City of

Bellevue

Post Office Box 90012 ▪ Bellevue, Washington ▪ 98009 9012

DATE: December 5, 2013

TO: Bellevue Transportation Commission

FROM: Kevin McDonald, AICP, Senior Transportation Planner, 452-4558
kmcdonald@bellevuewa.gov

SUBJECT: MultiModal Concurrency and Planning
Best Practices Overview
http://www.bellevuewa.gov/downtown-transportation-plan-update.htm

INTRODUCTION

Through this topic we will explore a range of options to consider that would better integrate multiple modes of travel into the City's concurrency methodology and long range mobility strategy. This work is a component of the Comprehensive Plan Update and it will provide a range of policy choices based on best practices and applicability to Bellevue. Consideration will be given to establishing context-appropriate standards for Bellevue Mobility Management Areas (MMAs) based on their existing or intended land use character and the available or planned mobility options. New policy for the Comprehensive Plan could provide direction to implement a multi-modal level of service standard and concurrency strategy and long-range planning standards and metrics – this subsequent phase would be accomplished through a future work plan and budget as directed by the City Council.

This agenda item is an opportunity for the Transportation Commission to review best practices and current policy, to seek clarification and provide direction.

Background

For Concurrency purposes, Bellevue uses a level of service (LOS) standard based on the ratio of volume to capacity at "system" intersections, and includes an area-wide standard for MMAs. For long range transportation planning, the City uses travel demand and traffic operational modeling to forecast intersection and area-wide LOS based on the delay of vehicles at intersections. Both methods consider only vehicles and provide a quantitative analysis of a single mode of travel. Throughout the City, and significantly in existing mixed-use urban neighborhoods such as Downtown, Crossroads and Factoria; and evolving neighborhoods such as Bel-Red and Wilburton, mobility is characterized by high volumes of transit riders, pedestrians and bicycles, yet the quantitative metrics upon which transportation investments and planning decisions are made are related only to private vehicle capacity and delay. This

work will determine if additional metrics are appropriate for Bellevue to use in transportation system planning and analysis.

Scope of Work

This initial effort will not redo the Bellevue concurrency methodology, but will evaluate this methodology with respect to Bellevue's desired mobility strategies to serve mixed and dense urban land use and compared to methodologies and strategies used by other cities. The product of the work will be a range of policy alternatives that provide pathways and choices to address concurrency and long range transportation planning. This task is part of the 2014 Comprehensive Plan update, and the focus is on the transportation policy in the plan.

Within the scope of work, the following items are highlighted:

- Identify the current state of the art in assessing urban mobility and concurrency consistent with the Washington Growth Management Act.
- Identify and evaluate what other cities are doing to implement concurrency and prepare a report on "best practices," especially those practices that integrate multiple mobility modes for urban centers.
- Identify and evaluate long-range (20+ year planning horizon) transportation planning methodologies and metrics used by other cities to forecast, plan for, and implement projects to accommodate multiple mobility modes.
- Review and critique Bellevue's current Transportation Element and concurrency policy with respect to planning for and accommodating multiple modes of mobility.
- Identify a range of potential strategies for Bellevue to consider in updating its concurrency policy, long-range transportation planning methodology and other Comprehensive Plan strategies related to multimodal mobility.

In this Packet and on the December 12, 2013 Agenda

The consultants selected for this project, Fehr & Peers, have prepared and will discuss a "best practices" report (Attachment 1). Staff from Fehr & Peers will provide an overview and answer questions. Time permitting there will be a discussion of preliminary policy options for the Transportation Commission to consider (Attachment 2) in developing a recommendation for the 2014 Comprehensive Plan update

NEXT STEPS

Further discussion of best practices and policy options is scheduled for Commission agendas in early 2014. A recommendation from the Commission will be forwarded to the Planning Commission as a policy update in the Transportation Element.

ATTACHMENTS

1. Best Practices
2. Bellevue policy review

FEHR PEERS

MEMORANDUM

Date: December 2, 2013

To: Kevin McDonald, City of Bellevue

From: Ariel Davis and Chris Breiland, Fehr & Peers

Subject: Review of Best Practices for Multimodal Transportation Planning

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The Washington State Legislature passed the Growth Management Act (GMA) in 1990. The GMA identifies transportation as one of the mandatory elements of a jurisdiction's Comprehensive Plan. Further, the Legislature defined that the transportation element must include an inventory of facilities and a level of service (LOS) standard for "all locally owned arterials and transit routes to judge performance of the system." A pedestrian and bicycle component is also required in the transportation element, however, no LOS standard is required. As an integral part of the transportation element, the Legislature included the concept of transportation concurrency, as stated below (RCW 36.70A.070):

> *After adoption of the comprehensive plan by jurisdictions required to plan or who choose to plan under RCW 36.70A.040, local jurisdictions must adopt and enforce ordinances which prohibit development approval if the development causes the level of service on a locally owned transportation facility to decline below the standards adopted in the transportation element of the comprehensive plan, unless transportation improvements or strategies to accommodate the impacts of development are made concurrent with the development.*

In essence, the transportation element and concurrency provision are intended to have jurisdictions identify a long-range transportation system plan that accommodates the anticipated future land use growth and devise a system to ensure that the transportation system is implemented to meet community defined LOS targets. While nearly all Washington State communities have defined a multimodal long range transportation system, very few communities have a LOS standard for non-auto modes. As a result, few communities have a concurrency

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program that ensures that non-auto improvements are implemented to support growth. Even fewer communities use multimodal LOS for developing long range plans.

This document focuses on the two levels of planning described above:

- **Long-range planning** is meant to achieve a balance between land use and transportation during the development of a Comprehensive Plan.
- **Regulatory concurrency** is the process that jurisdictions implement to determine if a specific development would cause any transportation facilities to fall below the LOS thresholds adopted in the Comprehensive Plan.

WASHINGTON STATE – STATE OF THE PRACTICE

This section describes how long-range planning and regulatory concurrency are typically performed in Washington State communities. Most of the focus on this section is on regulatory concurrency since there tends to be more documentation on how communities develop and monitor regulatory concurrency programs. Following this section is a discussion of best practices in Washington State, and examples of both long-range planning and regulatory concurrency programs are highlighted.

Long-Range Planning

There is no cookbook of how to develop a transportation element for a Comprehensive Plan. These plans tend to be as unique as the communities that develop them. However, given the requirements set forth in the GMA, the example below is typical of how a community might go about developing such a plan:

1. Identify the future land use growth in the community
2. Define goals and policies related to issues such as traffic congestion, transit service, and bicycle and pedestrian mobility
3. Quantify a LOS standard for autos
4. Determine how much auto demand there will be in the future
5. Identify capital projects needed to meet the auto LOS standard

Some jurisdictions stop with the list above, and do not develop an explicit bicycle and pedestrian plan[1]. However, most of the larger jurisdictions in the State go further to identify capital projects for bicycles, pedestrians, and occasionally transit. Some cities develop bicycle and pedestrian networks and project lists using a qualitative approach. In this case, lines are drawn on a map to connect important destinations, or policies are defined, such as the need to build a sidewalk on at least one side of every street and to ensure that all collectors and arterials have bike lanes. This approach is typically iterative and involves substantial public input to identify destinations, travel desire lines, and potential policies.

Other some cities go a few steps farther to prioritize projects once a large list is developed. For example, Tukwila went through and inventoried every street in the city in terms of available right-of-way to determine which pedestrian and bicycle projects could be built at a reasonable cost. Newcastle developed a qualitative ranking system based on roadway type, proximity/connectivity to destinations, and collision history.

Regulatory Concurrency

As described above, the GMA requires multi-modal transportation elements, but because LOS is required to be defined only for "locally owned arterials and transit routes," the law does not explicitly require concurrency planning for other modes. In practice, most jurisdictions within Washington state set concurrency standards only for autos—for example, this is currently the case for the cities of Kent, Spokane, and Tacoma[2]. The City of Seattle sets LOS standards for autos (using volume-to-capacity across large screenlines)[3], but also includes mode share goals which serve to quantify the City's vision of its future transportation system. Both the screenline LOS and mode share goals vary across the city, reflecting a higher tolerance for congestion, availability of transit and other mobility options, and a higher goal for non-SOV mode share in denser areas of the City.

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[1] In this case, jurisdictions typically have street and sidewalk standards developed and include policy language to provide appropriate pedestrian and bicycle facilities as part of all new development.

[2] While there is transit in these cities, the transit is not owned or operated by the city and is therefore no transit LOS standard is defined.

[3] Seattle also defines LOS standards for transit, but they are the same as autos noting that buses travel on the same right-of-way as cars and are equally affected by congestion

While mode share goals are identified Seattle's Comprehensive Plan, these goals are not explicitly tied to the assessment of concurrency. In essence, Seattle has quantified its vision for the transportation system, but has not developed a means to achieve it via the concurrency regulations.

King County has a relatively unique concurrency evaluation method that considers auto LOS within various "travel sheds" using average travel speeds on state routes and arterials. LOS standards vary depending on whether the travel shed is a rural area, a rural neighborhood commercial center, an urban growth area or a rural mobility area. Rural area LOS standards are skewed to higher speeds than are those for urban areas. In each area, 85 percent of the state routes and arterials must meet the adopted LOS standard. King County does not test individual developments; rather they assume a development proposal meets concurrency if it is located in a travel shed that meets the LOS standards cited above. This type of concurrency assessment is known as *Plan Based Concurrency*.

By measuring concurrency based only on auto LOS, jurisdictions are focusing exclusively on auto improvements, potentially at the expense of other modes including pedestrians, bicycles, and transit. As the thinking of the transportation planning community has evolved to consider a more holistic approach to the transportation system, applying concurrency in a multimodal fashion has emerged as a challenge. The remainder of this memorandum surveys the best practices for assessing concurrency and long-range planning both in Washington state and beyond.

City of Bellevue

The City of Bellevue's approach to long-range planning generally follows the process outlined above, although the City does maintain advanced travel models and GIS databases to streamline the identification and prioritization of future projects. Documents such as the Comprehensive Plan transportation element and Pedestrian and Bicycle Transportation Plan define specifically the City's long-range planning process; key features are summarized below.

- The City has a long-range auto LOS standard to facilitate planning for the capacity of the roadway network.
- The Pedestrian and Bicycle Transportation Plan was developed through the efforts of Transportation planning staff and the Transportation Commission through an extensive community outreach process. The Plan includes a final project list that was prioritized using sophisticated GIS and field data analysis techniques.

- There are no LOS standards for non-auto modes.

It is notable that the City is currently updating its Transit Master Plan, which outlines Bellevue's vision for transit service. With King County Metro focusing on performance metrics to guide future service provision, the City's draft Transit Master Plan has a decidedly quantitative approach. Some of the elements of the Transit Master Plan could serve as the basis of a transit LOS that could be applied for future long-range planning and potentially regulatory concurrency.

Bellevue currently has a plan-based regulatory concurrency system that monitors auto LOS in 14 "mobility management areas" (MMA). The MMAs allow for different LOS standards to be defined in areas of the city according to land use and urban form characteristics, and the availability of mobility options. Auto LOS is defined as the PM peak period volume-to-capacity (v/c) ratios for vehicles at specified intersections. Maximum v/c ratios are defined for each MMA and, similar to King County, a certain number of intersections within each MMA are allowed to exceed the v/c ratio. In general, dense areas with multiple transportation options have both a higher v/c standard and a greater number of intersections that can exceed the v/c standard.

