THE CONCURRENCY CALCULATION PROCESS

CURRENT PROCEDURES AND POTENTIAL ALTERNATIVES

by

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THE CONCURRENCY CALCULATION PROCESS
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This report serves three functions. First, it meets the requirement for Technical Memorandum #2, a report on state, regional, and local concurrency systems and practices. Second, it fulfills the requirement for Technical Memorandum #4 on issues identification. Last, it presents an initial review of alternative approaches to changing or refining the concurrency practices currently used by some of the participating cities.

The first section of this report briefly describes how concurrency is calculated. The second section describes the limitations of those procedures and highlights important issues raised by project stakeholders that should be addressed in changes to the current system. The third section presents a preliminary review of alternatives that are being considered in the near term to replace or refine the current process. This specific list of alternatives was included in the original scope of work by the four cities. They are briefly analyzed for implementation in the near term. It is the project team's opinion that none of these solutions resolve the larger issues identified in the second section of this report. As a result, additional approaches to concurrency need to be considered by the four cities if they wish to resolve these issues. The fourth and final section of this report briefly identifies the primary subject areas that need further investigation if the project team is to develop functional alternatives to the current concurrency process that address the limitations identified in the second section of this report.

CURRENT CONCURRENCY PROCESS

This section describes how each city has implemented concurrency and how they approach its application. It summarizes their technical procedures, the standards they have adopted, and where concurrency fits into their planning process.

The four cities participating in this project use concurrency determination procedures that are similar in style and structure but that differ in technical execution. All four cities currently use a technical process that is driven by roadway level-of-service and that focuses primarily within local jurisdictional boundaries. (However, these boundaries can extend to neighboring jurisdictions when the development is located close to a border or causes obvious vehicle volume increases on roads in a neighboring jurisdiction.) Table 1 summarizes the concurrency procedures used by the four cities.

In all four cities, roadway level-of-service is computed as a function of roadway use (vehicle volume) and capacity. In addition, the level-of-service that is acceptable without violating the concurrency standard changes with geographic location within each city. Three of the four cities have adopted LOS standards that vary by geographic zone, with better levels-of-service required in some zones (usually residential areas) and more congestion allowed in other zones (usually those that are heavily commercial). Issaquah's LOS standards vary by arterial street classification, rather than by zone.

All four cities use two different basic sets of procedures for computing roadway level-of-service for determining transportation concurrency. One method is based on classic four-step modeling, while the second is based on physical vehicle volume counts and predicted trip generation for given developments. In both cases, vehicle volumes (estimated or measured) are input into algorithms that essentially predict level-of-service.

Table 1: Summary of Concurrency Procedures

City	Citywide Approach	Model Used	Project-Specific Approach	LOS Standard is Based On	Roadway Facility Type Used	Methodology	Time Period Used	Zonal v/c Standards Used?	Zonal v/c Ratios Accepted	Specific Facility Exemptions Allowed?	v/c Intersection Exceptions Allowed?	Multi-Modal?	Other
Redmond	Four-step model	BKR	ITE Trip Generation + Current Conditions	Roadway v/c	Intersection	Circ. 212	1 hour	Yes	0.85 – 0.95	Yes	Yes	Partly	Sum v / Sum c not average of individual v/c
Kirkland	Four-step model	BKR	ITE Trip Generation + Current Conditions	Roadway v/c	Intersection	Cir. 212	1 hour	Yes	0.98 – 1.116	Yes	Yes	Partly	No intersection can exceed a v/c of 1.4
Issaquah	Four-step model	T-Model	ITE Trip Generation + Current Conditions	Roadway v/c	Mid-block screenlines	(segments)	1 hour	No	0.85 – 3.18 (no zonal standard, only segment specific standards which vary by location)	Yes	Yes	Partly	Additional check for intersections exceeding baseline by more than 0.3 More direct incorporation of missing roadway features in computation of "c"
Bellevue	Four-step model	BKR	ITE Trip Generation + Current Conditions	Roadway v/c	Intersection	HCM	2 hour	Yes	0.80 – 0.95	Yes	Yes	Partly	No. of intersections allowed to exceed standard changes from zone to zone

These equations are taken from various editions of the Highway Capacity Manual and result in volume to capacity ratios (v/c) that are compared against standards adopted by the respective jurisdictions.

A brief description of these two types of procedures is presented below.

Four-Step Modeling

For longer term forecasts each of the four cities uses its four-step planning model to forecast traffic conditions. Inputs to the four-step model are current land uses (primarily households and employment); the current transportation system; forecast changes in households, employment, and transportation system improvements; and the fraction of trips made during the peak period. The modeling process computes trips generated (by mode), the approximate origins and destinations of those trips, and the transportation facilities used by those trips. From this process, the model computes roadway link-specific vehicle volumes, which can be compared with roadway capacity to estimate roadway level of service. (These outputs may also be further manipulated by cities (Bellevue is one) to better reflect specific turning movements, and to account for limitations in the road network detail maintained in the four step planning model roadway assignment.[1])

For predicting future conditions, the four-step model is calibrated against current conditions and then used to forecast changes in v/c ratios at roadway sections / intersections of interest. Model calibration is usually updated annually. Calibration is adjusted by refining model coefficients so that predicted roadway volumes match

[1] Four-step models do not include all roads and network details (such as accurate left turn delays at signalized intersections) in their roadway network descriptions. Consequently additional refinement of

measured volumes for major facilities within the city. Three of the cities use the same basic four-step model (the BKR model), and jointly participate in the previously described annual update process, while Issaquah uses a slightly different model.

All four cities use forecast control totals and system level inputs that are provided and/or agreed to at the regional level through the Puget Sound Regional Council (PSRC). PSRC also provides each city with a common set of regional transportation system improvements for specific forecast years. Each city notifies PSRC of transportation system improvements occurring within its boundaries so that these improvements can be passed along to other jurisdictions. PSRC also participates as a technical peer reviewer in critiquing the BKR model during the annual update process.

It is important to realize that the modeling process is not sensitive to a wide variety of factors that affect mode choice or vehicle volumes. For example, because the fraction of trips taken during any given period is an input to the modeling effort, shifts in the time of day during which trips take place that are caused by congestion are not accounted for directly.

In addition, the BKR mode split model used by three of the jurisdictions applies traffic analysis zone-specific transit fares. This means that the effects of building or development-specific travel demand management actions, such as subsidizing transit passes for employees or differential SOV parking costs, can not be directly modeled.

To account for these types of model limitations, the cities rely on their annual model validation and the resulting adjustments to the model calibration.

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model outcome is often performed to four-step model output in order to more precisely reflect traffic movements.

Direct Measurement Plus Generated Trips

For concurrency calculations estimated in response to specific development proposals, each city directly measures current vehicle volumes and then adds vehicle volumes predicted for the proposed development to those conditions. "Predicted vehicle volumes" for a given development are usually computed with the ITE Trip Generation rates. ITE rates are often modified to reflect promised travel demand management efforts or other mitigating circumstances.

As a result, the exact size and timing of the vehicle volumes generated by a new development are often the subject of negotiation between city staff and the developer, as relatively little standardized guidance is available on the effect of the different travel demand management options available to a developer. For example, a company constructing a new building might state that its staff will be working four 10-hour shifts a week, rather than five 8-hour shifts, with shifts starting at 5:30 AM and ending at 4:00 PM. This would be grounds for reducing the number of "peak hour" trips generated by this development, since one of the work trips would occur before the morning peak hour, and on one day per week, a work trip is removed from both peak periods. Exactly how significant a reduction in "peak hour" trips such a proposal might be worth would be the subject of negotiation.

Differences in Concurrency Procedures

While all four cities use the basic analysis process described above, there are a number of technical, procedural, and conceptual differences in their respective concurrency procedures. These differences reflect the four cities' different roadway conditions, their different levels of development, the roadway attributes they are trying to encourage, and the professional choices made by different staff charged with developing their respective concurrency systems.

All four sets of concurrency procedures are acceptable reflections of city-specific interpretations of how concurrency is meant to be used to help meet the development goals of each city.

Differences observed in the four approaches to level of service calculation include the following:

- the duration of the "peak period" examined
- the mechanism used to compute "capacity" on roadways
- the specific roadway attributes examined
- the specific mathematical equations/algorithms used to compute level of service
- the mechanism used to combine specific location level-of-service into a figure representative of the entire zone
- the v/c or LOS standards actually adopted
- exceptions allowed by the different cities to their basic v/c standards.

