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DRAFT TECHNICAL MEMORANDUM

Bellevue, Redmond, Kirkland & Issaquah Concurrency Study
Task 4c: Literature Review

Date: May 10, 2002 **Project** #: 5118

To: Mark Hallenbeck, UW-TRAC
From: Peter Haliburton and Paul Ryus

INTRODUCTION

This document reviews state-of-the-art methodologies being used or considered in Florida and elsewhere that address ways to include alternative travel modes—including transit, bicycle, and pedestrian travel—in the transportation concurrency process. As the literature described in this document was being assembled, it became clear that much of the work identified for this memorandum had already been completed and published by the Center for Urban Transportation Research (CUTR) at the University of South Florida. As a result, the first half of this document provides a summary of the CUTR report, supplemented with additional information, where appropriate. Other sections describe examples of ongoing Florida jurisdictional work to implement transit concurrency, and descriptions of existing analysis methodologies for alternative modes.

CENTER FOR URBAN TRANSPORTATION RESEARCH

Sara J. Hendricks, a CUTR researcher, and Cecilia Dyhouse, a graduate student assistant, wrote *Land Developer Participation in Providing for Bus Transit Facilities and Operations,* which was published in March 2002. Material within this section has been summarized from the CUTR report, and supplemented with additional information and comments provided by us.

Policy, Regulatory, and Performance Measure Background

Florida Policy and Regulatory Environment

The State of Florida grants strong powers to local governments, which are free to develop their own land use regulations, taxes, etc., as long as they are not inconsistent with state law. The State may require that local jurisdictions do certain things—for example, to develop comprehensive plans and land development codes—but not specify how jurisdictions must accomplish this. Concurrency is an area where the State requires that public facilities, including transportation facilities, must be available to provide adequate service concurrent with the impacts of new development, but leaves it up to local jurisdictions to develop specific performance measures and standards that specify "adequacy."

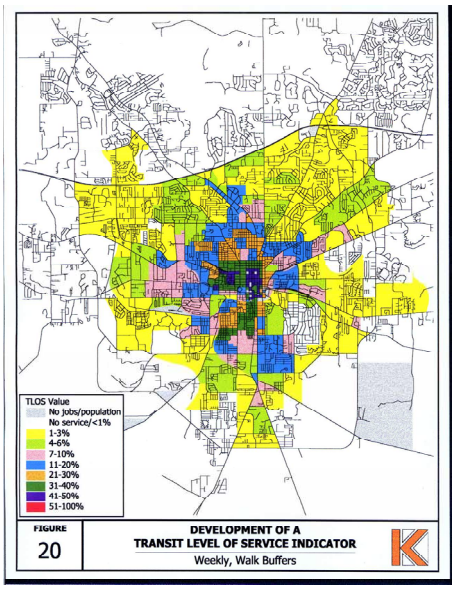
In 1999, the Florida Legislature amended the state's concurrency law, to make it more favorable to alternative modes. Previously, concurrency was "almost exclusively" applied to the automobile mode, with adequacy based on providing a specified level of service along roadways and at intersections. Under the new law, the focus was on mobility—how easily people can travel, regardless of mode—and it was made permissible to favor non-auto mobility in designated "multi-modal transportation districts." Another of the law's provisions required that multi-modal concurrency standards be based on professionally accepted level of service techniques. An outcome of this was a multi-year research effort by the Florida Department of Transportation (FDOT) to develop measures of the quality of service of non-auto modes, and associated "A" to "F" levels of service. The result of this work was published in March 2002 as the updated *Florida Quality/Level of Service Handbook.*

Florida Transit Environment

Florida's fixed-route transit systems are handicapped by having no fixed source of funding. Service from year to year is based on the amount of local funding that can be obtained from city and county governments, in addition to the federal operating assistance agencies receive. Transit must often compete each year with other services such as police and fire for its portion of the local budget. As a result, service levels in most Florida communities are lower than what would be considered attractive to choice riders—in many areas, 30-40 minute headways on routes is considered relatively good service. In addition, the pedestrian and bicycle infrastructure needed to get people to and from transit stops is often poorly developed.

Florida transit planning tends to focus more on the short term, with a five-year transit development plan as far out into the future as agencies typically look. These plans tend to have little connection to local comprehensive plans, which typically cover a 20-year timeframe. As a result, there is often a disconnect between local land use planning and transit service planning.