Recognizing the limitations of its auto-based concurrency system, the City of Bellevue participated in a multimodal concurrency pilot project with the PSRC and King County Metro in 2009. The final product of that work was a document that outlined the following three steps for a multimodal concurrency management program:

> ***Step 1)*** *Evaluate multimodal concurrency in a future year. In this step, forecast travel demand is compared with the planned capacity of the transportation system. If the analysis concludes that the transportation system is adequate, a positive concurrency finding, then the proposed development can be constructed and no further work is required.*
> ***Step 2)*** *If step one finds that concurrency has not been met, the analysis must determine the gap between the originally proposed future transportation system and a scenario that would meet concurrency. The gap is then translated unto units such as person trips, which allows scenario testing to be conducted.*
> ***Step 3)*** *Finally, strategies are designed and tested to close the gap and meet concurrency requirements.*

This report also suggests various metrics for each mode. Staff from PSRC, King County Metro, and the City of Bellevue collaborated to test this approach in Downtown Bellevue. They tested a long-term planning scenario rather than applying it as a development review case. Although it was

determined that Downtown Bellevue would meet concurrency in the planning horizon year of 2020, the project team assumed that this was not the case so that a sample gap analysis could be completed. The team used person trips to quantify the gap and tested a variety of transit, pedestrian, bicycle, and TDM measures to close the gap.

BEST PRACTICES IN WASHINGTON STATE

Two Washington state jurisdictions have implemented multimodal concurrency programs: the cities of Bellingham and Redmond. These programs go beyond auto-centric measures so that the cities have a means to achieve their multimodal visions. The approaches used by Burien and Renton for long-range planning are also uncommon so they are summarized in this section.

City of Bellingham

The City of Bellingham implemented a multimodal transportation concurrency program in 2008. The fundamental concept underlying the program is quantifying the number of available person trips by each mode (PTA for Person Trips Available). Metrics for each mode are shown below.

Table 3. Multimodal Transportation Concurrency Measurements For Each Mode

Motorized	**Measurement**
Automobiles	Arterial volume-to-capacity measured during weekday p.m. peak hour based on data collected at designated concurrency measurement points in concurrency service areas
Public Transit	Seated capacity based on bus size and route frequency and ridership based on annual transit surveys measured during weekday p.m. peak hour based on data collected at designated concurrency measurement points for each concurrency service area
Non-motorized	**Measurement**
Bicycle	Credit person trips according to degree of bicycle network completeness for designated system facilities/routes for each concurrency service area
Pedestrian	Credit person trips according to degree of pedestrian network completeness for designated system facilities/routes for each concurrency service area
Trail Use	Credit person trips according to degree of trail network completeness, where trails serve a clear transportation function for a concurrency service area
Source: Bellingham Municipal Code 13.70 Multimodal Transportation Concurrency (2008)	

Figure 1. Source: "Moving Beyond the Automobile: Multi-modal Transportation Planning in Bellingham, Washington, "Chris Comeau, AICP, Practicing Planner, Vol. 7, No. 3, September 2009.

Long-Range Planning

The Comprehensive Plan was revised to include LOS standards based on the PTA platform, as follows:

- Arterial Streets: LOS E which corresponds to no more than a 1.0 volume-to-capacity ratio.

- Transit: LOS F which corresponds to 1.0-1.25 riders per seat (e.g. up to 50 riders on a 40-seat bus).
- No separate LOS thresholds are identified for pedestrians, bicycles, or trails; however, they are considered in the overall PTA measure.

Based on the existing and planned transportation facilities, the City can estimate the total PTA in their planning horizon year. Land use forecasts can then be tested against this transportation system to determine if the land use plans and transportation system are in line with one another. Other than determining whether future roadway and transit infrastructure meet the LOS standards, there are no explicit quantitative metrics guiding the long-range planning for the other modes. The bicycle and pedestrian plans were developed using traditional planning approaches.

Regulatory Concurrency

The PTA concept can also be applied in a regulatory setting. The City divides its jurisdiction into 15 "concurrency service areas," to account for the varying land use and urban form characteristics of each area. These areas are categorized into three types. Type 1 areas are urban villages with adopted master plans and generally have the highest level of pedestrian, bicycle, and transit service. Type 3 areas are less dense with few pedestrian, bicycle, and transit options and high dependence on auto travel, while the Type 2 designation is used for those transition areas that fall in the middle of the spectrum. Different weights—called "policy dials"—are applied to each mode as shown in the following figure, to help direct development into the areas that the City has identified as being most appropriate for growth.

Table 4. Multimodal Transportation Concurrency Measurements and Policy Dials			
	Transportation Concurrency Service Areas		
Mode	**Type 1[1]**	**Type 2[2]**	**Type 3[3]**
Motorized			
Auto			
Mode weight factor[4]	0.70	0.80	0.90
Transit			
Mode weight factor[5]	1.00	1.00	0.80
Non-Motorized			
Pedestrian			
Percent threshold for minimum system complete[8]	50%	50%	50%
Person trip credit for 1% greater than minimum threshold[9]	20	20	20
Mode weight factor[6]	0.60	0.60	0.60
Bicycle			
Percent threshold for minimum system complete[8]	50%	50%	50%
Percent credit for 1% greater than threshold[9]	20	20	20
Mode weight factor[7]	0.40	0.40	0.40

1. Type 1 = Urban Village areas with adopted master plans, high-density mixed use zoning, or an active master plan process.
2. Type 2 = Medium density areas adjacent to and influenced by Urban Villages.
3. Type 3 = Lower density and auto-oriented areas near edges of City.
4. Auto mode weight factor considers the importance of roadways to a service area, relative to the availability of other mode alternatives.
5. Transit mode weight factor considers the availability/viability of the transit mode to a service area.
6. Pedestrian mode weight factor considers the importance of pedestrian facilities to a service area, relative to land use and travel patterns.
7. Bicycle mode weight factor considers the importance of bicycle facilities to a service area, relative to land use and travel patterns.
8. This is the minimum level of the planned system completed for it to be considered a viable mode alternative.
9. Person trips credited to service area based on the amount of the system completed minus the minimum threshold.

Source: Bellingham Municipal Code, Section 13.70, Table 1 (2008).

Figure 2. Source: "Moving Beyond the Automobile: Multi-modal Transportation Planning in Bellingham, Washington," Chris Comeau, AICP, *Practicing Planner*, Vol. 7, No. 3, September 2009.

The following examples illustrate how PTA are calculated by mode:

- A roadway with a 1,400 vehicle hourly capacity and a volume of 1,000 vehicles would have 600 PTA assuming an average occupancy rate of 1.5 people per vehicle.

- A location with four 40-seat buses per peak hour (160 person trip total capacity) and 100 riders would have 60 PTA.
- An area with 90% of its sidewalk or bicycle network complete would be credited with 800 PTA. An area with 40% of its sidewalk or bicycle network complete would not be credited with any PTA. To gain PTA via sidewalk or bicycle improvements, a minimum of 50% of the area's sidewalk and bicycle network must be completed.

Each year, the City of Bellingham calculates the PTA for each concurrency service area, taking into account projects with approved permits that are already in the pipeline. Each new development application draws upon the PTA in the relevant area. If the development would generate more person trips than are available, the developer must contribute sufficient PTA through construction of new multimodal facilities or implement transportation demand management strategies to allow the project to go forward (these strategies reduce the PTA demanded by the development).

The pool of PTA can be increased by improving any modal facility which offers flexibility to the City and developers. Another benefit of this approach is that it is based on recent observed data, providing a reliable check of current conditions. However, this also means the approach is somewhat data-intensive. In addition, there is no direct link to SEPA standards, which generally rely on traditional auto LOS thresholds to make determinations of significance.

City of Redmond

The City of Redmond implemented a multimodal transportation concurrency program in 2009. The system defines LOS based on citywide person miles traveled, which are called "mobility units" by the City. The City uses supply and demand language to describe the program: completed infrastructure projects create mobility units of supply and new developments create mobility units of demand.

The City uses this concept for both long-range planning and regulatory concurrency. The City developed a Transportation Facilities Plan (TFP) that lists multimodal capital projects intended to achieve the envisioned land use/transportation balance. The fundamental assumption underlying the concurrency system is that the list of projects to be constructed by the TFP's horizon year is expected to meet the demand of new development. In other words, the number of mobility units supplied by the TFP is equal to the number of mobility units that would be consumed by the planned development.

Long-Range Planning

The Redmond Comprehensive Plan includes the following policy which serves as the LOS standards for long-range planning as well as concurrency:

> *Policy TR-28: Support planned land use through the use of a citywide person-mile-of-travel-based transportation level of service standard. Redmond's transportation level of service standard is established to mean that so long as the growth of the city and the development of the city's transportation system are proportionate, work in parallel, and are consistent with the Comprehensive Plan, all concurrency management requirements are considered met.*

Concurrency is quantified as the ratio between the mobility units of supply and the mobility units of demand so a ratio of more than 1.0 indicates that the City is achieving its envisioned transportation/land use balance.

Mobility units are calculated using the City's travel demand model. First, land use growth is determined, then ITE trip generation rates are applied to estimate vehicle trips which are subsequently converted to person trips. (Person trips for pedestrians, bicycles, and transit were estimated using the travel model.) Lastly, the travel demand model is used to estimate trip length which is applied to the total person trips to arrive at the person miles of travel. The resulting number of person miles traveled—or mobility units—is then allocated proportionately to each capital project in the TFP based on cost. Balance between the supply and demand of mobility units can be tracked by summing the mobility units supplied by completed projects and comparing that to the total mobility units consumed by new development.

While Redmond ultimately translates its TFP into mobility units, these units are not the basis for developing the plan itself. In terms of long-range planning, Redmond recently completed an update of the TFP with the projects in the multi-modal plan being selected on the basis of how well they help to advance nine "dashboard" measures. These measures are summarized on the following page.

Redmond Dashboard Measures	
Measure	**Description**
Connectivity	Percentage of Downtown and Overlake Village development square footage with connectivity levels of "medium" or better. Connectivity is measured using route directness—the ratio of the actual pedestrian travel distance to the straight line distance between set points on the transportation network. 2030 targets are 81% of development in Downtown and 31% of development in Overlake Village
Network Completion	Proportion of the multimodal transportation system that is complete to the city's defined ultimate buildout plan. Tracked separately for auto, bicycle, pedestrian, transit, and truck networks. 2030 targets are 68% auto, 51% bicycle, 53% pedestrian, 100% transit, 76% truck.
Mode Share	Non-SOV mode share. 2030 target is 53%.
Vehicular Congestion	Average PM peak hour vehicle delay per mile on principal arterials. 2030 target is 46 seconds per mile.
Transit Ridership	Average boardings per weekday citywide. 2030 target 26,700 (based on mode share target).
Concurrency	Ratio of mobility units of supply to mobility units of demand. 2030 target is 1.0.
Safety	Number of injuries per 1,000 persons (based on daytime population). 2030 target is 1.3 injuries per 1,000 persons or less. Note that future performance for this target cannot be forecasted. The city uses this target to prioritize short-term safety projects.
Air and Water Quality	Air quality measure based on federal "attainment" status for PM 2.5. Water quality measure is based on the proportion of right of way that is equipped "basic" treatment infrastructure. 2030 air quality target is for attainment status and 2030 water quality target is for 36% of right of way to feature basic water quality treatment.
Street Preservation	Pavement condition index. 2030 target is 73.

Regulatory Concurrency

The regulatory concurrency process requires that the City determine the number of mobility units that would be available in the next six years—the timeframe that the GMA requires for transportation infrastructure to be implemented following development. To measure the available mobility units, the City employs the system completion dashboard measure in conjunction with the funding status of each project in the TFP. The City has specific guidelines to help determine which projects should be assumed to be completed within six years. For example, a fully funded project included in the CIP or the annual expenditure for a programmatic project would be included.

Each development application is evaluated to estimate the number of mobility units that would be generated using a spreadsheet tool that mirrors the more involved travel demand modeling process used for long-term planning. Redmond uses a look-up table that provides the mobility unit rates for each type of land use development, similar to an impact fee table. This demand is then compared to the level of six-year mobility unit supply to determine if the development is permissible. If insufficient mobility units are available, the development would be rejected or the developer could pay to implement a project that would supply the required amount of mobility units to maintain concurrency. The mobility unit calculation and allocation methodology is currently being updated to ensure that projects which generate higher rates of pedestrian or bicycle travel (which have lower person miles of travel than auto trips) would use proportionately fewer mobility units and since mobility units also for the basis for Redmond's transportation impact fee program, would pay lower impact fees.