Peak Period Examined

Three of the four jurisdictions measure or predict vehicle volumes for a single PM peak hour to compute concurrency. At one time, Bellevue also used a 1-hour time period, but in 1998 it switched to using a 2-hour period. Use of a 2-hour period is appropriate where "rush hour" volumes are affected by significant peak spreading that results from capacity constrained regional roadways. Use of a 1-hour peak is generally a better assumption on facilities not subject to significant, extended peak period traffic volumes. (Where peak spreading is not significant, a 2-hour peak period is likely to result in a lower v/c ratio. This may or may not be an acceptable outcome of the analytical process. For example, the 2-hour period can be used to reflect a city council decision that considers short duration peak period traffic congestion an acceptable cost of development and considers congestion significant enough to limit development only when it persists for well over an hour.)

Calculation of Volume to Capacity Ratio

The actual calculation of the volume to capacity ratio also differs from city to city, in part because of the wide variety of factors that can be included in the determination of the capacity and volume estimates provided by both model output and measured ground counts. Basically, each city has selected a slightly different set of procedures to trade off simplicity (and thus smaller resource requirements) against the precision and accuracy of the results.

Among the factors that can affect the calculation of v/c ratios are

- the type of roadway segment selected for analysis
- the specific aspects of roadway geometry that are included in or excluded from the capacity calculation
- the duration of the period used in the calculation (1 hour or 2 hours)
- the expected variations in traffic volume during the time period being analyzed.

The four cities are all using professionally acceptable methods of measuring v/c, which itself is a well accepted mechanism for estimating roadway level-of-service. No one method of computing v/c is especially “better” than the others, particularly since all of the methods used are based on the same concept: that level of service can be predicted by the metric vehicle volume divided by roadway capacity.

Issaquah's approach to concurrency differs somewhat from the other three jurisdictions in that it does not restrict itself to intersection locations for computing level-of-service. Instead, the city staff have identified a set of "critical links" (mid-block) for computing concurrency. This approach is certainly acceptable from a technical perspective and makes considerable sense, given the different characteristics of much of the roadway system and current land use in Issaquah in comparison to the other three cities. A consequence of choosing mid-block locations for calculation is that Issaquah uses a different methodology for computing v/c than the other three cities.

In addition, during the project team's review of procedures, Issaquah was the only city that specifically discussed incorporating the presence or absence of minor geometric features (for example, sidewalks) in the calculation of facility capacity used in the concurrency process. (However, the procedures adopted by Bellevue also provide for inclusion of roadway features.)

By directly incorporating roadway features into its capacity calculations, Issaquah has created a mechanism to fund these types of desired improvements. The intent was that in some cases a developer could bring a facility (or zone) into compliance with concurrency standards by funding these minor roadway improvements, thereby increasing roadway capacity and lowering the v/c ratio for that segment to an acceptable level. This approach is a perfect example of how the concurrency calculation process has been tailored to fit specific jurisdictional needs and conditions.

In reality, all v/c-based estimations of LOS are reasonably similar. All are based on work published in the Highway Capacity Manual (HCM.) For intersection-based computations, an extra step is required to determine the “critical” traffic volumes from the data submitted for each of the intersection approach legs. (“Critical” is basically defined as “the largest among competing movements.”) These critical approach volumes are then compared with available capacity, and the resulting v/c ratio is used to estimate level of service.

The more “common” of these approaches is based on TRB Circular 212, published in 1980. This approach simplifies the capacity calculation by removing much of the detail involved in that computation. (The “detail” includes elements such as signal timing information and geometric details such as lane width, or the presence of on-street parking.) This lack of detail reduces the time and data needed to calculate LOS, but it results in some loss of precision in the v/c calculation. These results, however, are still a reasonable measure of level of service if the input volumes are accurately estimated. This level of accuracy is particularly acceptable for forecast conditions where many intersection details (such as signal timing or precise turning movement volumes) are not known.

If a more precise estimate is desired, procedures published in the 1994 Highway Capacity Manual[2] can be used. These procedures allow the inclusion of considerably more detail in the calculation of both volume and capacity. The result is a more realistic estimation of v/c, but one that requires both more data and more effort to perform. (Note that the results from this procedure are only more “accurate” than the Circular 212 computations when the more complex inputs are accurately tracked by the city and used within the process.) Perhaps more important than whether the 1994 HCM procedures are more accurate than the Circular 212 procedures is the fact that use of the 1994 HCM allows a city to incorporate the effects of specific geometric features into its capacity calculations and thus account for these types of improvements in its v/c computations.

However, these minor computational additions are not a cause of significant differences in how concurrency is applied from one city to the next. In fact, in all probability, the differences measured by comparing the computational outcomes are small relative to the error inherent in measuring or predicting vehicle volumes at that location. For example, if vehicle volume data are collected at two significantly different times of the year (e.g., mid-summer or early December) in a commercial district, and those data are used to compute v/c, the differences in computed v/c for the different data collection efforts are likely to be greater than the differences between results obtained from using the Circular 212 versus the 1994 HCM.

Similarly, different assumptions that are used when inputs to both procedures are computed can have more significant effects on the v/c computation than the differences in the procedures themselves. For instance, in general, the 2-hour approach Bellevue currently uses tends to produce slightly lower v/c ratios than the 1-hour approach it previously used. (This is because 2-hour peak period volumes tend to be slightly lower relative to capacity than 1-hour peak period volumes.) However, also important in the 2-hour to 1-hour comparison is Bellevue's choice to select a peak hour factor of 1.0 instead

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[2] Note that the HCM procedures used for mid-block computations by Issaquah will not be the same HCM computations used for intersections by Bellevue. Furthermore, these mid-block computations have no direct counterpart in Circular 212.

of the 0.95 used earlier. The change in peak hour factor most likely changes estimates of traffic volumes as significantly as the shift from a 1- to 2-hour period.

Level-of-Service Standards

Despite the effect of various assumptions used in developing concurrency calculation inputs, the biggest difference in how the four cities determine concurrency is in the specific "standards" each has adopted. As with the v/c calculations themselves, there are both similarities and differences in how each city has established concurrency standards.

Three of the four cities approach concurrency zonally. That is, they allow different levels of congestion in different geographic regions within their city. The level-of-service standards are all expressed as v/c ratios and vary from geographic sub-area to geographic sub-area within each jurisdiction. Issaquah's LOS standards vary by arterial street classification, rather than by zone. However, in all four cities, more congestion is accepted in predominately commercial areas, and less congestion is accepted in primarily residential areas.

In addition, each city has created a list of "exemptions" or "exceptions" for specific types of developments that are permitted regardless of the calculated level of service. These exemptions involve facilities viewed as providing far more "public good" than any resulting loss that might result from an increase in traffic congestion caused by the new facility. A good example of such a facility would be a new fire station.

While the same basic process is followed for setting standards, there are differences among the four cities. The most significant difference is in the allowable average v/c ratio within a zone. Kirkland allows average v/c to reach 1.16 in one zone, while Bellevue's highest allowable v/c is 0.95. The next differential is the specific list of exempt facilities accepted by each city.

In addition to exempting specific types of developments, each city allows a specific number of locations to exceed the adopted v/c standards as long as the zone average itself does not exceed standards. The number of these permissible "exceedances" varies from zone to zone, as well as from city to city. Issaquah allows five exceedances citywide. Kirkland allows between two and seven for different zones within the city; Bellevue allows between two and ten; and Redmond allows any number of exceedances, so long as the average v/c for the zone remains below the adopted standard for that zone.

The UW project team's general opinion is that the differences in both the mechanisms used to compute concurrency and the standards against which the results of those computations are compared are a direct result of political processes and the specific objectives that each jurisdiction is trying to accomplish. While it might be possible to "force" the adoption of a single process and/or standard, this would meet considerable political resistance, primarily because it would limit the ability of the individual jurisdictions to accomplish their local objectives.

City Specific Approaches To And Uses Of Concurrency

Technical variations in how concurrency is computed and the selection of standards against which those results are compared are not the only concurrency process differences between the four cities. In many respects, how the four cities apply their concurrency system also differs. Each city attempts to use concurrency to address their local concerns, and since those concerns vary (as do the local land use / transportation circumstances), the outcomes from the concurrency process also vary from city to city.

Many of these differences in "outcome" from the concurrency process stem from the political climate within each city, from that city's geographic location relative to regional transportation movements, and from the existing level of urban development and transportation infrastructure development within each city. (Also note that the geographic location and current level of transportation and land use development directly impact the political climate.) These differing background conditions result in very different local attitudes towards growth, the acceptability of traffic congestion, and the acceptance of widening roadways in response to traffic congestion. These differences are reflected both in the differing standards (described above) that have been adopted by the four cities, and the ability or willingness of the cities to use their concurrency regulations to require additional developer mitigation as a precursor to permitting those developments.

