE 113th St
NE 100th St
NE 90th St
NE 85th St
NE 80th St
NE 70th St
NE 68th St
NE 60th St
NE 52nd St
Forbes Creek Dr
18th Ave
7th Ave
Central Way
Kirkland Ave
Kirkland Way
NE Juanita Dr
Holmes Point Dr NE
76th Pl NE
I-405 Fwy
Willows Rd NE
NE Redmond Way
NE Old Redmond Rd
140th Ave NE
Hunts Point Rd
92nd Ave NE
Evergreen Point Rd

Transit

Do you want to have a measure that is service related and therefore that we can't really control.

Transit Stop amenities	
Level of Service	Number of stops with improved lighting, shelters, etc.
Green	More than 20
Yellow	10 to 20
Red	Less than 10

Transit	
Level of Service	% of priority transit route miles with delay level (sec) less than
Green	60 or less
Yellow	70
Red	80

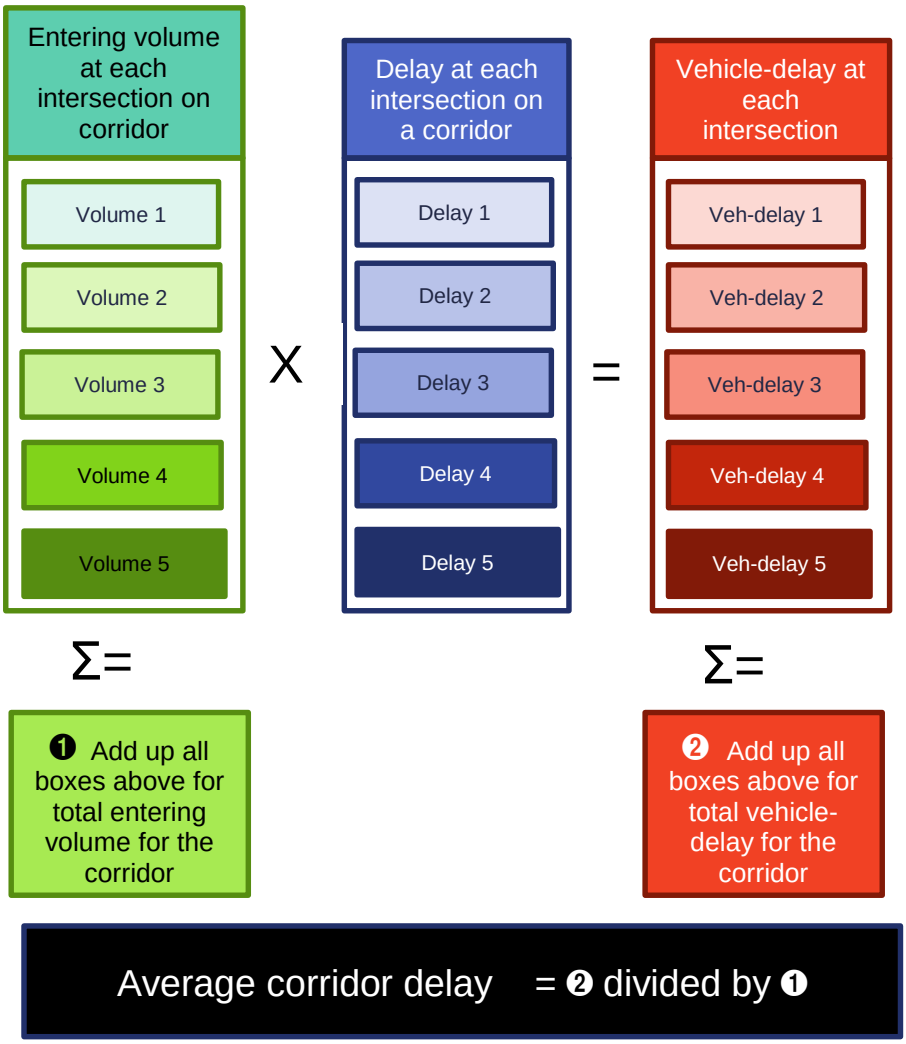
Auto
Because the auto mode usually gets the most interest in level of service discussions, and because the existing vehicular level of service is fairly complicated, a more detailed explanation is given here than in other modes. As described above, in the existing Comprehensive Plan, the vehicular level of service standard is shared with the concurrency system. The proposed concurrency system breaks this link and makes concurrency a multi-mode proposition.