As with Bellingham, this approach provides flexibility to build a project that addresses any mode. Redmond's method requires only that the total mobility units be recalculated when the Comprehensive Plan is being updated rather than every year (although the six-year projection must be done more frequently). One potential problem with this approach is that more expensive projects tend to be implemented since they provide substantial mobility units; in turn, smaller projects are sometimes ignored. Also, there is no correlation to mode split goals or SEPA standards.

City of Burien

The City of Burien uses a multimodal LOS methodology in its 2012 Transportation Master Plan (TMP) to help define the projects in the City's CIP and prioritize the projects in the TIP. This

approach has not yet been translated to the regulatory concurrency process. Burien continues to employ traditional auto LOS standards for regulatory concurrency review.

For transit, pedestrians, and bicycles, the City uses a three-tier LOS system with green denoting the highest level of service, yellow denoting an intermediate level of service, and red denoting a poor level of service. As described below, the three LOS tiers vary based on the type of transportation facility and the neighborhood context. In conjunction with the LOS system, Burien defined a "layered network," which is a system that identifies the "priority" modes on a given facility. For example, Ambaum Boulevard, which is a major north-south arterial, is defined as both a transit priority and an auto priority corridor. Ambaum is not defined as a bikeway, recognizing that cycling will not be practical for much of the public on this busy street. 4th Avenue, a parallel street located just east of Ambaum is identified as one of the City's main north/south bicycle corridors.

Burien identified corridors with high transit demand and/or high service frequency. These corridors were evaluated using the criteria shown in Figure 3. The TMP recognizes that the City can improve the infrastructure on which transit operates, although it has no direct control over transit service. Therefore, City investments would include projects such as bus stop amenities, crosswalks, sidewalks, intersection improvements, and transit signal priority. The City aims to achieve a green LOS for all roadways designated as transit priority corridors.

Table 3. Transit Priority Corridor Level of Service

LOS	Transit Stop Amenities	Transit Travel Speeds	Pedestrian Access	Frequency of Service
	High level	Minimal Roadway Delay	Sidewalks and marked crosswalks serving stops	All day service. Peak service 15 minutes or less, midday 30 minutes or less
	Some amenities	Moderate Roadway Delay	Sidewalks and marked crosswalks serving some stops	All day service. Peak services 30 minutes or less, midday service 60 minutes or less
	Little or no amenities	Congested Roadway	General lack of sidewalks and marked crosswalks	Low level of service

Figure 3. Source: Burien Transportation Master Plan, 2012.

Burien's criteria for the pedestrian network are shown in the following figure. The City designates areas as being either pedestrian priority areas or pedestrian non-priority areas. This system recognizes that investment should first be focused in areas such as downtown or near schools, rather than outlying residential areas.

Pedestrian Priority Area LOS – Sidewalk Requirements

LOS	Along Transit Priority Corridors	Pedestrian Activity Centers	Downtown Burien
	Sidewalk and Buffer	Arterial/Collector – Sidewalk on Both Sides	Meets Downtown Standards
	Sidewalk	Wide Shoulder	Sub-standard Sidewalk
	No Sidewalk	Congested Roadway	No Sidewalk

Pedestrian Non-Priority Area LOS – Sidewalk Requirements

LOS	Other Roadway Segments
	Arterial – Sidewalk on Both Sides
	Arterial – Sidewalk on One Side
	Arterial – No Sidewalk

Crossing Requirements

LOS	Pedestrian Priority Areas	Other Areas
	Appropriately designed crossing every 300 feet in pedestrian activity area[a] or downtown	Appropriately designed crossings at existing marked crosswalks
	Crosswalks present every 600 feet	Crosswalks present
	No crosswalks present	No crossings within 600 feet

[a] Pedestrian activity areas are those areas within a quarter mile of schools, an eighth mile of neighborhood parks, or within a quarter mile of food banks.

Figure 4. Source: Burien Transportation Master Plan, 2012.

Bicycle facilities are also categorized into two tiers: neighborhood bikeways which are designed to accommodate bicyclists of all abilities on low volumes, low speed residential streets, and general bikeways which are designed for more confident riders who are comfortable using roadways with higher volumes and speeds.

Figure 16. Bicycle Level of Service – Speed, Volume, and Grade Thresholds
Note, Speeds are posted limits.

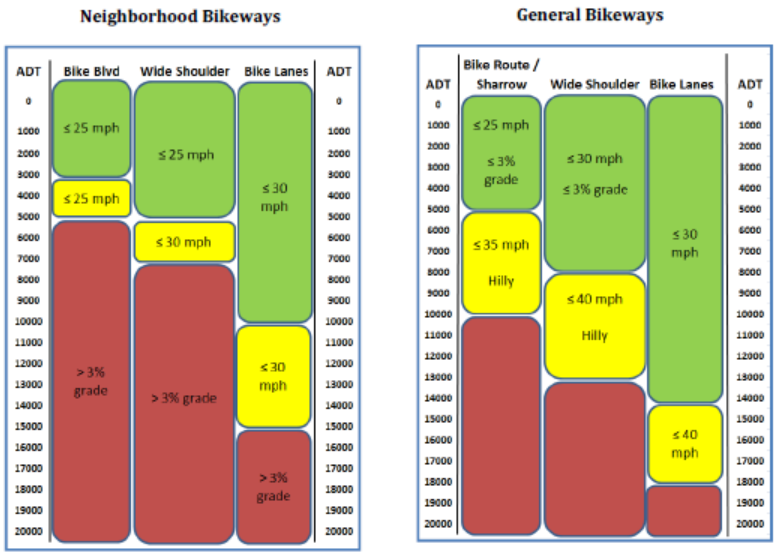

Table 5. Bicycle Intersection and Stop Frequency LOS

LOS	Unsignalized Intersections	Stop Frequency (Neighborhood Bikeways Only)
	Adequate crossing of arterial or collectors along bikeways	< One stop per 1/4 mile
	Marked, but insufficient crossing of arterial or collector along bikeway	Stops spaced at 1/8 to 1/4 mile
	No marked/controlled crossings of arterial or collector along bikeway	>One stop per 1/8 mile

Figure 5. Source: Burien Transportation Master Plan, 2012.

Burien uses traditional HCM intersection LOS for autos. Again, roadways are categorized differently to account for their desired character. For example, downtown Burien has a lower LOS threshold than other areas because the City wants to maintain the walkability of the area which eliminates projects such as roadway widening from consideration.

Burien's Comprehensive Plan includes the following language:

> *The City adopts the following Level-of-Service standards for vehicles: LOS standard D for designated vehicle priority roadways; LOS standard E for downtown Burien streets; and LOS C for all other roadway facilities and services.*
>
> *The City will pursue the following actions along designated transit priority roadways: provide high level of transit stop amenities, maintain adequate vehicle LOS, provide sidewalks and marked crosswalks at all major transit stops, and encourage transit agencies to provide all day service with minimum 15-minute peak/30-minute midday bus frequencies.*
>
> *The City will pursue the following actions within designated pedestrian priority areas: provide sidewalks and/or wide shoulders on both sides of all arterial and collector routes and provide adequate street crossings within 300 feet of identified activity areas. For other areas of the city, provide sidewalks and/or wide shoulders on all arterial routes and adequate crossings at existing or planned marked crosswalks.*
>
> *The City will pursue the following actions for designated bicycle priority streets: provide high-level bicycle treatments on roadway segments considering traffic volumes and speeds, adequate intersection treatments, and undertake actions to minimize stop frequency for bicycles along these routes. For other streets with bikeways, provide appropriate bicycle treatments considering traffic volumes and speeds on designated streets, and adequate intersection treatments.*

This approach requires minimal data collection and uses simple analysis with context sensitive LOS definitions. However, there is no regulatory concurrency component, there is potential for modal conflict, and some of the measures are subjective.

City of Renton

The City of Renton uses a less common measure for its regulatory concurrency evaluation. Using the Renton travel demand model, the City estimates the distance that can be traveled in 30 minutes from the center of the city. This is done for a single occupant vehicle, a high occupancy vehicle, and a transit vehicle. Then, an index is determined by calculating the sum of the HOV and

SOV distances and twice the transit distance. This analysis is updated periodically to set the standard for future evaluation. For instance, the 2002 index was determined to be 42 (16.6 miles for SOV plus 18.7 miles for HOV plus 2 x 3.4 miles for transit), which then serves as the standard for the 2022 horizon year.

This citywide standard is applied as part of a plan-based concurrency program to determine whether future development may impact mobility in Renton. This approach is inherently multi-modal since projects that generate fewer auto trips will have less of an impact on the travel distance index. One downside compared to Redmond or Bellingham's concurrency program is that non-auto improvements do not directly improve the index. However, transit speed improvements are weighted more highly than auto improvements, providing incentive to increase the mobility of transit, with particularly high value to transit operating in dedicated right-of-way.

While Renton uses this travel distance methodology for regulatory concurrency, it is unclear if they use this measure to inform the long-range transportation plan.

NATIONAL BEST PRACTICES

Florida Department of Transportation

Florida is the only other state with a concurrency requirement. The Florida Department of Transportation (FDOT) has developed a detailed handbook for determining level of service. In addition to auto LOS, the handbook addresses transit, pedestrian, and bicycle LOS. FDOT has also developed a software program to streamline the LOS calculation.

Pedestrian and bicycle LOS are calculated using a regression model. Pedestrian LOS is based on four variables: existence of a sidewalk, lateral separation of pedestrians from motorized vehicles, motorized vehicle volumes, and motorized vehicle speeds. Bicycle LOS is based on five variables: average effective width of the outside through lane (which can include a bike lane), motorized vehicle volumes, motorized vehicle speeds, heavy vehicle volumes, and pavement condition[4]. Note that while the bicycle LOS is not applicable to off-street facilities, the pedestrian model may be applied to shared use paths within 100 feet of the roadway.

These models were originally designed for operational purposes, but FDOT has made some assumptions to simplify the methodology for planning level evaluation by giving a discrete number of choices with default values for some variables. For example, the software includes three choices for outside lane width (wide, typical, or narrow) with default values. For pedestrian and bicycle analysis, FDOT weights segments based on their length and the severity of their scores, which puts extra weight on poorly operating

Table 2 – 2
Service Frequency LOS Thresholds

Level of Service	Adjusted Service Frequency (Vehicles/hour)	Headway (minutes)	Comments
A	>6.0	<10	Passengers don't need schedules
B	4.01 to 6.0	10 to 14	Frequent service, passengers consult schedules
C	3.0 to 4.0	15 to 20	Maximum desirable time to wait if transit vehicle missed
D	2.0 to 2.99	21 to 30	Service unattractive to choice riders
E	1.0 to 1.99	31 to 60	Service available during hour
F	<1.0	>60	Service unattractive to all riders

Figure 6. Source: Quality/Level of Service Handbook, FDOT, 2009.

[4] The FDOT method does not give any explicit credit for bike lanes based on the idea that the painted line does not provide any inherent benefit, but the space adjacent to the outside travel lane is beneficial for cyclists. Therefore, a wide lane provides the same benefit as a bike lane. There are no explicit benefits calculated for newer types of bicycle treatments such as buffered bike lanes or cycle tracks.

segments.

For transit, FDOT relies on the concept that frequency of service is the most relevant performance measure. FDOT uses the service frequency standards cited in the Transportation Research Board's Transit Capacity and Quality of Service Manual, as shown at right. FDOT also created "Generalized Tables" that may be used for generalized planning of facilities, rather than focusing on the segment level.

City of Destin, Florida

Comment [km1]: Any bigger cities - Bellevue sized or greater? Or maybe Destin is a big-ish city I have not heard of.