Of the four cities participating in this study, the two most "extreme" cases of differences in application of concurrency are Kirkland and Issaquah. Kirkland is a "more established" city, has relatively little undeveloped land, a well defined land use pattern, and (with the exception of I-405) moderate pass through regional traffic. Issaquah has considerable undeveloped land, in many ways is still establishing its land use patterns and expected levels of density (in part because of the amount of undeveloped land still available), and considerable pass through regional traffic especially from the north and south (in addition to I-90.)

These differences are reflected in how the two cities approach concurrency. Kirkland uses its land use plan (for which there appears to be broad public acceptance) to determine demand, compares that to the transportation system it is willing to provide (which has basically already been established), factors in some expected pass through traffic, and sets its concurrency standards as being equal to the expected LOS that results from these assumptions. They also have explicitly considered the effects of regional traffic, both incorporating language in their comprehensive plan that it exists, and is beyond their control, and in selecting the number of LOS standards exceptions they allow per zone. (That is, the number of allowable LOS exceedances appears highly correlated to the number of intersections where regional pass through traffic could become an issue.) Only development that departs from these accepted/expected conditions "runs afoul" of concurrency.

Issaquah entered into concurrency with a residential population that was not at all happy with the state of the local transportation system relative to the existing land use, let alone the prospective transportation system performance that would occur given expected growth. There is considerable debate amongst various factions in the area about the amount, location, and style of development that should be permitted, as well as the location, size, and design of transportation system improvements.

Consequently, the Issaquah concurrency plan is not based on "implementing the agreed upon development plan." Instead, the concurrency standards appear to have been developed and adopted specifically in response to the concurrency requirements of the Growth Management Act.

The land use assumptions in the Issaquah comprehensive plan do not appear to directly drive their transportation system plan, and do not appear to have been a major factor in the selection of their concurrency standards. Land uses are not mentioned in the transportation vision and values section of the comprehensive plan.

The concurrency standards adopted by the City are an excellent compromise between those advocating growth and those protesting against the negative effects of that growth. They accurately reflect the political desire to allow growth, but to mitigate the effects of that growth on traffic congestion. The standards themselves can be summarized as "new development won't make the transportation situation worse than it already is." Issaquah staff characterize their approach to concurrency not as a constraint on achieving the comprehensive plan itself, but as a constraint on the *timing* of when those planned improvements occur.

The problem Issaquah has is not with this approach to concurrency, but with the fact that Issaquah lacks the ability to apply the same standards to regional trip making, and/or to obtain the mitigation necessary to compensate for the significant growth in regional trips that pass through the City. The growth in regional traffic has caused a number of concurrency exceedances, and consequently limited the City's ability to permit local land use development. This situation is exacerbated by public resistance to significant increases in roadway lanes in key areas, as well as the cost (financial and otherwise) of those capacity increases. As a result, the concurrency check "we won't let growth make things worse" frequently prevents even desirable growth (for example development that reinforces the traditional "main street" town center) from occurring in the City.

Bellevue and Redmond have approaches to concurrency that fall between the extremes of Kirkland and Issaquah. In many respects, Bellevue and Redmond are more diverse cities. This diversity tends to make both the public attitude and city decisions more like Kirkland in some areas and more like Issaquah in others.

Both cities have adopted approaches to concurrency that start with determining their constituents "acceptable levels of transportation system performance" (given adopted land uses) rather than letting adopted land uses and transportation systems plans from the comprehensive planning process drive the LOS standards determination, or by adopting a standard aimed at preventing degradation of the current conditions.

In addition both cities appear to have focused their concurrency process on ensuring the connection between local land use and local roadway level of service. Neither city appears to have adequately anticipated the effects of (or their lack of control over) regional traffic as directly as Kirkland. As a result, both now share a significant concern about losing control of local land use decision making and permitting because continued increases in regional pass through traffic on some city streets are resulting in roadway level of service measurements approaching or exceeding adopted standards. This results in conflicts between two desired goals, adopted and desired growth and adopted and desired roadway system performance.

As in Issaquah, concurrency problems in both Bellevue and Redmond are primarily a function of regional traffic growth. Where desired development is permitted by the adopted standards, "concurrency works." Where land use intensity permitted in the comprehensive plan causes traffic to exceed adopted standards the "concurrency system needs to be fixed."

Where both cities differ most strongly from Issaquah is in how closely tied to their comprehensive plans they have made concurrency. In both cities the comprehensive plans demonstrate considerable linkage between accepted land use, the planned transportation system, and the adopted concurrency standards. Increases in the intensity of adopted land uses correlates strongly with an increase in allowable traffic congestion. In addition, both cities were able to adopt LOS standards that allowed for both growth, and some degradation in traffic congestion. However, unlike Kirkland, the plans for these cities do not appear to acknowledge the full effects of regional traffic on the cities' ability to meet both land use growth and transportation level of service goals, although in Bellevue's case, language has been added to the comprehensive plan that specifically discusses the need for increased state route capacity to provide for regional growth.

It is unclear from our review where the disconnect between acceptable land use, acceptable traffic congestion, and the reality of regional traffic is occurring. It may be because regional trip making is not adequately incorporated in the planning process. It may be that the adoption of LOS standards is sufficiently independent from the adoption of land use plans that the public does not realize the mutually exclusive nature of some of their adopted plans and standards. It may also be simply that regional trip making is growing more quickly than anticipated.

In general, citywide, Redmond's standards allow more growth than Bellevue's. Redmond's approach to LOS standards also facilitates their decision to use concurrency as a mechanism to help generate funds for transportation system improvements to mitigate the negative impacts of development. However, as opportunities to add capacity begin to run into local opposition (for example, in Redmond's Grasslawn neighborhood)

Redmond is likely to begin to have more concurrency related problems such as those faced continually by Issaquah.

Cooperation Between Cities

While the focus of all four cities' concurrency programs is on the roadway conditions within each respective city, each has recognized the fact that concurrency's problems and solutions stretch across jurisdiction boundaries and thus require multi-agency cooperation. Within the four cities, there are two notable efforts at managing growth impacts across jurisdictional boundaries: the Bellevue Redmond Overlake Transportation Study (BROTS), and the Issaquah/King County reciprocal inter-local agreement. Both of these efforts deal with what might be called the "near local" impacts of growth across jurisdictional boundaries.

With BROTS, Bellevue and Redmond have worked jointly to plan and fund roadway and other mobility improvements in the Overlake area and on the major arterials that serve Overlake development. In this case, most of the development is occurring within Redmond, but significant impacts are occurring on arterials in Bellevue. Through the BROTS agreement the two cities have worked together to adopt growth targets in the Overlake area and to fund the transportation improvements (in both jurisdictions) needed to accommodate that growth. Thus, developer fees generated in Redmond are used for mitigation in Bellevue, and the two cities work together to identify and plan those improvements.

Similarly, Issaquah and King County have signed an inter-local agreement that allows each jurisdiction to collect two sets of impact fees for developments whose impacts cross jurisdiction boundaries. Issaquah collects the King County fees needed for mitigation for development occurring in Issaquah (as well as fees for Issaquah), and King

County does the same in reverse. These fess are then transferred to the appropriate jurisdiction to help fund the needed transportation improvements.

In addition to these development impact efforts, the Bellevue Kirkland Redmond four-step planning model (the BKR model) is a good example of the cross-jurisdictional effort that is required to address the more regional problems associated with concurrency. While the BKR model does not lead directly to better multi-agency growth management within the concurrency legislation framework, it is an important step in the planning process needed to support such an effort. It incorporates many of the necessary data elements, as well as requiring considerable coordinated planning effort from the three cities. The BKR modeling effort also provides both a common data collection tool for growth planning (i.e., a review of where growth is occurring and what transportation improvements are planned) and a means for analyzing the multi-jurisdictional effects of those land-use and transportation system changes. Lastly, the use of a common modeling system also provides a large degree of consistency in the analytical methods that serve as input to the concurrency calculations.

ISSUE IDENTIFICATION

This section discusses problems identified with the current concurrency process. It identifies areas that the project team believes need to be addressed if changes are made to the current process. Issues identified include technical, political, institutional, and financial shortcomings that either cause inaccurate output from, or are not addressed well within, the current concurrency process. These issues were raised by participating city staff, interested stakeholders, or the project team through the project interview process and the literature review. Table 2 provides a summary list of these issues.