As in the existing Plan, performance of signalized intersections forms the basis for the Level of Service for vehicles. Instead of averaging intersections in subareas, 14 corridors have been identified. At each intersection on a corridor, average vehicle delay[3] is calculated. These delay numbers are averaged, in a weighted manner, based on the number of vehicles entering each intersection[4] to come up with a delay estimate for the corridor. This was done for each corridor based on a proposed 2035 land use.

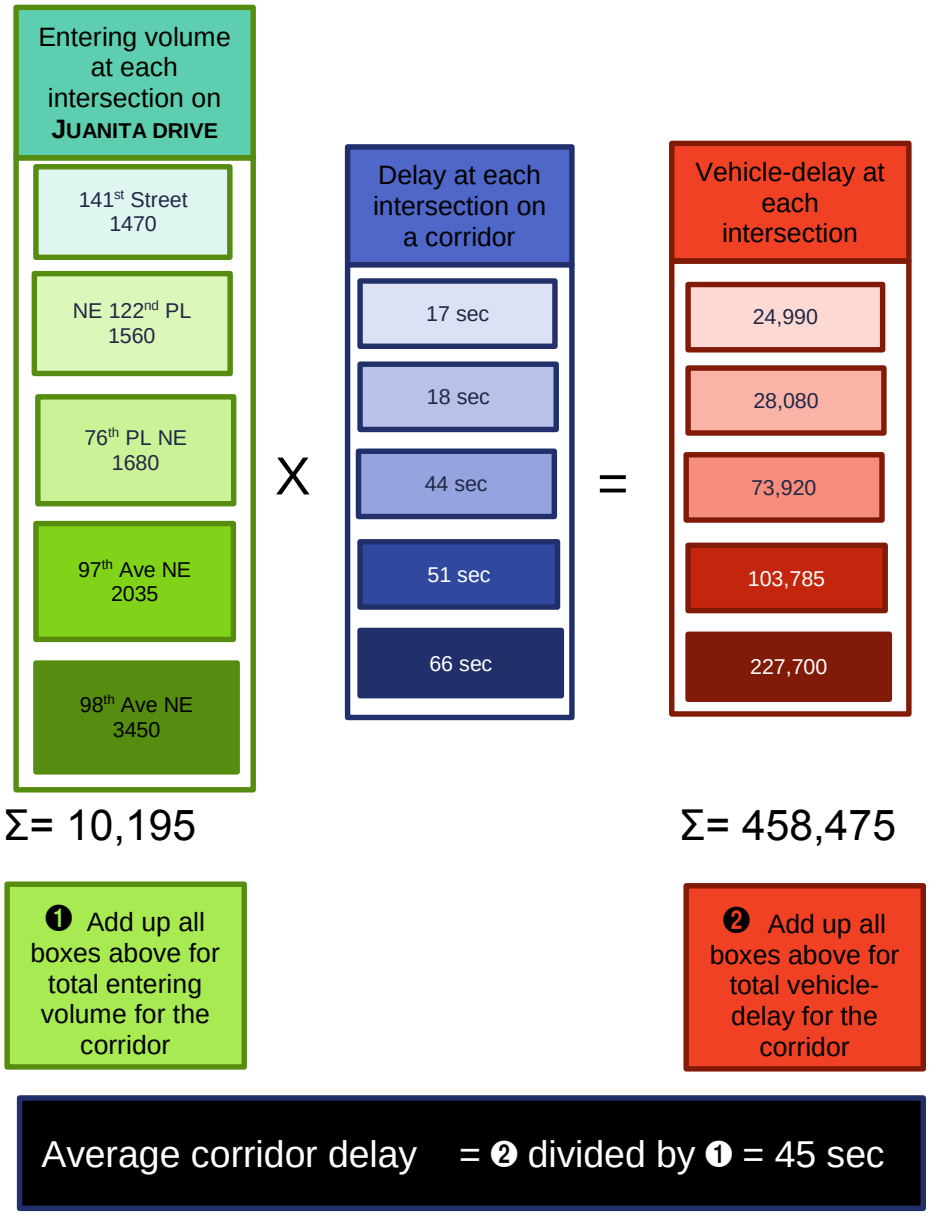
In addition to the corridors, a similar method was used to calculate delay in two subareas, Totem Lake and downtown. These subareas were selected recognizing that in an urban setting, trips may take many, non-linear paths. Thus, providing for an average mobility over a network is a reasonable approach.