Comment [CB2]: No, Destin is not very large – it is telling that no larger cities in the State have used ARTPLAN. I will dig into this a bit more…

The City of Destin uses FDOT's ARTPLAN software to evaluate multimodal LOS within a designated Multimodal Transportation District (MMTD). In 2006, Destin was the first jurisdiction in Florida to adopt a MMTD and several other small-sized cities have since followed suit. Destin codified both short-term and long-term multimodal LOS standards within their Comprehensive Plan. The figure below summarizes the ARTPLAN LOS standards for major collector roads.

	BICYCLE	PED	BUS
Adopted (2006)	C	E	F
Adopted (2011)	B	C	E
Adopted (2020)	B	B	C

Figure 7. Source: Quality/Level of Service Handbook, FDOT, 2009.

Within the MMTD, the City requires proposed developments to meet two conditions to be considered in compliance with the concurrency standard. First, the development must follow certain urban form and multimodal facility design standards. Second, the development must offset its traffic impact through multimodal improvements. The traffic impact of a project is determined by entering project vehicle trip generation into a spreadsheet. Multimodal improvements to offset the impact can be selected from a checklist. The number of impact mitigation points must equal or exceed the calculated impact. Mitigation projects include on-site, frontage improvements, and off-site improvements. Examples include development of pedestrian oriented buildings (adjacent to the sidewalk), constructing on-site sidewalks to connect uses, constructing off-site sidewalks/bicycle facilities, or providing less than the maximum allowed parking.

San Francisco, California

The State of California has no concurrency requirement. Therefore, jurisdictions have been moving toward using other means to achieve the goals of a concurrency program, namely, the California Environmental Quality Act (CEQA) impact disclosure requirements and impact fee programs.

The San Francisco Department of Public Health (SFDPH) developed a Bicycle Environmental Quality Index (BEQI) and a Pedestrian Environmental Quality Index (PEQI). These indices consider a wide variety of facility characteristics and quantify how well the facility is serving pedestrians or bicycles. These scores can help jurisdictions to prioritize capital investments.

The PEQI and BEQI were developed using a survey of available research on how different roadway environments affect pedestrians and bicyclists. Both the PEQI and the BEQI use a field observation in conjunction with other data to determine an overall score for the facility. The PEQI has a total of 30 variables while the BEQI has 22, as shown below.

INTERSECTION	*STREET SEGMENT*			
Intersection Safety	**Traffic**	**Street Design**	**Land Use**	**Perceived Safety**
Crosswalk	Number of lanes	Sidewalk width	Storefronts/retail use	Illegal graffiti
Ladder crosswalk	Two-way traffic	Sidewalk impediments	Public art/historical sites	Litter
Pedestrian signal	Vehicle speed limit	Sidewalk obstructions		Pedestrian scale lighting
Traffic signal	Traffic volume	Presence of curb		Construction sites
Crossing speed	Traffic calming features	Driveway cuts		Abandoned buildings
Crosswalk scramble		Trees		
No turn on red signs		Planters/gardens		
Traffic calming features		Public seating		
Additional signs for pedestrians		Presence of buffer		

Figure 8. Source: Pedestrian Environmental Quality Index (PEQI) Draft Methods Report v 1.1, 2008.

Table 2. BEQI Indicators by Bicycle Environmental Domain

INTERSECTION	STREET SEGMENT			
Intersection Safety	**Vehicle Traffic**	**Street Design**	**Safety**	**Land Use**
Left Turn Bicycle Lane	Number of Vehicle Lanes	Presence of a Marked Area for Bicycle Traffic	Bicycle/Pedestrian Scale Lighting	Line of Sight
Dashed Intersection Bicycle Lane	Vehicle Speed	Width of Bike Lane	Presence of Bicycle Lane Signs	Bicycle Parking
No Turn on Red Sign(s)	Traffic Calming Features	Bicycle Lane Markings		Retail Use
	Parallel Parking Adjacent to Bicycle Lane/Route	Trees		
	Traffic Volume	Connectivity of Bicycle Lanes		
	Percentage of Heavy Vehicle	Pavement Type/Condition		
		Driveway Cuts		
		Street Slope		

Figure 9. Source: Bicycle Environmental Quality Index (BEQI) Draft Report, 2009.

Most of the data is collected by observation at an intersection or street segment, using a two-page survey with simple questions. Other data is also required, including traffic volumes, grade, and heavy vehicle percentage. SFDPH created a Microsoft Access database that takes the data from the field and other sources to calculate the overall score using varying weights for each indicator. The final score ranges from zero to 100, with 100 denoting the highest quality facilities and zero denoting the poorest quality facilities.

San Francisco has also tried to use the concept of Auto Trips Generated (ATG) in its development review. This method assumes that each new auto trip is an incremental impact to the network. The concept is aimed at balancing objectives to consider the public right-of-way as a space for all modes rather than strictly as a facility for vehicles. However, the City ran into challenges demonstrating the nexus to the mitigation it proposed and is now reconsidering if there is another way to achieve its goal.

Fort Collins, Colorado

The City of Fort Collins has developed a multimodal LOS system that essentially functions as a concurrency management system. Fort Collins was on the forefront of this approach, developing its program in 1997. These standards are used for long-term planning as well as part of the development review process (which is similar to regulatory concurrency).

Transit LOS is based on four factors: hours of weekday service, weekday frequency of service, travel time factor (the ratio of transit travel time to auto travel time), and peak load factor (the ratio of passengers to seats). The City sets two sets of thresholds depending on the area in question. Mixed use centers and commercial corridors have more stringent thresholds than outlying areas. The number of conditions met and the distance to the transit route determine which LOS grade is achieved as shown in the figure below.

Figure 10. Source: Fort Collins Multimodal Transportation Level of Service Manual, 2002.

Figure 1. Public Transit LOS -- Standards and Ratings

service level standards: (by 2015)	mixed use centers and commercial corridors	remainder of service area
Hours of weekday service	18 hours	16 hours
Weekday frequency of service	15 min	20 min
Travel time factor	2.0 X	2.0 X
Peak load factor	≤ 1.2	≤ 1.2

LOS ratings:	number of service level standards met				
	all 4	3 of 4	2 of 4	1 of 4	none
areas within 1,320' of transit routes	A	B	D	E	F
areas within 2,640' of transit routes	B	C	D	E	F

Fort Collins sets thresholds for five distinct typologies for pedestrian LOS. Each measure has a different standard, rather than aggregating the measures into a single standard. Pedestrian LOS is based on five standards:

- Directness – defined as the ratio of actual walking distance via sidewalks or pathways to minimum walking distance as measured on the street grid. Continuous sidewalks along the grid system represents the ideal condition; LOS A is defined as having a ratio less than 1.2 while LOS F is defined as having a ratio greater than 2.

Figure 11. Source: Fort Collins Multimodal Transportation Level of Service Manual, 2002.

Figure 2
Pedestrian Level of Service by Location Area Type

factors / area type	directness	continuity	street crossings	visual interest & amenities	security
pedestrian district	A	A	B	A	A
activity center/corridor	B	B	B	B	B
transit corridor	B	B	B	C	B
school walk area	B	B	B	C	B
other	C	C	C	C	C

- Continuity – qualitative measure. For example, LOS C is defined as "continuous stretches of sidewalks which may have variable widths, with and without landscaped parkways."
- Street crossings – Four types of crossings are defined (signals, unsignalized crossing the major street, unsignalized crossing the minor street, and mid-block major street crossing), each with their own LOS thresholds. For example, LOS A on a signalized crossing is defined as "three or fewer lanes to cross; signal has clear vehicular and pedestrian indications; well-marked crosswalks; good lighting levels; standard curb ramps; automatic pedestrian signal phase; amenities, signing, sidewalk, and roadway character strongly suggest the presence of a pedestrian crossing; and drivers and pedestrians have unobstructed views of each other."
- Visual Interest and Amenity – qualitative measure. For example, LOS B is defined as "generous sidewalks, visual clarity, some street furniture and landscaping, and no blank street walls."
- Security – qualitative measure. For example, LOS A is defined as "sense of security enhanced by presence of other people using sidewalks and overlooking them from adjacent buildings. Good lighting and clear sight lines."

Bicycle LOS is based on the concept of connectivity to bike facilities, as shown in the following figure. Again, areas have different LOS standards based on their character.

Figure 3. Bicycle LOS Standards

connectivity required for levels of service:

A	directly connected to both North-South and East-West on-street lanes
B	directly connected to both North-South and East-West corridors at least one of which is a set of on-street lanes
C	directly connected to either a North-South or an East-West corridor which is a set of on-street lanes
D	directly connected to either a North-South or an East-West corridor which is an off-street path
E	indirectly connected via an on-street unstriped route along a low volume local street to one or more of the above within 1/4 mile
F	no direct or indirect connections to either North-South or East-West corridors

minimum LOS

base city-wide minimum level:	C
public school sites:	A
recreation sites:	B
community/neighborhood commercial centers:	B

Figure 12. Source: Fort Collins Multimodal Transportation Level of Service Manual, 2002.

Auto LOS is defined using volume-to-capacity ratios with standards varying based on the functional classification of the roadway and the type of neighborhood.

Figure 4. Motor Vehicle LOS Standards

roadway functional classification	land use (from structure plan)			
		Other Corridors Within:		
	Commercial Corridors	Mixed Use Districts	Low Density Mixed Residential	All Other Areas
Major Arterial	E	E*	D	D
Arterial	E	E*	D	D
Minor Arterial	E	E*	C	D
Collector	D	D*	C	D
Connector		C*	B	C

* Corridors within mixed use districts may fall below the LOS level indicated. In such cases, the City will provide for mitigation of congestion through alternatives to motor vehicle travel.

Figure 13. Source: Fort Collins Multimodal Transportation Level of Service Manual, 2002.

Fullerton, California

The City of Fullerton, California recently completed an update to its General Plan (currently pending approval by the City Council) that includes a multimodal LOS requirement to evaluate project impacts during the CEQA process. The City is using the Fort Collins methodology for pedestrians, bicycles, and transit and the traditional HCM intersection delay methodology for autos. The City identifies a single threshold, but the standard is applied to whichever mode has been designated as the prioritized mode on a given corridor. This modal prioritization is based on a layered network that was developed as part of the City's General Plan update. A significant impact would be identified if the project would:

> *Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit as defined below:*
>
> - *Degrades levels of service for prioritized modes from an acceptable LOS D or better to LOS E, or F; or*
> - *Increases use of a facility operating at an unacceptable LOS.*
>
> *For non-prioritized modes within the City, LOS F shall be considered an acceptable operating level. For Caltrans' facilities or facilities outside the City of Fullerton, the respective guidelines and thresholds shall apply of the operator of the study facility, if available. If not available, the City of Fullerton methodology shall apply.*

Fullerton's approach is similar to a project-based regulatory concurrency program in Washington state. In Fullerton, all projects or actions that would require a discretionary action by the City Council would trigger the CEQA review. If a project impacts multimodal LOS, the project must mitigate the impact to a less-than-significant level, which could require the construction of multimodal improvements. One potential drawback to this method is that it can be difficult to demonstrate that a project increases the use of a facility operating at an unacceptable LOS, particularly for walking and cycling on facilities located away from the immediate vicinity of the project. Proportionally allocating costs (which is a requirement of any mitigation program) may also be difficult in the absence of a travel model that can predict the pedestrian and bicycle usage of a facility.

Carlsbad, California

The City of Carlsbad, California has developed a multimodal LOS methodology to guide development of its long-range transportation plan. Carlsbad has intentions to adapt the multimodal LOS method into a multimodal transportation impact fee program in the near future to streamline development review. As with other communities that have adopted multimodal LOS, Carlsbad has identified a layered network with priorities assigned to different modes. Below is a figure highlighting some of the transportation network typologies.