Table 2: Problems and Issues Identified With The Current Process

Issue	Technical	Political	Institutional	Financial
Computed v/c Ratios May Not Be Accurate - V/C Ratios	X			
Computed v/c Ratios May Not Be Accurate - Undervalued Non-automobile Travel	X			
Computed v/c Ratios May Not Be Accurate - Different Computational Procedures	X			
Adopted Concurrency Standards Are Limiting Desired Local Growth in Some Places	X	X		
Regional Traffic Growth Is Limiting the Effectiveness of Concurrency	X	X		
Non-automobile Travel Is Not Truly Considered	X	X		
There Is No Agreement on How to Estimate the Effect of TDM	X			
Each City Views the Objectives of Concurrency Differently and Thus Uses Concurrency Differently		X		
Some Cities Do Not Have a Clear Vision of How They Should Develop		X		
The Public Does Not Understand the Growth Choices Available		X		
Too Much Uncertainty Is Associated with the Concurrency Process		X		
No Guarantees Exist That Transit Service Will Remain as Planned			X	
Current Funding Sources Are Insufficient and Are Heavily Skewed toward Capital Projects				X
There Is No Way to Fund New Ongoing Operations Costs through Concurrency Fees		X		X
Too Many Resources Are Used for Concurrency Calculations				X

In general, these issues define limitations of the current concurrency procedures. Addressing these limiting factors so that cities can more effectively manage new development and transportation system improvements will require exploration of other "issues" that are not discussed in the following section. Issues for further analysis are introduced in the final section of this paper.

Computed v/c Ratios May Not Be Accurate (Technical Issue)

The project team heard or identified several concerns about the accuracy of level-of-service computations used by the four cities. Three sub-issues are reflected in those concerns about accuracy. The first issue is that the public's perception of traffic congestion is worse than the reported v/c ratios. The second is some transportation professionals' concern that the current process undervalues non-automobile travel and thus does not accurately reflect the current transportation system. The third is the concern that different cities use different computational procedures, resulting in the public perception that some cities are "cooking the books" in favor of specific, pre-determined outcomes.

V/C Ratios (Technical Issue)

The first of these issues stems in part from problems with using v/c to compute level-of-service and in part from the inability of the volume estimation process to accurately reflect the "true" peak period traffic volumes. This is because on a congested street, measured traffic volumes are often lower than those associated with roadway "capacity." This is because heavy congestion causes vehicles to slow down, resulting in throughput below maximum levels. A traffic count taken during this condition reports a volume that significantly under-represents actual traffic demand for that street. When such a “low” volume statistic is used to compute v/c, the resulting ratio predicts a better level-of-service than actually exists.

While four-step planning models have capacity constraints built into their highway assignment algorithms, they do allow predicted traffic volumes to exceed “capacity” as an indicator that roadway demand exceeds capacity. When this occurs, the predicted v/c ratios are greater than 1.0, which indicates the occurrence of significant congestion. (Note that an actual traffic count taken at such a location, under those conditions, will show lower volumes and significant congestion.) The ability of the forecasting process to predict v/c ratios above 1.0 is used by the cities to predict LOS failures as part of the concurrency review process.

Thus, four-step model output does not necessarily suffer from the limitation of “congestion caused” volume reductions and their effect on v/c computation. However, because four-step model volume outputs are compared with actual ground counts as part of the calibration and validation process, they are subject to being biased by the calibration process to under-estimate traffic volumes on congested roads. This is particularly true with models for which re-calibration efforts are undertaken to account for the effects of travel demand management strategies that are not effectively tracked in the mode split model.

Consequently, any vehicle volume-based approach to level-of-service computation will suffer from this same problem, regardless of whether it computes v/c directly or uses the basic v/c ratio to compute a related statistic (e.g., total delay) or level-of-service value.

A second problem that effects the "accuracy" of v/c based level-of-service computations when they are compared to the general public perception of congestion stems from the timing of traffic volume counts. The concurrency process assumes that "peak" conditions occur in the PM peak period (evening rush hour). In many locations, this time period is not when peak traffic demand occurs. Instead, peak traffic demand can occur on weekends (when shopping trips are highest), on Friday evenings (because of recreational movements), earlier in the day (because of traffic movements to/from schools), or during peak seasonal events (such as Christmas shopping periods). Because the public experiences and remembers these "actual peak" conditions, they are skeptical of level-of-service conditions being reported that do not reflect these same extreme levels of congestion.

Unfortunately, current traffic planning and forecasting procedures do a poor job of estimating non-commute trip travel patterns. Adding to this problem is the fact that "peak" conditions in one part of a zone may easily occur at different times of the day and/or year, which makes it especially difficult to compute an "accurate zonal average" v/c ratio for all intersections or roadway segments in a zone. In many cases, cities even lack the data needed to accurately describe the size, timing, and duration of these "unusual" peak conditions, because permanent data collection capabilities are needed over wide geographic areas to accurately measure and record these events, and the cities can not afford these data collection efforts. The result is an inability to accurately measure and model many of the peak conditions experienced by the public.

Undervalued Non-automobile Travel (Technical Issue)

The second major "accuracy" concern is that the v/c-based computational process does not accurately reflect all travel in a zone. This basic concern appears to be quite true. In zones where few alternatives to the car exist, the basic v/c process works reasonably well (subject to the limitations discussed above and elsewhere in this report). However, where transit service or other non-automobile modes serve a significant portion of current or planned trips, the current v/c-based procedures undervalue the mobility provided by these modes of travel and thus tend to present a view of transportation system concurrency that is inappropriately skewed toward roadway performance. The incorporation of non-automobile travel within the concurrency process is covered in more detail in another subsection below.

Different Computational Procedures (Technical Issue)

The last issue relates to the accuracy of the alternative procedures used by the four cities. The project team is confident that the differences in equations and algorithms used by the four cities are not a major source of inaccuracy. Instead, each city is using a reasonable, professionally accepted approach to the computation of v/c. As noted earlier in this report, the observed differences simply reflect the local choices made by the cities as they attempt to use the concurrency process to meet their specific needs and interests. Any "inaccuracy" is caused not by the differences in technique used but in the assumptions required to develop vehicle volumes input into those procedures.

Adopted Concurrency Standards Are Limiting Desired Local Growth in Some Places (Technical and Political Issue)

In almost all cases where concurrency is limiting development desired by the local jurisdiction, the "concurrency failure" is in large part caused by increases in pass-through traffic, both generated in and bound for areas outside of the local jurisdiction. These non-local traffic volume increases use road capacity that then becomes unavailable for serving local land use development. In some areas, regional traffic growth has caused roadway congestion to increase beyond concurrency standards initially adopted by the city.

At the same time, increases in roadway capacity on these routes would result in publicly unacceptable decreases in quality of life within the local area.

The root cause of these difficulties is discussed in the following subsection.

Regional Traffic Growth Is Limiting the Effectiveness of Concurrency (Technical and Political Issue)

Concurrency is intended to provide local control over the interaction of land use and transportation. However, by focusing exclusively on the local transportation impacts of land use and excluding the regional impacts, the current process has inadvertently created a system that causes loss of local development control for areas with roads that carry significant regional traffic volumes. This "local only" focus has also skewed land-use development decisions to favor those developments that can minimize local transportation impacts and maximize regional impacts.

By law, concurrency is defined by local conditions, and any fees generated for traffic mitigation must be spent on impacts directly attributable to the development. Thus, real but "less direct" regional impacts occur without mitigation. For example, a residential development in Kent increases the number of people driving up I-405 and on SR 520 to Redmond's Microsoft campus. This increase in traffic increases congestion on these routes and shifts commuters traveling from Issaquah to Redmond away from I-405 and onto 148th Ave. Concurrency does not recognize these real impacts on 148th Ave, nor does it provide funds to mitigate them. Yet this increase in traffic on 148th Ave can prevent further development contemplated in Bellevue's comprehensive plan because the "extra" traffic now using this street cause a failure of the v/c based concurrency standard.

Adding to the problems this regional pass-through traffic creates is the fact that no funds exist to mitigate the "Kent caused" traffic increase, and Bellevue residents object to the road expansion plans that would be necessary to lower the v/c ratio for that street.

The above example illustrates how the "local only" focus of concurrency can easily result in a loss of actual local control over both facility performance and local development.- State routes are specifically exempted from concurrency calculations, yet congestion on state routes causes travelers to divert onto "local" roads. These "extra" pass-through vehicle trips often create "local" concurrency failures that can not be mitigated with transportation strategies acceptable to local residents and businesses. In large part no local transportation changes other than roadway expansion can affect these trips, since the trips themselves start and end outside of the local area. They are thus not affected by local land-use actions or local TDM measures. Instead, they simply use up "local" roadway capacity and limit local development.