[3] Average vehicle delay is calculated using HCM 2010 methodologies.
[4] The number of vehicles entering is….

Schematic drawing of auto level of service



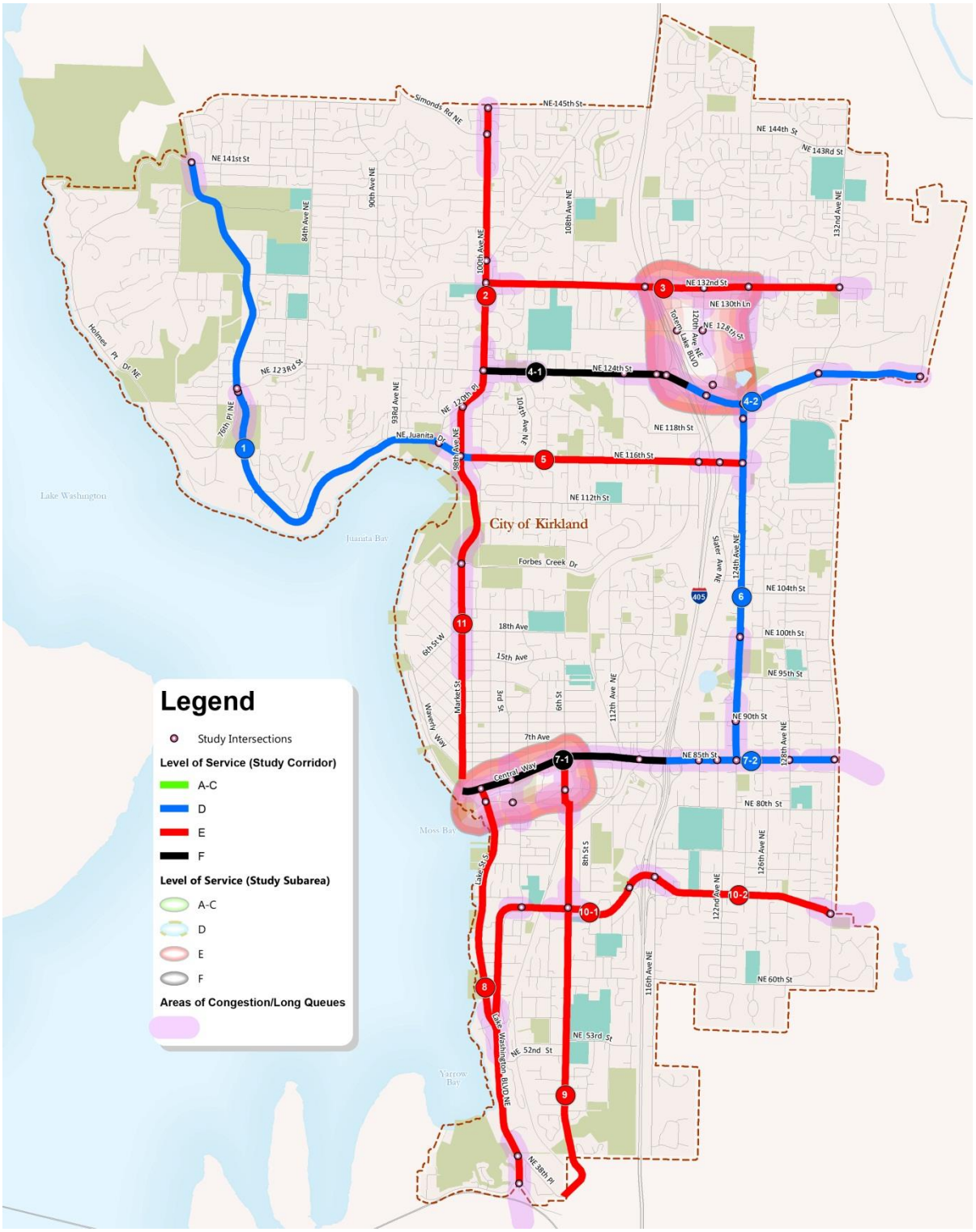
An example of the system as applied to a corridor is below