Most Florida jurisdictions have not developed an urban growth boundary that defines where urban growth is to occur. As a result, new development patterns tend to be more scattered, and less easy for transit agencies to provide service to. The figure to the left shows a notable case from Tallahassee relating to the siting of a new state office complex. The grey area by itself in the lower-right corner of the map shows the site location; the other shaded areas indicate areas of the city receiving transit service, with darker areas indicating a greater amount of service. Land surrounding the site is undeveloped, and there are no pedestrian or bicycle facilities anywhere near the site.



As can be seen from the figure, the site is located well beyond existing transit service. The local transit agency tried providing service to the complex for about six months, but discontinued it due to low ridership. Instead, the arterial beltway around Tallahassee was widened to serve the site's additional traffic, which must travel a considerable distance from anywhere in the city to get to the site. In addition, the lack of other services near the site encourages midday auto trips.

The lesson from this story is that transit-supportive policies and regulations applying to individual developments do little good if transit planning and land use planning are not integrated. If land uses locate in areas that can only be feasibly served by the automobile, no amount of incentives, facilities, or services will make other modes attractive enough to be viable alternatives.

Finally, the ability to secure even modest transit-related infrastructure (e.g., transit shelters) from large developments in Florida varies greatly from one jurisdiction to another. Some communities have incorporated requirements for developer-provided transit infrastructure into their development codes. Other communities rely on negotiations with developers to obtain this infrastructure.

Oregon Comparison

Oregon does not apply concurrency in the strict sense that transportation improvements must coincide with the developments that trigger the need for them, although in practice it often works out that way. The State of Oregon takes a much greater role in setting planning requirements than does Florida, with laws and administrative rules that specify the content of long-range transportation plans, that require much closer integration between land use planning and planning for individual transportation modes, and that require consistency between state, regional, and local plans. Urban growth boundaries are required by the State for all cities. In addition, requirements for cities to provide street connectivity, pedestrian and bicycle facilities on new and improved roadways, transportation demand and transportation system management measures, and a long-term reduction in per-capita auto trip-making are all set at the State level by the Transportation Planning Rule (TPR).

Oregon fixed-route transit systems tend to have a fixed funding source: larger systems in MPO areas can form transit districts with the ability to impose a tax on employer payrolls, while smaller systems have relied upon renewable property tax levies. As a result, Oregon communities tend to receive higher levels of transit service than similarly sized Florida communities. Transit infrastructure requirements for individual developments depend on the local development code; however, these provisions are becoming more common as local transportation plans undergo their periodic update.

Performance Measure Environment

Performance measures and analysis techniques have existed for decades for the automobile mode. The *Highway Capacity Manual* (HCM) was the first document to assemble roadway capacity analysis procedures into one source, with the first edition being published in 1950. The next edition, in 1965, introduced the concept of *levels of service* (LOS), where ranges of values of roadway performance measures were assigned one of six letter grades ranging from "A" to "F". The LOS concept has been widely adopted, and has been used to describe service quality as perceived by the user for many other modes. The 1985 HCM introduced a LOS measure for transit, based on passenger loads, and a measure for pedestrians, based on pedestrian and bicycle densities.

In contrast, procedures for evaluating the service quality of other modes, as perceived by the users, have been lacking until recently. Bus transit capacity procedures were developed in the 1980s, and rail capacity procedures in 1995, but no single document summarized them until the *Transit Capacity and Quality of Service Manual* was published in 1999. Transit service quality measures have existed in various forms for many years, but no unified, nationally recognized means of presenting them existed prior to the TCQSM. Much existing pedestrian capacity work dates back to the early 1970s, but was mainly focused on evaluating high-volume pedestrian facilities and transit platforms. Not until the late 1990s did a nationally applied pedestrian LOS measure applicable to any facility type emerge. Similarly, early bicycle LOS measures borrowed traffic flow concepts from the auto mode, and not until the 1990s did user-oriented measures appear. Consequently, even if one wanted to evaluate modes other than the automobile, no nationally recognized methods existed until recently to do so.

Currently, the analysis procedures for the individual modes vary considerably in how much one mode affects the others. Different levels of work have been done in matching levels of service to user perceptions. As a result, a National Cooperative Highway Research Program (NCHRP) scheduled to start

late this year will develop a means of integrating the various modal procedures into a single multi-modal procedure, where levels of service across modes reflect similar levels of user satisfaction.