For developers, this "local only" review of concurrency results in a large incentive to build sprawl style developments in undeveloped, uncongested areas and considerable disincentive to develop in existing urban centers. This is precisely opposite to the intent of Washington's Growth Management Act which is to encourage development in urban areas and reduce the inappropriate conversion of undeveloped land into sprawling, low-density development (RCW 36.70A.020), and is inadvertently being caused by the exclusive application of roadway LOS standards which favor development in less dense areas away from centers and closer to the edge of the Urban Growth Area. Costs imposed to help roads meet concurrency standards mean that developments must internalize the cost of mitigation required to meet local concurrency failures, but current regulations externalize the cost of regional concurrency failures and other regional trip impacts. This provides a strong economic incentive to build in low density areas that have less chance of "tripping" local concurrency levels. These development locations are not easily or effectively served by non-auto modes, and thus the vast majority of trips they generate require single occupant automobile travel. Since regional impacts are ignored, no incentive exists for the developer to mitigate the impacts of those trips. For example, in the 148th Ave illustration above, no incentive exists for the Kent developer to fund the regional transit facilities (e.g., park and ride lots, expanded transit service) necessary for making transit a viable travel option to Redmond, in order to reduce SOV trips on I-405.

Thus, because the current concurrency process ignores "concurrency failures" that are not geographically close to the development or that occur on state routes, it encourages development that exacerbates those problems. These problems in turn create congestion in communities that contain regional transportation facilities, and that congestion effectively eliminates that community's ability to control its land-use decisions relative to its traffic congestion levels.

Non-automobile Travel Is Not Truly Considered (Technical and Political Issue)

When asked by PSRC, all four cities indicated that they use a "multi-modal" approach to level-of-service computation.[3] At first glance, this seemed a somewhat surprising response to the project team since the concurrency determination is based exclusively on roadway v/c.

[3] Implementing Destination 2030, Assessing the Effectiveness of Concurrency: Phase 1 Report, Survey Results, January 2002, PSRC

Cities answered “multi-modal” to PSRC’s questionnaire because in both the “project specific” and “four-step modeling” procedures, a mode split estimation is performed, and “non-driver” trips are removed from the vehicle volume estimates. Thus, the effects of transit usage, walking, biking, and other forms of transportation to and from new developments are removed from the v/c calculations used to compute level-of-service. Consequently, the current processes are indeed “multi-modal.”

This definition of “multi-modal” has an interesting effect. In theory, for all four jurisdictions, if the roads serving a geographic area were “congested,” no development would be permitted in that area, even if it were served by a rail transit line where “extra” capacity existed and 95 percent of new peak period trips were served by that rail line (unless the developer was somehow able to build additional roadway “capacity”). This is because all four cities currently incorporate only roadway congestion in the “definition” of concurrency. Thus, the process may be considered “multi-modal” technically speaking, but functionally the determination of concurrency is based strictly on roadway conditions.

There Is No Agreement on How to Estimate the Effect of TDM (Technical Issue)

Many key travel demand management actions (carpool formation programs, building-based transit pass subsidization programs, guaranteed ride home programs, the provision of bike lockers and showers) are not directly accounted for in the mode split models used to forecast future transportation system mode split and performance. This is both because no nationally accepted guide similar to ITE’s *Trip Generation* book exists for these programs, and because the mode split models used in the BKR and Issaquah four-step modeling efforts do not include these items as input variables. In addition, the four-step planning mode-split models use zonal average input variables, and thus development specific TDM programs are not even potential model inputs (assuming the mode split model could be redesigned and calibrated to include them).

While each city uses the best available information to determine the effects of specific proposed TDM improvements for each development review, the lack of a common national standard makes effects of TDM actions subject to "second guessing" by groups participating in the concurrency review process. This in turn slows down the process, makes its outcome less predictable, and leads to considerable disagreement about its accuracy.

Each City Views the Objectives of Concurrency Differently and Thus Uses Concurrency Differently (Political Issue)

While all cities agree on the basic goal of concurrency (keeping transportation improvements in step with development), the more practical objectives of each city differ, depending on their individual needs, pressures, and situations. These differences lead to different approaches to calculating concurrency. These differences generally result in concurrency outcomes that address specific local objectives. Thus, a single "consistent" approach to concurrency is unlikely to be acceptable across all four cities.

Some Cities Do Not Have a Clear Vision of How They Should Develop (Political Issue)

Many jurisdictions and most of the general public do not have a clear vision of how land use is expected to change in the future (either short- or long-term) and how the transportation system needs to change to meet that growth. Without an agreed upon vision, review of individual development projects is very difficult, and the determination of required mitigation fees is haphazard. If a clear vision can be expressed and agreed upon <u>for both land use and transportation system changes,</u> it will be much easier to compute the cost of required improvements and to assign those costs appropriately.

Having a clear vision also eases the task of communicating what that vision is and how a given development project or transportation improvement will fit into that vision.

Ideally, each city's vision includes both a concept of its own transportation/land-use system and how that system both contributes to and fits within the regional transportation/land-use vision.

<u>The Public Does Not Understand the Growth Choices Available (Political Issue)</u>

Broad public support exists for each of the following four statements: 1) "I want to drive my car." 2) "I don't want the impacts from roads hurting my neighborhood's quality of life." 3) "I want to develop my property to maximize its value." and 4) "I want to pay lower taxes." Large segments of the public do not understand that these choices are mutually exclusive, in that increasing car use requires increasing roadway space (or increasing congestion), and that space invariably comes at the expense of some existing neighborhood's quality of life. The public does not actually have the choice of "development or no development," as state law requires each jurisdiction planning under GMA to accept its share of projected growth. The real choice is, "Where and how do we develop?" Public officials and city residents might find the concurrency dialogue easier with the understanding that pushing growth elsewhere often does not relieve the local area of growth impacts, just the possible benefits from local growth. (See the effects of pass-through traffic above.)

The existing concurrency process does not help explain these choices and does not make the broad consequences of specific development decisions clear.

Too Much Uncertainty Is Associated with the Concurrency Process (Political Issue)

Members of the development community interviewed by the project team were uniform in their frustration with the current process, both in terms of the delays it caused in the development process and in terms of the uncertainty associated with the costs imposed on their developments.

For cities where developers can "buy their way out" of concurrency failures (usually by funding projects or programs that allow roadways to operate within the concurrency standards adopted by the city) developers complained about the variability of these costs, and the delays in determining just what those costs would be. In general, when considering development of a parcel, developers would like to have a better, and earlier, understanding of what size of development will fit within existing concurrency standards, what transportation improvements could be made to keep a larger development within concurrency standards, and what the costs associated with those improvements would be. This information is needed early in the development process in order to make informed business decisions.

Even without the presence of added "concurrency related fees" that allow developments to stay within concurrency standards, developers were unhappy with the time required to learn whether their proposals were permissible within existing standards, and to negotiate changes (smaller size, adoption of specific TDM programs) that allowed their proposals to remain within standards.

<u>No Guarantees Exist That Transit Service Will Remain as Planned (Institutional Issue)</u>

In this region, transit service is a county or regional agency function, but concurrency is a local jurisdiction function. Cities have relatively little control over the amount of transit service provided and the routing of that transit service. Because cities have relatively little control over the transit service provided to a given development, there is concern that reliance on transit as a long-term travel mitigation measure is impermanent and therefore risky.

<u>Current Funding Sources Are Insufficient and Are Heavily Skewed toward Capital Projects (Financial Issue)</u>

The PSRC Phase 1 Concurrency report[4] noted that over 70 percent of responding jurisdictions indicated that developer fees pay less than 10 percent of the costs of needed transportation improvements. When added to the reduced transportation funding available from state and federal sources, the result is that the cities face a significant deficit when comparing transportation needs with available revenue. Because it does not pay for all associated costs, new development further exacerbates the revenue problem, and the "regional" trip problem noted above makes the situation even worse.

As a result, the concurrency process frequently becomes one more way to generate transportation improvement funds, rather than a "go/no go" development switch. In areas already "non-concurrent" this results in a bias toward large developments that are more likely to be able afford the mitigation fees required to permit increases in travel activity.