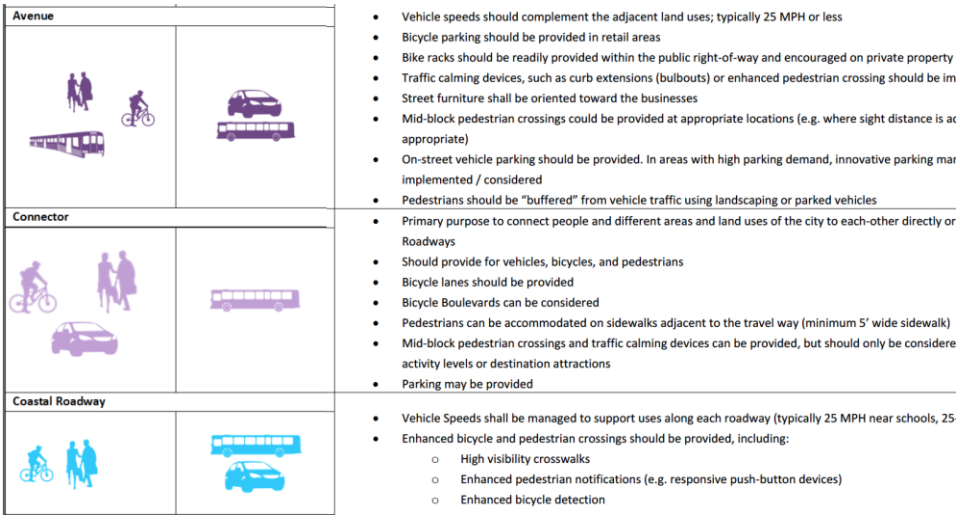

Figure 14. Carlsbad Livable Streets-Modal Priorities

As shown above, different street typologies have different modal priorities. The symbols in the leftmost column represent the prioritized modes, while the symbols in the right column represent modes that are accommodated, but not prioritized. Note that Coastal Roadways, which are right-of-way constrained streets along the coast, prioritize pedestrian and bicycle travel, while accommodating cars and transit. Carlsbad's General Plan identifies a LOS standard of D for all prioritized modes and some minimum design criteria are also specified. The ultimate transportation network in the General Plan was developed to meet the LOS D standard for the prioritized modes and potential project impacts are assessed against the multimodal LOS thresholds.

Auto LOS is analyzed using traditional HCM intersection methods.

The pedestrian, bicycle, and transit LOS methodology is similar to ARTPLAN from FDOT or the 2010 HCM methods in that LOS is based on a points system for each facility. The total points, which will range from 0 to 10, correspond to traditional LOS letter grades, as shown below. However, unlike ARTPLAN or the 2010 HCM, the points system is highly customized to Carlsbad and issues such as high traffic speeds or volumes do not degrade pedestrian or bicycle LOS[5].

MMLOS Point System and LOS Rating	
Point Score	**LOS**
9.0-10	A
8.0-8.99	B
7.0-7.99	C
6.0-6.99	D
5.0-5.99	E
0-4.99	F

The pedestrian level of service criteria and point system for a pedestrian prioritized street are outlined below:

- Number of lanes (including travel lanes and turn lanes) at a pedestrian crossing
  - 4 points for roads with two lanes or fewer; or
  - 3 points for roads with three lanes; or
  - 2 points for roads with four lanes; or
  - 1 point for roads with five lanes; or
  - 0 points for roads with more than five lanes
- Crossing Quality
  - 0.5 points for presence of a pedestrian refuge
  - 0.5 points for well-marked crossways and mid-block crossings at safe and convenient locations

[5] A major criticism of ARTPLAN or the 2010 HCM multimodal LOS method is that pedestrian and bicycle LOS is heavily influenced by traffic conditions on the adjacent road. While traffic speeds and volumes are important considerations, for major roads, traffic volumes can dominate the calculation, making it impossible to improve pedestrian or bicycle LOS. A road like NE 8th Street or Bellevue Way, even with wide tree-lined sidewalks and good adjacent urban form would end up scoring poorly with this method.

    - 0.5 points signing, striping, sidewalks, and other elements that suggest the presence of a pedestrian crossing
    - 0.5 points for Rectangular Rapid Flashing Beacons at an uncontrolled crossing
    - 0.5 points for drivers and pedestrian having unobstructed views of each other
    - 0.5 points for posted speeds of 25 miles per hour or less
    - 0.25 points for posted speeds of 30 miles per hour or less
- Other Elements
    - 1 point for active building frontages
    - 0.5 for pedestrian lighting at night
    - 0.5 points for street trees and/or quality street furniture facing the land uses
    - 0.5 points for twinkle lights in trees along the corridor
    - 0.5 points for sidewalks that are at least ten feet adjacent to retail, at least six feet adjacent to residential uses, or at least eight feet everywhere else
    - 0.5 points for a sense of security by the presence of other people and clear sight lines
    - 0.5 points for on-street parking and/or landscaping as a "buffer" from vehicle traffic and pedestrian walkway.

The bicycle level of service criteria and point system for bicycle oriented streets are outlined below:

- Type of bicycle facility
    - 6 points for multiple bicycle facilities (e.g. a bike path and bike lanes or something similar) along the corridor; or
    - 5 points for a Class I facility (off-street path) or a Class II facility (on-street bicycle lanes) with a bicycle buffer (e.g. striped median buffering the bicycles from the vehicles either on the right side or left side of the bike lane depending on if parallel parking exists); or
    - 4 points for a Class II facility that incorporates a painted lane that is at least 6 feet wide and signage or a Class III facility (bike route designated by signage only) that incorporates sharrows; or
    - 3 points for Class II bike lanes that are under 6 feet wide or a Class III facility
- Connectivity – 0.5 points if it is directly connected to bicycle facilities in all four directions at intersections
- Amenities
    - 0.5 points if bicycle racks are provided along roadway segment corridor
    - 0.5 points if signage is provided
    - 0.5 points for bike-friendly intersections (e.g. bicycles are not trapped by right-turn lanes, there is space for bicycles to bypass the vehicle queue, etc.)
    - 0.5 points for enhanced bicycle detection or video detection at an intersection
- Other Elements
    - 0.5 points for posted speed limits of 25 miles per hour or less
    - 0.25 points for posted speed limits of 30 miles per hour or less

  0.5 points for good pavement conditions

- Adjacent Vehicle Parking
    - 1.5 points for no parking along the street; or
- 1 point for backed-in angled parking; or 0.5 points for parallel parking

The transit level of service criteria and point system for a transit prioritized street are outlined below:

- Right of Way
    - 0.5 points for dedicated right of way for transit only
- Service
    - 1.5 points for at least 15 minute headways during the peak hours
    - 1 point for at least 30 minute headways during the peak hours
    - 0.5 for at least 60 minute headways during the peak hours
    - 1.5 points for good on-time performance
    - 1.5 points if the route provides for a single transfer to reach of the Coaster stations
- Visual Interest, adjacent land use and Amenity
    - 0.5 points for covered bus stops
    - 0.5 points for a bench
    - 0.5 points for a well-lit stop that provides a sense of security
- Other Elements
    - 0.5 points for a corridor that has transit preemption to reduce delays
    - 0.5 points for routes that have available seats on the bus
    - 0.5 points for the availability to directly access multiple routes (e.g. the stop serves more than one bus route)
    - 1 point for bike parking availability at the bus stop
    - 1 point for buses that provide on-board bike racks

Carlsbad's system combines standard and well-understood auto LOS methods with customized LOS methods for the other modes. The key for this system is the layered network and prioritized mode concept, which addresses potential issues where improving the LOS of one mode compromises the LOS of another. While this framework has proven useful for long-range planning, it is relatively untested for development review. Translating this type of program into a Washington-style regulatory concurrency program would also require some additional thought; but systems like Redmond's and Bellingham's could work with this general framework.

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FEHR PEERS

MEMORANDUM

Date: December 4, 2013

To: Kevin McDonald, City of Bellevue

From: Chris Breiland and Don Samdahl, Fehr & Peers

Subject: Policy Options for Multimodal LOS

Policy direction regarding multimodal level of service (LOS) is needed for concurrency and long-range planning purposes to expand documenting, reporting and analysis to consider a full range of mobility options in a comprehensive manner.

Key Issue:

Should City staff investigate multimodal LOS to plan for a transportation system that meets the long-term transportation and land use goals outlined in the Comprehensive Plan?

- No; retain the current LOS methodology of vehicle-to-capacity (v/c) ratios at system intersections with vehicle LOS standards set according to land use context and transit service in 14 Mobility Management Areas. For long range planning retain the current use of average vehicle delay in seconds at intersections and averaged across the appropriate geography (Downtown Subarea for instance)
    - The current system implicitly accounts for multimodal improvements since additional non-auto travel reduces demand for auto travel
- Yes; identify that a multimodal LOS framework that explicitly defines a LOS methodology and target for non-auto modes is potentially more effective than the current system.

Assuming multimodal LOS is to be investigated further, additional policy options must also be considered. If the current LOS methodology is to be retained, other policy options are also relevant (see the end of this memo).

Policy Options and Questions for Multimodal LOS

- Which mobility options should be considered in a multimodal LOS framework?
    - Private vehicles
    - Transit
    - Pedestrians
    - Bicycles
- Recognize mobility options strategies that vary by geography (MMAs for instance)
- Which multimodal LOS methodology is most appropriate for Bellevue? Some options are below:
    - Quantitative method similar to ARTPLAN or HCM 2010 MMLOS, but tailored to Bellevue
        - Pros: Can help to determine the types of facilities that are appropriate in the future, particularly as land use patterns and densities change.
        - Cons: this would require a detailed evaluation of factors that are relevant to Bellevue, subject to data availability and issues related to illogical output; may require updated to modal and sub-area plans if quantitative analysis identifies other improvement projects.
    - Simple qualitative method for instance, a "red-yellow-green" system.
        - Pros: Can be informed by existing modal plans (Transit Master Plan, Pedestrian and Bicycle Transportation Plan) and sub-area plans; will be consistent with existing plans.
        - Cons: Method is not dynamic to unexpected changes in land use or travel patterns; for example, this method cannot answer the question of: Given the land use and travel characteristics, what pedestrian and bicycle system is most appropriate—this must be pre-determined.
    - Target-based system, for example, mode split, per capita VMT target, average commute trip length (time).
        - Pros: Outcome driven; projects are selected to best meet the specified targets.
        - Cons: Targets will need to be iteratively adjusted to balance inherent conflicts between the targets (e.g., increasing auto speeds runs counter to increasing transit mode share) and financial constraints. This approach makes the most sense if targets are separately identified for different areas in the city (e.g., Downtown Bellevue, Eastgate, etc, or by Mobility Management Area).
        - Some improvements to a target-based system include better definition of how different modal investments advance mobility objectives in an

area. This should help to meet the goals of vehicle mobility while also helping to move toward a less vehicle-oriented program over time.

- Identify a citywide "layered network" that defines modal priorities for each main roadway within the City. This is similar to the Downtown Subarea street hierarchy concepts of auto biased, transit biased, etc.
    - Consider a generic set of facility definitions for the layered network; e.g., a bicycle oriented street includes substantial bicycle amenities such as a cycle track or buffered bike lane.
    - Consider several specific typologies for unique corridors, such as:
        - NE 16th Street in Bel-Red
        - NE 6th Street Pedestrian Corridor
        - NE 6th Street HOV/HOT lane Extension across I-405
        - Main Street in Old Bellevue
- Define multimodal LOS targets for the layered network and for different areas of the City – by subarea or mobility management area. Consider setting (describing) conditions (and/or locations) where vehicle LOS F would be acceptable. For example, consider developing "ultimate facility" definitions, which is a condition where no further right-of-way will be dedicated to vehicles. If a facility reaches an ultimate facility buildout, then only non-widening improvements will be considered to improve vehicle LOS or to provide additional person through-put capacity (transit enhancements - TSP, queue jumps, BAT lanes, etc. - and/or bicycle and pedestrian facility enhancements).
- Craft a plan-based multimodal concurrency policy that forwards the City's goals. The policy need not be rooted in the same LOS targets that facilitate long-range planning, but a logical link to the long-range planning should be drawn. Consider a system that provides the City the flexibility to implement multimodal projects based on Bellevue's land use and mobility priorities. Consider a zone-based concurrency system like the current mobility management areas, but let the land use and long-range transportation plan determine the shapes and sizes of the zones.