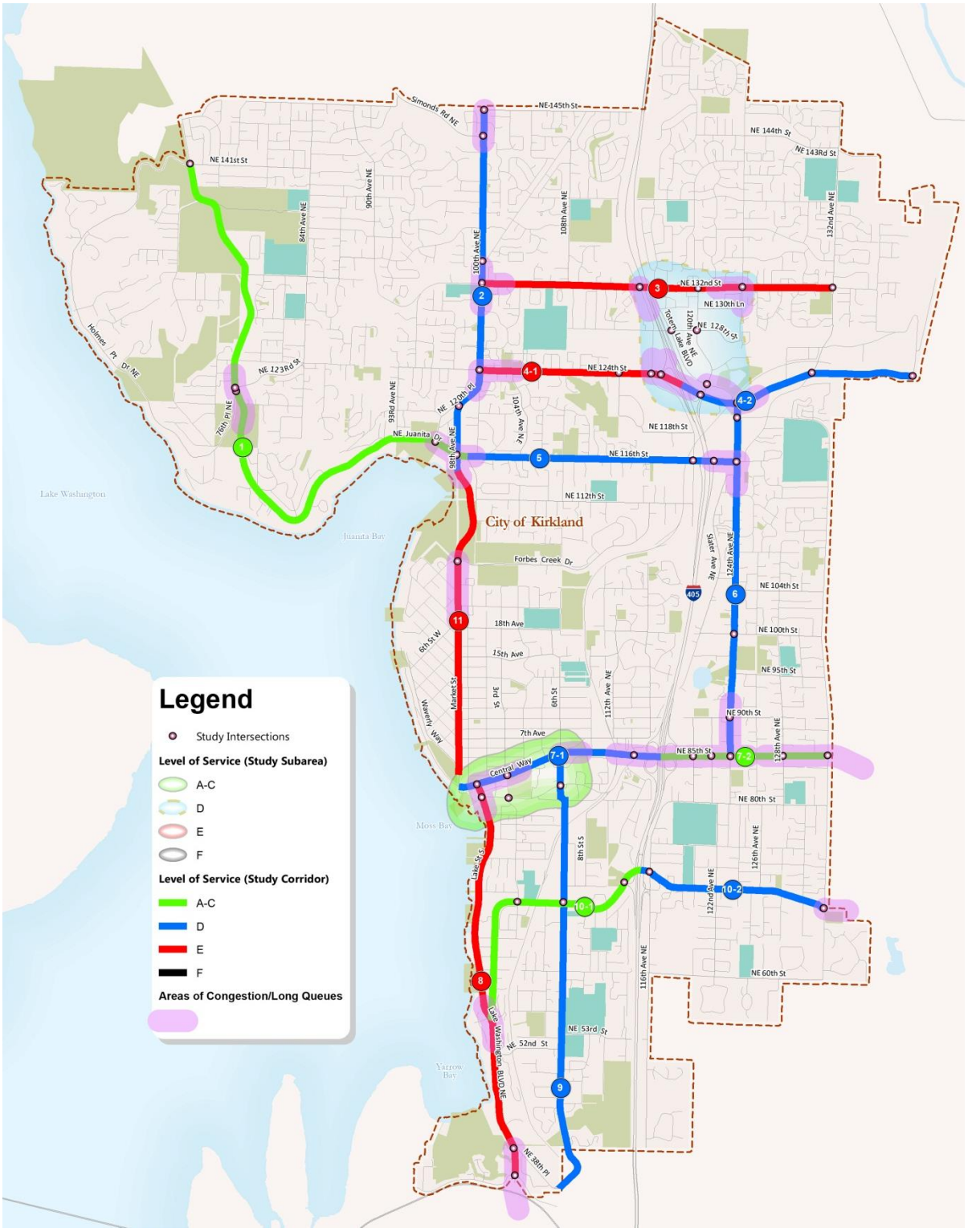
Average corridor delay = ❷ divided by ❶ = 45 sec

The level of service for the auto mode is based on the number of corridors that are near or above their forecast level of delay.