[4] Implementing Destination 2030, Assessing the Effectiveness of Concurrency: Phase 1 Report, Survey Results, January 2002, PSRC

Another drawback of the current approach to concurrency is that it further exacerbates the emphasis on capital projects to the detriment of operational improvements. This occurs because concurrency funds are spent on capital projects, and they must be matched with local funds, since concurrency fees can only be proportional to the impact of the development. Thus concurrency becomes a drain on existing local funds that might be used for operational improvements.

There Is No Way to Fund New Ongoing Operations Costs through Concurrency Fees (Financial and Political Issue)

By law, traffic impact fees must be spent on mitigation of direct impacts. Similarly, concurrency related "fees" must be spent in a way that allows impacted streets to lower their v/c ratios to the point where the proposed development does not violate the existing v/c standards. This has traditionally meant capital improvements (particularly given the use of v/c as the measurement criterion). The project team has found no mechanism to date that allows a city to collect and spend mitigation funds (either impact fees or concurrency specific fees) slowly over time to provide ongoing operational improvements—such as new bus service, periodic signal retiming, or general TDM program funding—that would add the necessary additional transportation system capacity in place of increasing roadway capacity. (Note that Redmond has developed a mechanism that allows it to negotiate an agreement with a developer where the developer funds the on-going TDM program, rather than providing the money to the city, which can then fund the TDM effort. This agreement then becomes legally binding on future property owners.)

In locations where roadway expansion is not acceptable, operational improvements are the only available mechanism for increasing person and vehicle throughput. If funds are not available to maintain those operational improvements, either congestion will increase or desired development will be prevented.

One potential way to begin to approach this problem is in use in Redmond. Redmond allows developers to propose long term TDM activities as part of their traffic mitigation plan. A key here is that funding and operation of the TDM program remains in the control of the property owner (and with subsequent property owners), and that the development must continue to generate traffic levels at or below agreed upon rates. These agreements become a legal requirement tied to site approval and remain as covenants with the property.

The primary limitation with this approach is that control of funds remains with the property owner. This may hamper a city's ability to combine these funds to provide a more effective TDM program or fund operational improvements (such as new bus service) that might have a greater impact on transportation system performance.

Too Many Resources Are Used for Concurrency Calculations (Financial Issue)

Each of the cities interviewed indicated a desire to reduce the staff time and resources needed to perform concurrency reviews. Their concerns mirrored the developers' concerns in that too much time was required to determine the concurrency standing for specific developments and then determine the required/acceptable mitigation required from developments.

NEAR-TERM CHANGES

This section discusses the project team's initial review of how a series of short-term changes to the concurrency process would affect that process. Review of this specific set of changes was requested as part of the scope of work for this project. Each suggested alternative is briefly described, along with the project team's opinion of how adoption of that change would affect the outcome of the concurrency process. Recommendation to adopt the change is then discussed. A recommendation for the change is based on whether the suggested change provides significant advantages over existing procedures, given the costs of adopting the change (for example, the cost of new data collection, if it were needed). If a reviewed alternative would provide advantages and can be adopted with minimal additional staff time and effort (meaning no new data collection or technical resources would be required), it is recommended for near-term adoption. If the project team review concludes that significant benefits could be gained, but additional study would be needed to determine the details of the approach, additional city resources would be needed to perform it, or significant changes in procedures would be required (meaning a significant staff training effort or public debate would be required before adoption of the procedure), the approach is recommended for further study in the remainder of the project. These issues can then be clarified and presented to the Executive Steering Committee for the project.

Switch to a Persons Per Hour Rather Than Vehicles Per Hour Approach to Capacity

This change is intended to measure the capacity to move people (or the actual efficiency of moving those people) by a combination of means, including non-motorized modes, buses, carpools, and vanpools, as well as automobile travel.

There are two basic ways to use person volumes in the concurrency process. The first is to actually use person throughput relative to available transportation facilities as a measure of facility performance. The second approach is to use person throughput as a way of weighing the relative importance of the performance of different transportation facilities. That is, the current LOS calculation process would be followed, but rather than computing simple average v/c ratios for all intersections (or screenlines) within a city analysis "zone," the performance of each intersection/screenline would be weighted according to the person throughput associated with that location.

These two approaches are discussed separately below.

Use of Persons per Hour as a Measure of Facility Adequacy or Performance

Used by itself, person throughput is an inadequate measure of facility performance; it is only a measure of facility use. Consequently, it does not describe whether the transportation facilities being examined are adequate for the current or proposed development.

To be converted into a measure of performance, person volumes must be related to the person carrying capacity of the current (or proposed) facility. Person carrying capacity for a facility is mode specific. Thus, to use person volume as a measure of facility performance or adequacy requires a mode specific, multi-modal analysis. Adopting such a process would not be a minor change to the current process of any of the four cities.

Consequently, use of the statistic persons per hour is not a reasonable near-term alternative concurrency measure.

However, adoption of a true comparison of person throughput versus person carrying capacity by mode would resolve several of the major limitations of the current process. Thus, use of person throughput within the concurrency process will be considered as one of the alternatives for long-term revision to the concurrency calculation process.

There is one significant caveat to this approach, however, and that is that the person carrying capacity of an automobile is essentially undefined. In theory, the person carrying capacity of automobiles on roads is roughly four times the vehicular capacity of that road. However, it is unrealistic to expect a mode shift that might "fill" each car. Determining a rational "capacity" for cars is therefore problematic.

For the long-term approach, the project team proposes that car capacity be treated as being equal to vehicle capacity, and that transit capacity be independently compared with actual transit ridership. This will allow a direct evaluation of whether "spare capacity (transit or automobile) exists within a defined area.

Use of Persons per Hour for Weighting the Importance of Different Locations

This approach can be adopted easily within the current procedures of all four cities. To adopt it, each city would either need to conduct vehicle occupancy counts or assume vehicle occupancy rates. The first of these would require a considerable increase in resources spent on facility performance monitoring; the second would be far less expensive but would make the system insensitive to the effects of changes in carpool and transit usage.

Use of person throughput for weighting v/c ratios within a given analysis zone would mean that large intersections would play a more important role in the computation of the "average" v/c ratio within a given analysis zone. This would mean that the performance of larger intersections would be more important to "zonal performance" than smaller intersections (where "large" is defined in terms of person movement, so an intersection heavily used by transit would likely be a "large" intersection within a zone).

The effect of such a change would be entirely dependent on the relative condition of large and small intersections within the zone. If the larger intersections operated better, or were more easily expanded, such an approach would have the effect of allowing more development to occur. If larger intersections were more difficult to expand (they might already have been expanded as much as possible to meet the larger demands placed on them), this might result in less ability to accept growth.

When viewed in the larger context of concurrency, emphasizing larger facilities would be likely to have only a modest effect on overall concurrency calculations. It would basically provide a modest "tweak" to the current system that could be used in some cases to influence the results produced. From a theoretical perspective, it would shift the emphasis within an analysis zone toward movements that served the most people.

It would not improve the analysis of specific facilities, nor would it provide particularly useful insight into a city's facility performance.

This approach is not recommended for further study. It would further complicate the concurrency process without providing a significantly better outcome than is currently available. It would not resolve any of the limitations in the current concurrency process.

Switch to a Travel Time Approach

The v/c approach to estimating level-of-service has a number of limitations. Among these limitations are that v/c is at best a mediocre surrogate for level-of-service as perceived by the traveling public and that under congested conditions use of actually measured volumes underestimates the "true" level of service. (Not included in this list are those larger limitations of the current concurrency process noted elsewhere in this report.)

As a result of the limitations in the v/c process, there is a growing sense among transportation professionals that the best statistic for gauging facility performance is travel time. This measure is easy for the public to understand, relates directly to the traveling experience, and can be compared transparently across modes.

The first disadvantage to the use of travel time is the fact that no data collection procedure currently exists to collect and report actual travel times. (Although the four-step modeling program can predict travel times with no changes to the current process.) Thus, a new data collection program would be needed if actual travel times were to be used for model validation, or for project development review. In addition, travel times are route and trip dependent, which means that specific "trips" would need to be defined for data collection and review. (This step would be similar to the designation of "critical intersections" or "screenlines" in the current process.)

A second disadvantage is that the analytical requirements for converting specific project improvements into travel time are not well defined, and those parts that are defined require more effort than the current v/c process. While the four-step modeling process allows for direct calculation of route-specific travel times, application of a four-step model would require more work than simply estimating trips to be generated and adding those trips to existing measured volumes at nearby intersections.

The next disadvantage of using travel times as the primary concurrency review statistic is that its adoption would require revision to the entire concurrency standards process. (This would be a significant, but certainly not overwhelming, effort.) As mentioned above, within each zone a city would need to adopt specific routes/segments for which travel times would be collected/estimated. Standards would then have to be adopted for each of these routes, just as v/c standards had to be adopted for intersections.