Policy Options for Retaining the Current System

- Revise the v/c-based LOS thresholds be update to reflect the City's "abundant access" transit service vision and future changes in land use
- Revise the MMA boundaries to reflect existing conditions or future land use changes
- Slightly revise v/c to explicitly consider transit capacity (at least on major transit corridors)

MULTIMODAL LONG-RANGE PLANNING, LEVEL OF SERVICE, & CONCURRENCY

Chris Breiland & Don Samdahl, Fehr & Peers

OUTLINE

- Background:
  - Level of Service
  - Multimodal Level of Service
  - WA State Requirements
- State of the Practice
  - Bellevue
- State of the Art
  - Washington
  - National
- Discuss Policy Options

BACKGROUND

Level of Service

- Description of the quality of the transportation system
  - How convenient is it to travel?
    - Autos: speed and ability to maneuver
    - Transit: frequency, span of service, crowding, amenities
    - Pedestrian and bicycle: directness, major street crossings, comfort
- Auto LOS is usually the only measure evaluated
  - Historic bias
  - Limited value of other mode LOS output
- Renewed interest in Multimodal LOS

MULTIMODAL LEVEL OF SERVICE

Why Multimodal LOS?

- You can't address what you don't measure
- Recognize tradeoffs between LOS for different modes
- Encouraged by State and Regional bodies
- Better transportation planning
  - Ideal: Provide basis for planning and implementing transportation facilities

WASHINGTON LEGISLATION ON LOS

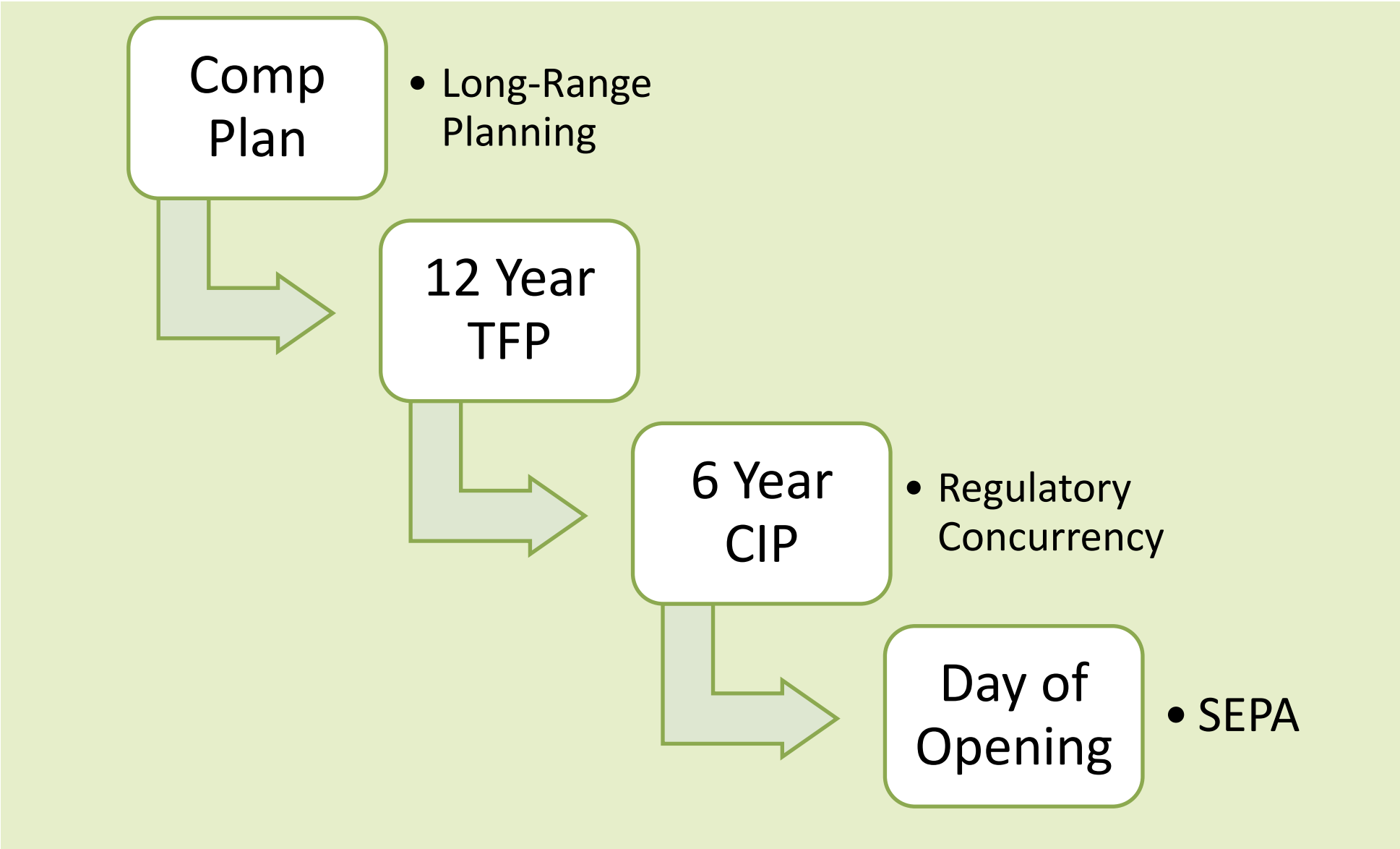
Growth Management Act

- Comprehensive Plan transportation element
  - Must define LOS for transportation
  - Must include multimodal elements
    - Modal plans
  - Defined as "long-range planning"

- Concurrency Requirement
  - Transportation LOS must be maintained concurrent with development
  - Auto and transit LOS standards are required
  - No requirements for other modes; but encouraged
  - Defined as "regulatory concurrency"

Planning the system	Implementing the system

LOS AS A PLANNING TOOL IN BELLEVUE



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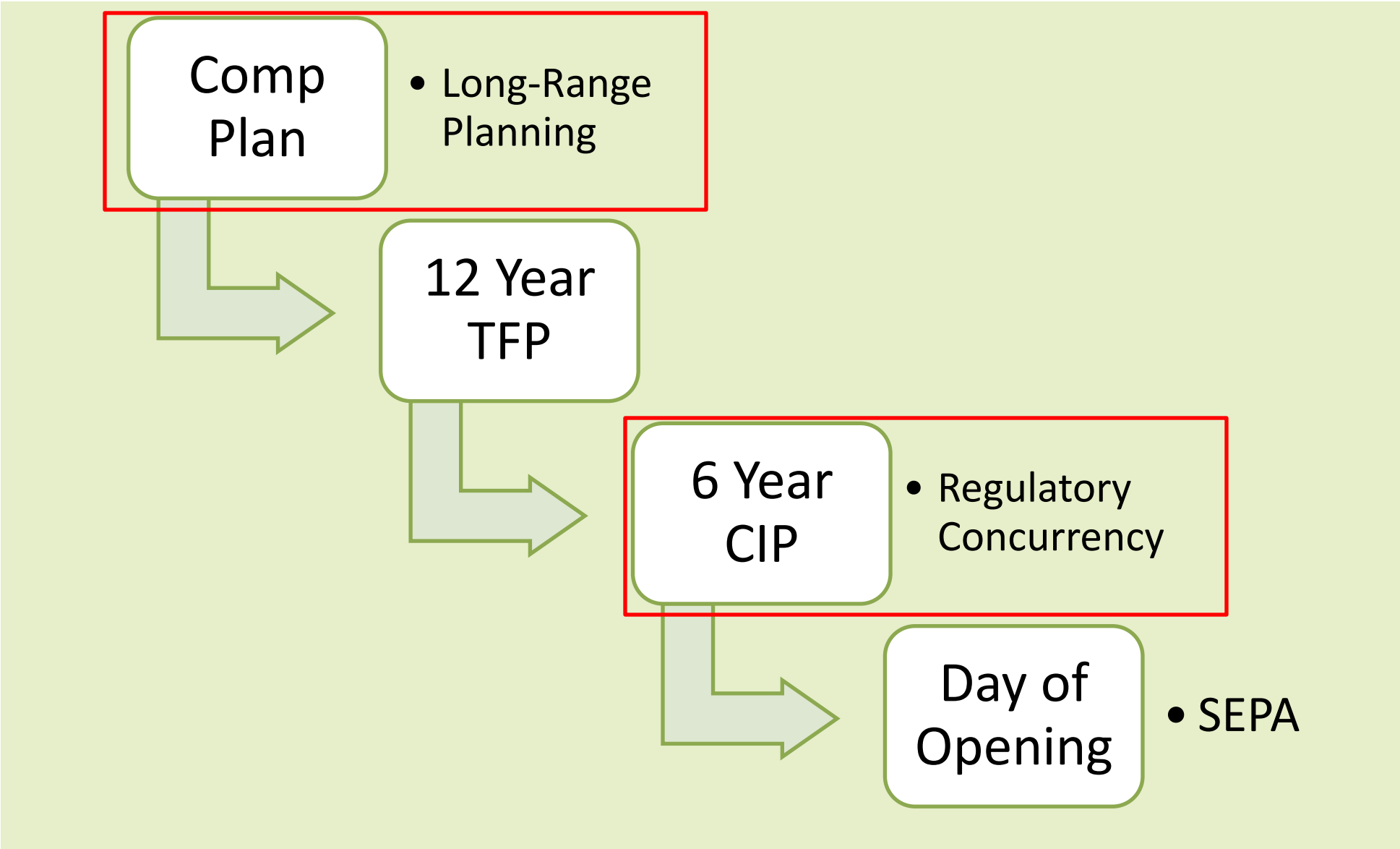
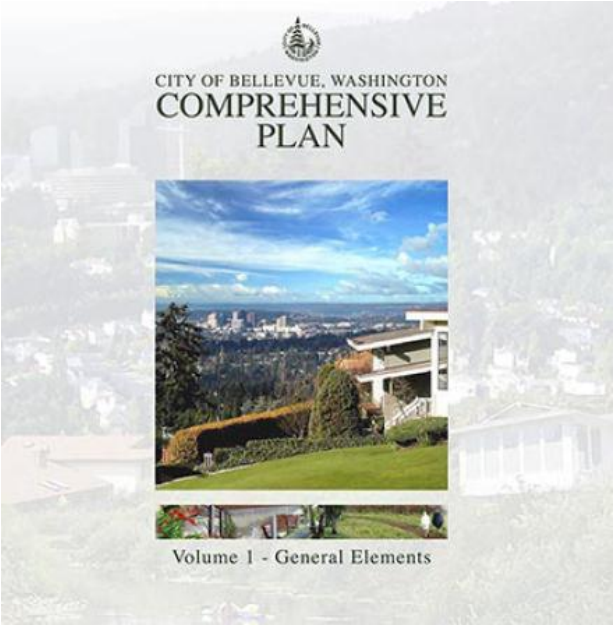