Level of Service	Number of corridors with delay greater than 110% of forecast value
Green	2 or fewer
Yellow	Between 3 and 5
Red	6 or more


Legend
Study Intersections
Level of Service (Study Corridor)
A-C
D
E
F
Level of Service (Study Subarea)
A-C
D
E
F
Areas of Congestion/Long Queues
City of Kirkland
Lake Washington
Juanita Bay
Moss Bay
Yarrow Bay
NE 145th St
NE 141st St
NE 144th St
NE 143Rd St
NE 132nd St
NE 130th Ln
NE 128th St
NE 124th St
NE 123Rd St
NE 120th Pl
NE Juanita Dr
NE 118th St
NE 116th St
NE 112th St
Forbes Creek Dr
NE 104th St
NE 100th St
NE 95th St
NE 90th St
NE 85th St
NE 80th St
NE 60th St
NE 53rd St
NE 52nd St
NE 38th Pl
Simonds Rd NE
Holmes Pt Dr NE
76th Pl NE
84th Ave NE
90th Ave NE
93Rd Ave NE
98th Ave NE
100th Ave NE
104th Ave NE
108th Ave NE
112th Ave NE
116th Ave NE
120th Ave NE
Totem Lake BLVD
124th Ave NE
126th Ave NE
128th Ave NE
132nd Ave NE
Slater Ave NE
Lake Washington BLVD NE
Lake St S
Market St
3rd St
6th St
6th St W
Waverly Way
Central Way
8th St S
122nd Ave NE
405
1
2
3
4-1
4-2
5
6
7-1
7-2
8
9
10-1
10-2
11

2035 LOS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120th Ave NE
122nd Ave NE
124th Ave NE
126th Ave NE
128th Ave NE
132nd Ave NE
Slater Ave NE
Totem Lake BLVD
Lake Washington BLVD NE
Market St
3rd St
6th St
6th St W
Waverly Way
Lake St S
8th St S
405
1
2
3
4-1
4-2
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7-2
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10-1
10-2
11

2015 LOS

Travel Modeling

The Bellevue-Kirkland-Redmond travel model (BKR model) is an analysis tool used by multiple Eastside communities to forecast travel demand growth for various transportation planning applications, including impact assessments, concurrency, and impact fees programs. Accordingly, the BKR model is being used to inform traffic forecast development for the TMP, Comprehensive Plan Environmental Impact Statement, and Totem Lake Planned Action Ordinance. As described below, several updates and adjustments were applied to the BKR model to generate results in-line with the Kirkland No Action land use alternative.

Land Use Input Updates

The most recent version of the BKR model uses 2035 land use inputs collected and assembled by the City of Bellevue. As part of the Comprehensive Plan update, the City of Kirkland has developed a more refined set of land use data for the 2035 no action growth alternative based on a development capacity analysis. This data set was provided to Fehr & Peers and integrated into the BKR model so that it more accurately reflects 2035 no action land use conditions.

Mixed-Use Development (MXD) Model Adjustment

In its current state, the BKR model does not fully recognize the reduction in vehicle trips that occurs in and around mixed-use developments, such those that currently exist in Downtown Kirkland and those envisioned for portions of the Totem Lake neighborhood. To account for vehicle trip reductions, Fehr & Peers used an innovative trip generation analysis technique known as the mixed-use development (MXD) model. The MXD model is based on a growing body of research which focuses on the relationship between travel and the built environment. This method supplements conventional trip generation methods to capture effects related to built environment variables (known as the Ds) including **d**ensity, **d**iversity of land uses, **d**estinations (accessibility), **d**evelopment scale, pedestrian and bicycle **d**esign, **d**istance to transit services, and **d**emographics. In short, places with higher densities, a rich variety of land uses close to one another, and high quality pedestrian, bicycle, and transit environments have lower vehicle trip generation rates. People have more choices in terms of both the travel mode as well as how far they must travel to reach various destinations. The MXD method provides a more reasonable picture of how travel characteristics change over time by avoiding overestimates of the number of vehicle trips that infill projects generate.

Using the MXD model, Fehr & Peers produced vehicle-trip reduction factors for Downtown Kirkland and Totem Lake, two neighborhoods with existing mixed-use developments and/or significant mixed-use growth envisioned under the 2035 No Action lane use alternative. These reduction factors[5] were applied to the BKR model and integrated into the final traffic forecasts.

[5] MXD reduction factors applied to Downtown included 32% in 2015 and 36% in 2035. For Totem Lake, a reduction factor of 25% was taken in 2035.