The good news is that such a process would allow a public review of expected transportation system performance. This would allow a city such as Issaquah to select new performance standards that might permit development where development was not currently allowed.

For any city, the selection of a new performance standard is not without significant risk of increasing public distrust in the planning and public decision making process. Consequently, it is important when selecting a new performance measure, such as travel times, to be able to clearly describe to the public why a new measure is better than the existing measure, how the measure serves the public good, and why it gives a more accurate reflection of the presence or absence of "adequate transportation facilities." (Bellevue has already experienced the communication difficulties loss of public trust entails as a result of changing from a one hour standard to a two hour standard.)

If a travel time approach is adopted, it must be remembered that simply shifting from a v/c approach to a travel time approach would not fix the structural problems the project team has found with the current concurrency process. The most significant of these problems include the inability to accurately account for non-automobile based travel modes, the insensitivity of the current forecasting process to adopted TDM measures, and the lack of measurement of the effects of regional impacts. (Note that while the use of travel time measurements would allow direct comparison of transit to

SOV performance, no process or standards exist to direct how this comparison would take place. That is, since transit travel times are typically slower than SOV travel times, a shift to transit use could conceivably make average person travel times increase, thus making concurrency <u>less</u> likely. Thus, even though use of travel time would make multi-modal comparisons possible, considerable work would be needed to make this technique operational.)

This proposal merits consideration of further review, but at first glance it does not appear that it would, by itself, resolve many of the primary issues identified earlier in this report.

<u>Remove Selected Intersections[5] from the LOS Calculation if Capacity Increases Result in Negative Neighborhood Impacts</u>

This proposal addresses limitations in the concurrency process where current (or forecast) levels of traffic volume are not acceptable, but increases in roadway capacity are unwanted by the local community. This combination of events prohibits further development in the area not because capacity improvements are not possible, but because political constraints prevent any undertaking of those improvements. (Note that these political constraints might not be "bad," that is, the city may agree with local residents and property owners that capacity improvements are not appropriate for that facility.) Removing intersections that fell under these constraints from the concurrency process would allow development to proceed. It would allow a development to proceed when "adequate" facilities did not exist to serve it, removing the constraint on development to under-served areas that concurrency is designed to provide. With no constraint on facility performance remaining, development that significantly exceeded "acceptable" levels could not be restrained.

Simply removing the intersection from the concurrency analysis eliminates the congestion check which concurrency was intended to provide. Thus, this approach appears counter to the goals of concurrency, and will not be further analyzed in this study.

The key in this situation would be not to "remove" the facility from concurrency calculations but to either restate the allowable congestion (i.e., raise the allowable amount of congestion to one that was acceptable), or raise the standard when specific pre-conditions had been met.

Kirkland has already adopted this type of arrangement in its approach to zonal LOS standards. Specific intersections can exceed the adopted LOS standard, as long as they are not TOO FAR above that standard, but only if the zonal average remains acceptable. In fact, all four cities have also adopted an "exemption" process, where a limited number of intersections (or roadway segments) are allowed to exceed the v/c standard without "tripping" the concurrency standard. Simply increasing the number of allowable exemptions by one intersection would have the same positive (pro development) effect as removing the intersection from the analysis. Unlike removing the intersection, however, this approach still acknowledges that congestion is being allowed to grow, which is an important public disclosure, given the intent of concurrency.

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[5] Note that "roadway segment" can be used interchangeably with "intersection" in this discussion, in that "congested roadway segments" could also be removed from the concurrency process if widening those roadways resulted in unacceptable, negative, neighborhood impacts.

A different twist to this same basic concept would be to allow an intersection to exceed the base LOS standard as long as transit service (or transit use) exceeded some set level. Such an approach would mean allowing additional development to occur where sufficient transit service (or use) existed to serve that development, and the availability of a "high" level of transit service would provide sufficient transportation access despite the congested roadway conditions. These more detailed, multi-modal approaches are not short-term improvements to the current concurrency process and are therefore included in the longer term solutions that will be studied in more depth as this project continues.

Lower LOS Standards (Allow More Congestion) for Motor Vehicles

This approach would simply allow development to occur without requiring the widening and upgrading of congested intersections and roadway segments. Where such an approach is politically acceptable, this would be reasonable. It would be inexpensive and easy, as long as the political will existed to do it.

No changes in the current concurrency process would be required to implement this alternative.

There are two primary drawbacks to this approach. The first is that such an approach might not be politically acceptable. Certainly in cities such as Issaquah and parts of Redmond and Bellevue, adjusting LOS standards to allow more congestion would not be accepted mildly by vocal segments of the population. The reason that concurrency was adopted at all was that transportation infrastructure was not being expanded quickly enough to serve new development, and the public resented the failure of the transportation system to move cars more freely. The project team's opinion is that, in many cases, the currently adopted standards would be difficult to lower without mitigation.

The second drawback to this approach is that it would eliminate the ability to use concurrency as a way of generating additional funds for transportation system improvements. While concurrency is, in theory, not about fund generation, it often does serve that purpose in heavily congested areas (because not enough other sources of transportation improvement funds are available). However, if development with no transportation system expansion were politically preferable to no development, then this approach would be acceptable.

Expand the Definition of "State Route" to Include Intersections Feeding State Routes That Are Not Controlled by the Local Jurisdiction

Because the state specifically removed state routes from the concurrency process, congestion on those facilities may not be factored into development concurrency decisions. The net effect is that approved development tends to create unmitigated increases in volume on state routes. This in turn creates congestion on routes that intersect (or parallel) those facilities. One particularly difficult location, from a concurrency standpoint, is where a city arterial connects to a congested freeway. When the local jurisdiction does not control these intersections, there is little opportunity to provide congestion relief to the arterial. The arterial congestion then causes a concurrency failure that limits the city's ability to permit additional development even in localities specified in its comp plan vision.

This proposal would essentially extend the current practice of removing state facilities from the concurrency process to include these specific intersections, even though they are not technically part of a state route.

The primary advantage of this idea is that it would further diminish the impacts of regional facility congestion on a local jurisdiction's ability to control its own development. The suggested change follows the basic line of thinking at the legislative level that resulted in removal of the state routes from the concurrency process. This line of reasoning can be summarized by the following example, "We shouldn't deny growth in Bellevue because I-405 is congested." This line of reasoning makes sense at the legislative level because the "fixes" for many of these concurrency failures are very expensive and thus significantly limit development under the concurrency legislation.

Extending "state route" designation to non-state route arterial intersections would allow increases in development without providing for "congestion" control related to that growth. This would be a good idea if the goal of the change were simply to permit additional development, regardless of congestion. It would be a bad idea if the city wished to uphold the intent of the concurrency process. Simply removing this class of transportation facilities from the concurrency calculation would not help "solve" the problem of inadequate transportation facilities for a given level of development. It would give a city more flexibility in "getting around" the concurrency legislation.

While exempting routes of state significance from concurrency requirements has been problematic, removing more arterials and intersections from concurrency requirements will not advance the balance of development and mobility intended by state policy and law.

This approach would certainly be one way of "surmounting" a specific type of problem, but it would not provide the cities with a tool that was very useful for managing their development patterns, given the existing, planned, and desired transportation system.

<u>Remove Arterial Roadways that Serve Primarily Regional Trips from the Concurrency Determination</u>

As noted above, state routes were specifically exempted from concurrency determination, and congestion related to a lack of capacity on those routes is a major problem in applying concurrency at the local level. The problem is that travelers divert from congested state routes onto locally controlled arterials that serve as alternative routes for these regional trips. Increases in these regional trips, with trip ends outside of the local jurisdiction, cause increases in local congestion without generating the funds needed to mitigate the volume increases. A roadway that primarily serves these types of trips becomes a "drag" on local concurrency and local control because it will continue to degrade in level-of-service, and the cost of improvements (which must be done to meet concurrency requirements) must be met by the local jurisdiction and/or local development.

Removing arterials that primarily serve regional trips from concurrency calculations would "solve" this dilemma, at least in the same manner that the current state route exemption "solves" the problem. The disadvantage of such an approach is that it essentially would allow development without regard to the availability of adequate transportation infrastructure. Thus, while "solving" one specific problem, it would likely generate or exacerbate several others. (For example, increased congestion on local roads caused by worsening conditions on regional by-pass routes would result in other concurrency failures as traffic attempted to by-pass the by-pass facilities.)