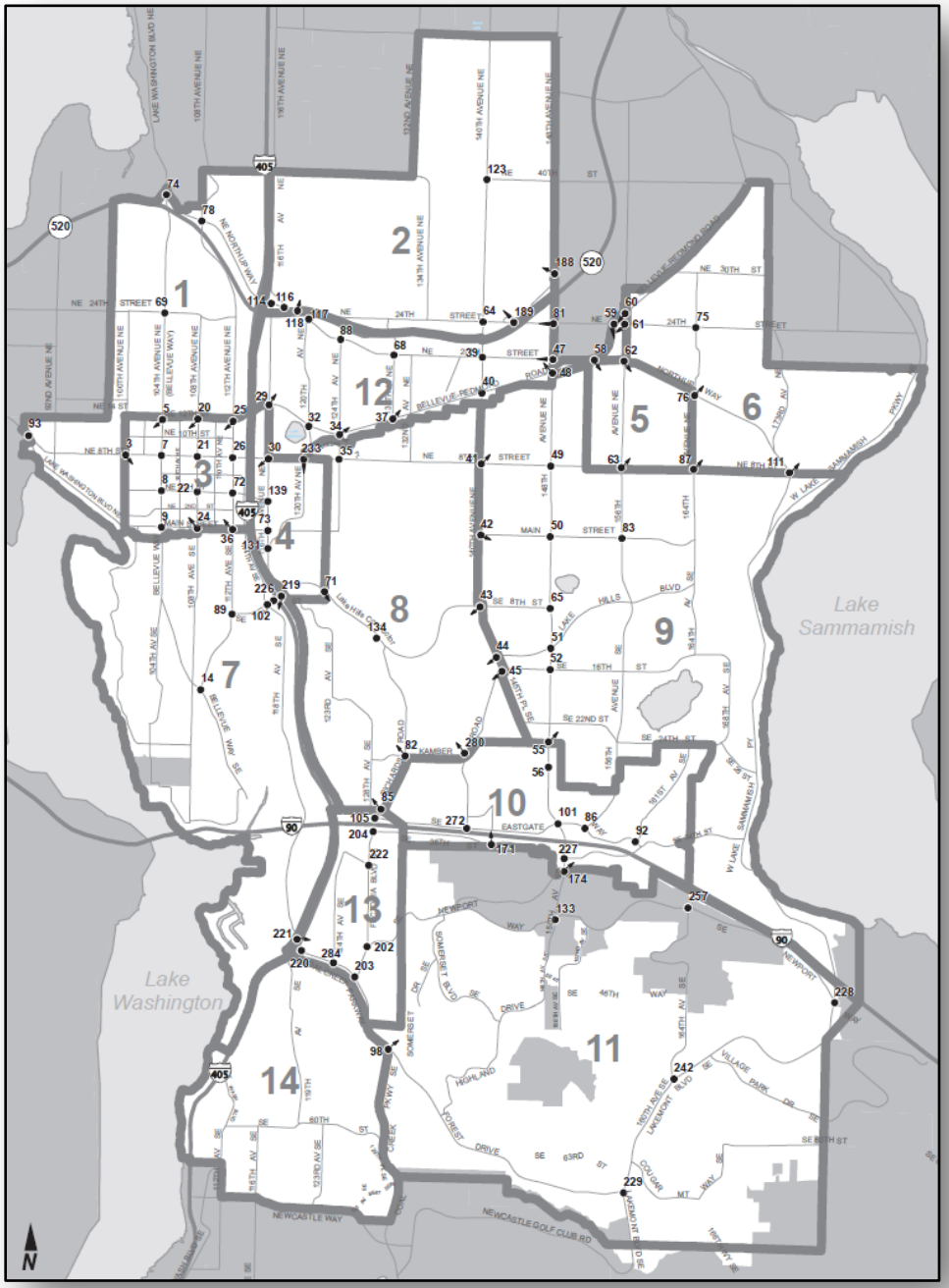
LONG-RANGE PLANNING

- Comprehensive Plan:
  - Auto: PM peak hour Auto LOS targets by MMA
  - Mode split goals for commute trips
  - Transit Master Plan
    - Frequency targets for different areas of the city
  - Pedestrian and Bicycle Plan
    - Mid and Long-term system completion targets



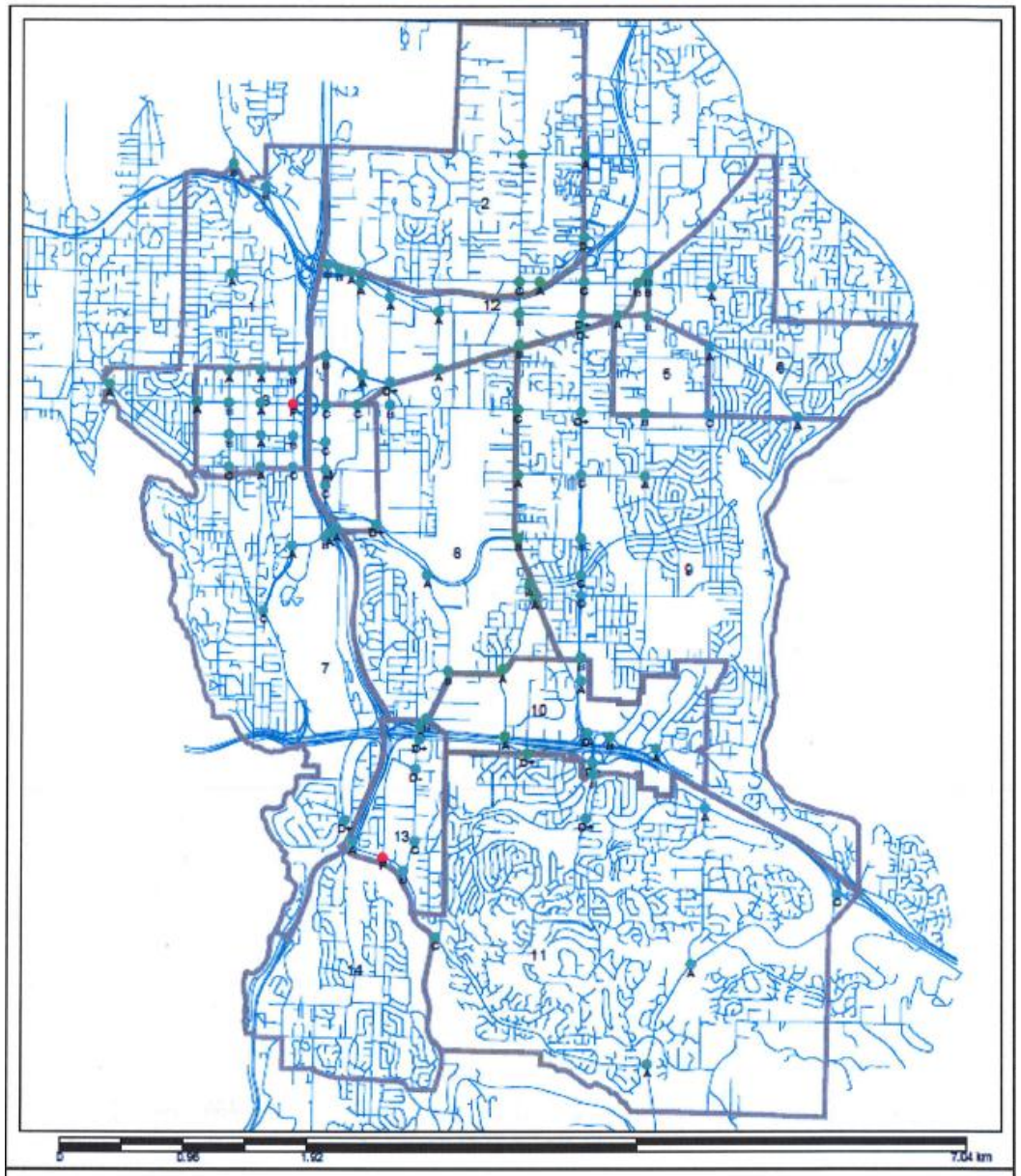
TRANPORTATION CONCURRENCY

- Traffic Standards Code
- Methodology: PM peak period auto LOS evaluation in MMAs
  - Uses travel model output
  - Analyzed by City staff
  - Automated process
- Generally a “project-based” system
  - Each development application is reviewed
  - CIP is also reviewed periodically



BELLEVUE: CRITIQUE OF CURRENT PRACTICE

- Long Range Planning: Mix of typical and leading-edge practice
  - Auto planning: traditional LOS based, MMAs recognize differences in the city; balance wider roads with other neighborhood values
  - Transit planning: correlating frequency with demand; excellent performance metrics; no LOS targets
  - Ped and Bike: Good data availability; typical planning; are connections available? No LOS targets
- Concurrency: Generally typical practice
  - Auto LOS only
  - MMAs recognize differences in city
  - Automated
  - Project-based

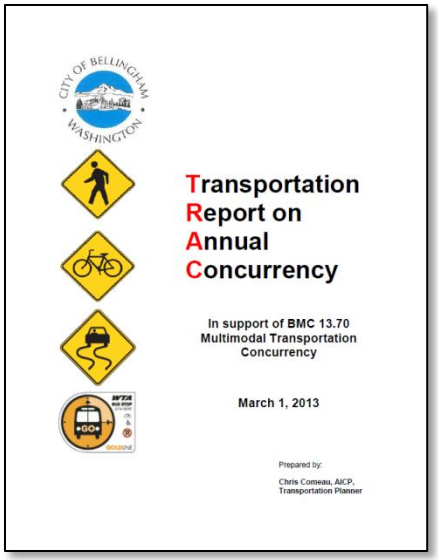


2012 PM PK 2hr Avg HCM209 LOS

Prepared by Bellevue Transportation Modeling Group

WASHINGTON STATE: STATE OF THE ART

- Bellingham and Redmond have implemented multimodal concurrency programs. No explicit use of multimodal LOS. Redmond has identified a range of multimodal planning "targets."
- Burien has adopted a simple multimodal LOS methodology that is used in long-range planning, but traditional auto LOS is used for concurrency.
- Tukwila has analyzed multimodal LOS at citywide level for long-range project prioritization, but not yet adopted any specific standards or targets in the Comp Plan nor a multimodal concurrency program.



BELLINGHAM, WA

Long-range plan developed in a traditional way using auto LOS and system completion for ped/bike

Quantifies the number of person trips available (PTA) by mode. The city determines the total pool of PTA within each of the 15 concurrency service areas and new development draws against the pool until it is exhausted.

Auto and transit PTA determined by comparing available capacity to observed auto counts and transit ridership. Pedestrian and bicycle PTA determined based on proportion of network completed.

Different weights – called policy dials – applied to each mode to direct development to areas the city identified as being most appropriate for growth. Also provides some bias to facility implementation. The PTA are updated annually.

Advantages

- Applicable for both long-range planning and regulatory concurrency
- Current demand is based on observed data
- LOS can be improved by improving any modal facility

Disadvantages

- Requires substantial data collection to calculate PTA
- Requires assumption about future transit service levels
- Concurrency approval tied to uncontrollable resource (transit)
- No explicit multimodal LOS evaluation

REDMOND, WA

Long-range plan developed in a traditional way, but multimodal performance targets were established based on the expected results of the plan. Targets used to track progress of plan implementation and may be used for future plan development.

Multimodal concurrency: Mobility units are equivalent to person miles traveled. Completed infrastructure provides mobility units and new development consumes mobility units. Each new development draws against the pool of mobility units until it is exhausted. Pool replenished with new transportation projects.

Trip generation element is very important. Recognizes lower mobility unit consumption in urban areas

Advantages

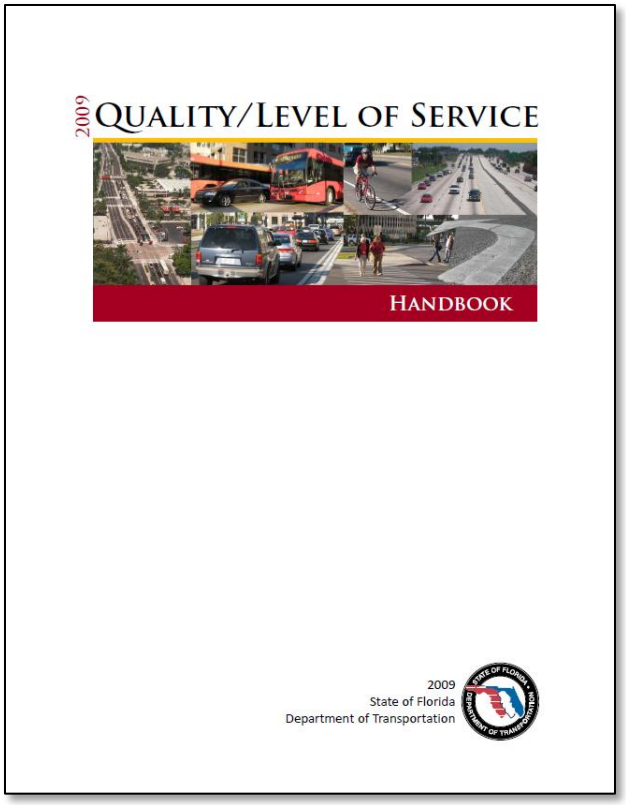
- Plan-based multimodal concurrency system
- Applicable for both long-range planning and regulatory concurrency
- Transparent multimodal performance targets
- Total mobility units don't change until Comp Plan update
- Any modal improvement can increase available mobility units

Disadvantages

- Mobility unit assumptions for individual projects based on cost rather than capacity – this tends to favor expensive (auto) projects
- No explicit evaluation of multimodal LOS

NATIONAL BEST PRACTICES

- Florida DOT
  - Only other state with concurrency requirements
  - Data intensive software program
  - Only implemented in a handful of smaller cities
- Ft. Collins, CO
- San Francisco, CA
  - BEQI and PEQI environmental quality indices
  - Auto trips generated (ATG)
- Carlsbad, CA
  - Simple checklist system
  - Layered transportation network
- HCM 2010
  - Data intensive and problematic results



FLORIDA DOT – REGRESSION MODELS

Summary

Software program (ARTPLAN) that uses regression models to evaluate LOS for pedestrians and bicycles.

LOS for pedestrians considers sidewalks, separation from autos, auto volumes, and auto speeds.

LOS for bicycles considers width of the outside lanes, auto volumes, auto speeds, truck volumes, and pavement conditions.

LOS for transit is determined solely by service frequency.

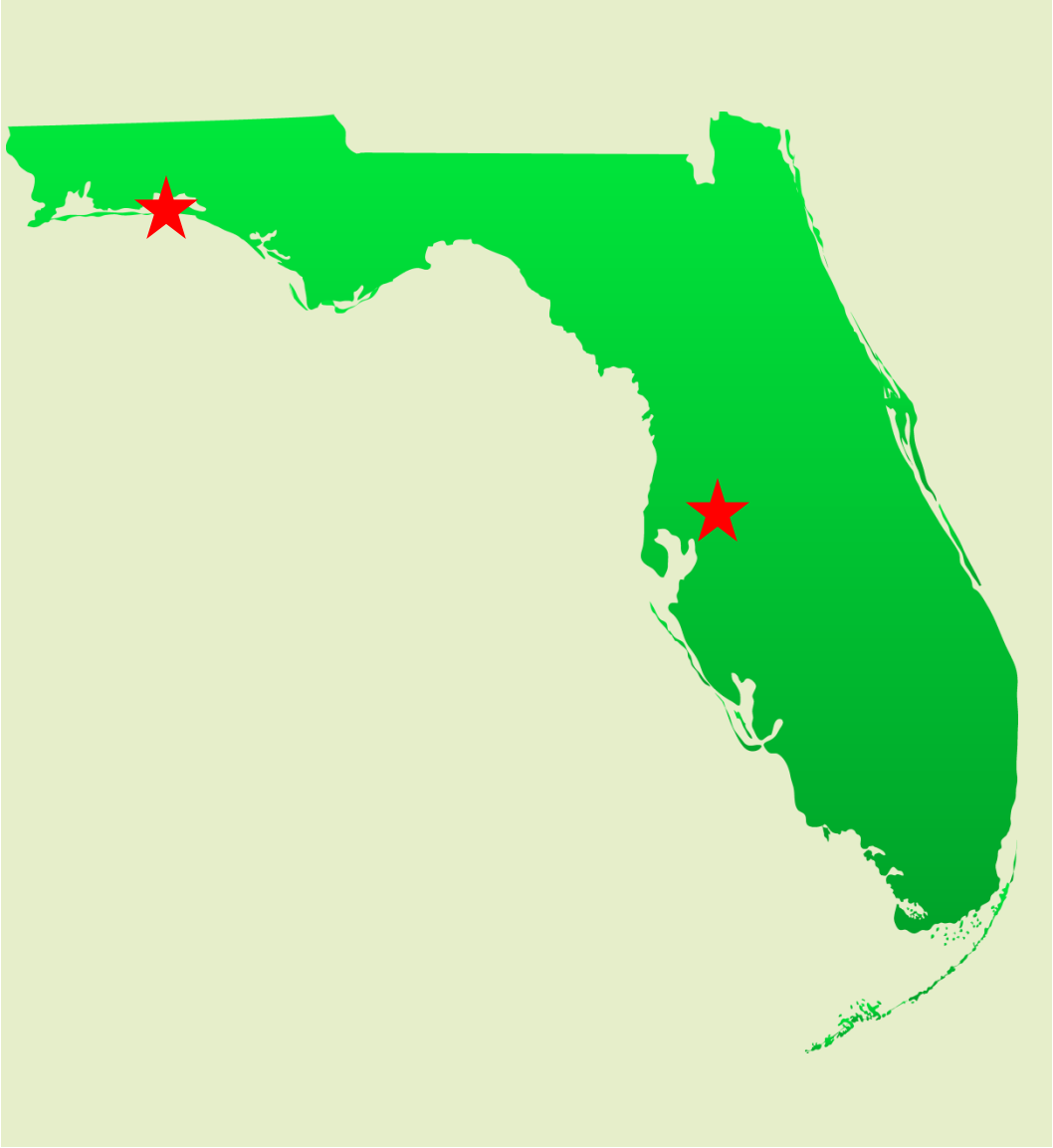
Advantages

- Strong quantitative foundation for pedestrian and bicycle analysis
- Helps prioritize capital investments

Disadvantages

- Requires substantial data collection
- May not be able to develop projects to address pedestrian & bike LOS deficiencies
- Regulatory concurrency may be challenging

FLORIDA MULTIMODAL CONCURRENCY



- Only implemented in Destin and Temple Terrace (beach town and suburb)
- Was partially implemented in Miami-Dade and Broward Counties but discontinued
- New Transportation Concurrency Exemption Areas are now more popular
  - Downtown area
  - Transit area

DESTIN MULTIMODAL CONCURRENCY

	BICYCLE	PED	BUS
Adopted (2006)	C	E	F
Adopted (2011)	B	C	E
Adopted (2020)	B	B	C

City of Destin MMTD Concurrency Evaluation Certificate: Old Destin MMTD, Tier 3

Project Name

Net PM peak hour trips (excluding credits for existing trips)

	Standard met? Yes, No, or N/A		Point value per standard	Points earned per Yes or N/A: Basic requirement	Points earned per Yes or N/A: Flexible requirement	Points earned per Yes or N/A: Basic/flexible Multiplier	Points earned per Yes or N/A: A. Standard points earned	B. Points required	C. Mitigation points earned
Pedestrian-oriented building design									
1. Buildings directly adjacent to sidewalk									
> 75% of frontage along public ROW	choose 1 only		20					40	
50% - 75% of frontage along public ROW			13						
25% - 50% of frontage along public ROW			7						
< 25% of frontage along public ROW			0			x 2 =			
2. Buildings directly adjacent to Harbor Boardwalk [1]									
> 75% of frontage along Harbor Boardwalk	choose 1 only		15					20	
50% - 75% of frontage along Harbor Boardwalk			10						
25% - 50% of frontage along Harbor Boardwalk			5						
< 25% of frontage along Harbor Boardwalk			0			x 2 =			
3. Building entrances oriented to public ROW			15			x 2 =		30	
4. Façade design									
a. Less than 100 feet of uninterrupted façade			5			x 2 =		26	
b. Transparency, primary ROW			5			x 2 =			
c. Transparency, secondary ROW (corner lot only)			3			x 2 =			

SAN FRANCISCO, CA – PEQI, BEQI & ATG

Summary

Environmental quality indices for pedestrians and bicycles. Regression models developed using a survey of available research.

The PEQI considers 30 variables and the BEQI considers 22 variables. Most of the data is collected in a field observation using a two-page questionnaire. Calculations are done using Microsoft Access. PEQI and BEQI are used for project prioritization and health impact analysis.

SF has used the Auto Trips Generated (ATG) concept for development review in the past. This simple method quantifies net new trips of a development and assumes each new trip is an incremental impact to the network.

Advantages

- Strong quantitative foundation for pedestrian and bicycle analysis
- Helps prioritize capital investments
- Automated calculation process
- ATG rooted in city's "transit first" policy

Disadvantages

- Requires substantial data collection
- ATG is not a long-range planning tool; not appropriate without modifications for many areas

FORT COLLINS, CO – MULTIMODAL LOS MANUAL

Combination

Summary

LOS criteria are a combination of qualitative and quantitative measures. “Look and feel” of traditional auto LOS.

Pedestrian LOS is based on route directness, continuity, street crossings, visual interest and amenities, and security.

Bicycle LOS is based on connectivity to bicycle facilities.

Transit LOS is based on hours of service, frequency of service, the ratio of transit travel time to auto travel time, and the ratio of passengers to seats.

Auto LOS is based on volume to capacity.

Advantages

- Used for both long-term planning and development review
- Requires minimal data collection
- LOS thresholds defined by district

Disadvantages

- Process is not straightforward
- Difficult to automate calculations
- Subjective analysis criteria

CARLSBAD, CA – POINT SYSTEM

Summary

Currently implementing a multimodal LOS system that assigns points based on characteristics of pedestrian, bicycle, and transit systems. Auto LOS uses traditional HCM methodologies.

Only used for planning-level purposes now, but the city plans to adapt the methodology into a development review and transportation impact fee program.

Advantages

- LOS thresholds defined for all modes; modal priority defined
- Helps prioritize capital investments
- Simple checklist process
- Points based on design standards
- Minimal subjective criteria

Disadvantages

- Nexus for fee program may be a challenge
- Regulatory concurrency not worked out yet

CONCLUSIONS

- Multimodal LOS is not generally used as a long-range planning framework either locally or nationally.
  - Difficulty in quantifying earlier LOS methods
  - Inability to match projects with LOS improvements
  - Difficulty to address modal LOS conflicts
  - Concerns over how to implement
- Newer multimodal LOS methods largely address these issues
  - Prioritize modes
  - Set variable LOS standards (time and location)
  - Define customized methodologies
- Multimodal concurrency is successfully implemented
  - Plan-based in WA
  - Project based in FL

POLICY OPTIONS DISCUSSION

Summary

Policy direction regarding multimodal mobility metrics is needed for concurrency and long-range planning purposes.

Ideas to consider:

Is the current LOS approach consistent with Bellevue's land use and transportation planning goals?

Yes; retain current v/c based system for long-range planning and concurrency

No; identify that multimodal LOS is a more appropriate analysis framework

POLICY OPTIONS DISCUSSION

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POLICY OPTIONS: MULTIMODAL LOS

Big Picture Issues

- Which modes to consider?
  - Private vehicle
  - Transit
  - Bike
  - Pedestrian
- Which MMLOS methods to consider?
  - Quantitative
  - Qualitative
  - Targets
- How to address modal priorities/conflicts?
  - Layered network
  - Modal priorities
  - MMA
- How to set LOS targets for long-range planning?
  - Iterative process
- Plan based or project based concurrency?

POLICY OPTIONS DISCUSSION

Summary

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Yes; retain current v/c based system for long-range planning and concurrency

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POLICY OPTIONS: RETAIN CURRENT SYSTEM

Big Picture Issues

- Is LOS target "correct"?
  - Review and refine LOS targets
  - Re-evaluate trip generation rates and trip lengths, particularly in urban areas
- Are MMAs the best idea; do boundaries need to be adjusted?
  - MMAs are considered a best practice, but they need not be fixed areas, could be an output of a model
  - How should we adjust MMA LOS targets?
- Are exemptions of LOS standards desirable? How to continue to invest in areas with an exemption in place?
  - Exemptions are gaining favor in Florida and California
- Should the concept of an "ultimate facility" be considered?
  - Similar to an exemption area, how do you address LOS issues on an ultimate facility?
  - How can other modes facilitate mobility?
  - Nexus issues?
- Should other "targets" be used to help guide multimodal investments to implement transportation vision?