The project team does not recommend adoption of this idea. Such an approach would simply eliminate the concept of concurrency, without replacing it with a more functional system. In addition, given the fact that standards have already been adopted that include these roadways, it is likely to be viewed as a “give away to developers” by significant segments of the population, and is likely to generate considerable distrust towards future city actions.

This approach would simply treat a symptom, not address the issues that concurrency was meant to address, nor would it provide a mechanism to help fund the transportation system improvements that non-concurrent development requires.

Change the Duration of the Concurrency Standard

The City of Bellevue changed from a 1-hour volume standard to a 2-hour volume standard in 1998. Bellevue also adopted a peak hour factor of 1.00, instead of the 0.95 that was previously used.

This peak period duration (and/or peak hour factor), or an even longer standard, could be applied by all jurisdictions. In most locations, computing an “average hourly volume” over a 2-hour peak period would result in a lower traffic volume than if such a volume were measured for only 1 hour. The lower volume would result in a lower v/c ratio and would consequently result in a “better” computed level-of-service. Similarly, using a peak hour factor of 1.0 instead of 0.95 would lower the computed v/c.

Combined, these adjustments would “artificially” reduce the v/c ratio computed for a given intersection (assuming that the current v/c ratio using 1-hour volumes and a 0.95 PHF are considered to be “truth”). In reality, neither of these adjustments would change the performance of the intersection; they would simply change how that performance was reported.

The lower value reported with a 2-hour period and 1.0 PHF simply reflects the "average" condition at that intersection over the entire 2-hour period, rather than the condition found during the highest volume 15-minute period during the highest volume hour of the day. The 2-hour approach is essentially a measure of "average peak period," while the 1-hour approach is a "worst case" condition during the peak period. Both conditions occur. The question is simply which one is the better measure of intersection performance for use in managing infrastructure investment?

Answering this question requires stepping back to how level-of-service standards are set. If LOS standards are adopted as if they represent the "worst" condition of the day but are then computed with an average peak period volume, the analysis results will produce an artificially low measure of congestion. On the other hand, if the standards are adopted with the understanding that the "average 2-hour condition" is being measured (and that at the worst of times during that 2-hour period conditions are likely to be worse than reported), then increasing the duration of the time period measured is certainly acceptable.

In a congested metropolitan area, it makes considerable sense to use a longer period and set standards based on the "peak period." This acknowledges the reality of urban congestion, particularly in zones with heavy employment, and accepts the facts that congestion does exist, that peak spreading is acceptable, and that roadway geometry should not be altered to meet the highest level of peak demand. However, while this may be "correct" from an "urbanist" point of view, it may not be politically acceptable or appropriate for zones that are primarily residential. The "correct" answer to this question is political, not technical.

At the same time, many local anti-growth activists will see such a change as simply a mechanism to permit unmitigated growth. This has the effect of creating distrust of the city's motives. This group of citizens is likely to view these types of changes as simply a "way around" previously adopted standards.

No technical improvement would result from this suggestion. It would not resolve any of the limitations noted earlier in this paper. It would simply allow more development, given the current transportation infrastructure. This same result could be obtained by adopting a different level-of-service standard.

Switch to an Average Total Delay Approach

The current Highway Capacity Manual includes procedures for estimating approach delay at intersections on the basis of input volumes, geometric intersection detail, and intersection timing information. Total intersection delay can then be used to look up the resulting level of service for the intersection. This technique could be used in place of the current v/c procedures for estimating level of service.

The advantage of such an approach is that it would describe intersection performance in terms of a traveler's time, rather than in terms of roadway characteristics. In theory, this would allow the comparison of travel improvements across modes and allow more effective consideration of non-automobile based travel. The description of intersection performance in terms of "time delayed" would probably also be easier for the public to understand than the more abstract v/c ratio.

Additionally, it would be possible to compute delay for the “less important” movements at each intersection and to incorporate this delay into the reporting process. (The current process ignores all “non-critical” movements.) This would allow improvements to these “non-critical” movements to be reflected in the concurrency computations. However, inclusion of data on those movements would decrease the importance of the most congested movements.

On the downside, as with adopting travel time in place of v/c, simply changing the statistic used to compute concurrency would not result in a significantly better concurrency process. To address the issues identified earlier would require a more structural change to the concurrency process, such as collection and use of transit ridership and transit performance information. However, inclusion of transit trips and performance in the level-of-service computation is not possible in the near term for the majority of the cities in this study. Without these additional capabilities, no significant change in the concurrency process outcome will occur. That is, all of the significant limitations noted above will remain, and therefore, this approach is not worth pursuing. Addition of non-automobile modal performance is considered a “longer term” change and is therefore addressed in the following section.

Finally, delay is only accurately measured when the effects of signal timing are accurately reflected. Signal timing is not incorporated into the four-step modeling process and is often not tracked well by the planning sections of most cities. Consequently, it is likely that delay computations output from the four-step planning process will be “rational” at best and most likely no better than the current v/c computations.

This approach is not recommended. It would provide few real benefits and would increase the time and resources required to perform the analysis.

POTENTIAL LONG-TERM SOLUTIONS

As a result of the work done to date on this effort, the project team believes that "fixing[6]" the concurrency process followed by the four cities in order to address the issues identified in the second section of this report requires some substantial changes to

- what types of measures are included in the concurrency standards,
- how the cities work together (and with other agencies in the region),
- how funds are generated, controlled, and spent for regional transportation improvements, and
- the types of transportation system improvements cities (and their residents) are willing to accept as a consequence of continued growth.

Not all of these types of changes must be adopted. However to fulfill the intent of this study, the project team believes that we need to explore this typology of changes in order to adequately describe their potential application to the participating cities, as well as to understand the advantages each might convey and the costs each implies.

The project team recommends pursuing the following six areas of study in order to adequately define and describe realistic proposals for addressing the major limitations in the current process.

- **A System of Regional Concurrency.** Our study and PSRC's concurrency assessment project confirm that local concurrency powers cannot and do not manage regionally generated traffic. Could a regional concurrency system be employed? What would it look like and how might it work? Who would manage it? Would loss of local control and complexity cause more problems than would be solved? How would you provide accountability? Measure success?

- **Results-based Concurrency Measures.** Presently, the four eastside cities use one LOS metric, the volume of automobiles at key points in roadways relative to estimated roadway capacity. But PSRC's survey identifies two examples where local governments have set different outcome-based measures for future transportation. Can the kinds of performance standards for reducing VMT in Snohomish County and increasing the transit share of trips in Renton make concurrency work better in the eastside cities? Could adoption of a program similar to the University of Washington's U-Pass (which limits vehicle trips bound to/from a defined geographic zone) within a defined geographic area function successfully when multiple land owners and hundreds of tenants and residents fall within that zone?
- **Investing in TDM, HOV, and Non Motorized Modes.** Auto capacity LOS measures invariably result in road widening solutions. The GMA legislation itself also leans towards immediate capital improvements because it uses the term "adequate public *facilities*" and imposes a six year time frame for implementing improvements paid for by impact fees on new development. What measures could induce more multi-modal and non-structural approaches to concurrency investments, consistent with the intent of federal TEA-21 transportation policy?

[6] Note that not all participants in this project feel that the current system needs to be "fixed."

- **Incorporation of Other Modal Performance Measures Within the Concurrency Standards.** Where the desired increase in transportation system capacity needed to serve desired growth is not roadway based, how can the four cities' define those system improvements in such a way that they can be incorporated into the transportation concurrency standards? How can performance against those standards be cost effectively monitored, and how can the effects of proposed development on the use of those non-roadway facilities be accurately predicted?
- **A Long Term TDM/Transit Fund.** There are two arguments against using impact fees (and other publicly controlled transportation funds generated from new development) for anything other than adding lanes or widening intersections. The first is that impact fees must be spent within six years, hence on-going car trip reduction methods would be impossible to sustain. The second is that transit operations are not permanent and would disappear after a six year period as well. We plan to examine the efficacy of creating *transit and TDM operating accounts,* a type of perpetuating fund which could yield an annuity for transit service and/or TDM efforts. If this kind of mechanism appears promising, we would want to understand if it is enabled under current state law, and if not, what changes would be necessary.
- **Local/Regional Transit Cooperation.** As we have seen, a strength and limitation of transportation concurrency is that it is locally defined and administered. Should an eastside city decide locally to enhance transit service to achieve concurrency in a given corridor, it would remain powerless to implement

such service, because transit operating authority falls within King County's jurisdiction. What legal, structural, or inter-jurisdictional arrangements would remedy the existing disconnect between concurrency at the city level and transit planning and operations at the county level?