On the demand side, the Institute of Transportation Engineers (ITE) *Trip Generation* manual is a standard reference for estimating the number of auto trips generated by a new development, and is supported by a number of site surveys undertaken over the years. In contrast, no tool exists for estimating the number of transit, pedestrian, or bicycle trips a development might generate. Some local or state rules (for example, the Oregon TPR) allow the number of automobile trips assumed for mixed-use and pedestrian-friendly developments to be reduced by 10%; however, the basis for the selected number is not clear and the actual reduction achieved would likely vary depending on local conditions.

Existing mode splits are not a good source of information about potential alternative mode trip generation, as (1) they reflect the quality only of existing transit, pedestrian, and bicycle services and facilities, and (2) they are usually generated based on data derived from large areas. Two Florida studies (Kittelson & Associates, Inc., Polzin et al.) have determined that the actual percentage of people using transit, in areas and at times where transit service was provided, is considerably higher than the traditionally reported mode split. In Tallahassee, for example, the reported mode split, based on daily transit trips made in Leon County divided by all trips made in Leon County is 0.7%. When the mode split is calculated only for the portions of Tallahassee that receive transit service, the mode split increases to 4%. Finally, when the mode split is adjusted to account for the times that service is offered, the mode split increases to 11%.

Comprehensive Planning Process

The local comprehensive plan should serve as the starting point for implementing multi-modal concurrency. This plan provides the policy and planning framework behind the development regulations that a jurisdiction implements. Most importantly, it provides the connection between land use patterns and transportation facilities and services.

Areas where the comprehensive plan can assist with implementing multi-modal concurrency include the following:

- **Defining locations where transit service is currently provided or is likely to be provided in the future.** This should be done in partnership with the local transit service provider. The approach should *not* be to expect a commitment on the part of the transit agency to provide a certain amount of service in a certain area by a certain date. Rather, the intent is to make sure that when it becomes appropriate to provide transit service to an area (due to sufficient development occurring to generate ridership), that the supporting infrastructure and land uses are in place to make transit service successful.
- **Developing policies that prioritize alternative modes.** These can range from a general commitment to supporting alternative modes, to specific actions, such as providing interconnected street networks, a desire for wider sidewalks and pedestrian amenities in commercial districts, or a commitment to providing signal priority for transit vehicles.
- **Providing guidance for the kind and form of development desired near transit routes.** This guidance forms the basis for the specific requirements incorporated into the development code.
- **Setting an urban growth boundary.** A UGB helps manage growth. By making it more likely that new development will occur close to existing development with established pedestrian, bicycle, and transit facilities and services, these modes become more viable for the residents, employees, and customers of the new development.

In Portland, Oregon, the transportation element of the City's comprehensive plan designates functional classes for each mode, rather than the more typical one-size-fits-all classification (e.g., arterial, collector, local) that is used to specify right-of-way width, pavement width, sidewalk width and setback, etc. This allows the physical characteristics of each street to be tailored to the street's desired modal uses.

Regulatory Processes

Zoning

The desired land use patterns identified in the comprehensive plan are implemented through a jurisdiction's zoning ordinance. In the long term, providing for transit-supportive land uses and densities along existing or future transit routes can help support the use of transit. In the shorter term, three different types of zoning can facilitate land developer participation in providing facilities supporting alternative modes:

- *Incentive* zoning allows developers to build at a higher density (i.e., build additional residential units or more retail floor area) than would otherwise be allowed under the zoning code, in exchange for providing specified public amenities or facilities. To date, incentive zoning has been mainly applied to light rail projects, but could also be applied to premium (e.g., limited-stop or express) bus services.

- *Conditional* zoning allows developers to develop certain uses on a property that would otherwise not be allowed under the zoning code, in exchange for meeting specified conditions. Transit-related conditions could include public access rights, dedication of some parking for park-and-ride use, and transit-oriented development designs.

- *Overlay* zones provide additional development requirements on top of the base requirements for a zone. For example, a transit overlay zone could require wider sidewalks than normally required, dedication of sufficient space to place a shelter at a stop, or a requirement to stub out electrical conduit to a future bus stop location.

Land Development Codes

The land development code specifies the requirements that new developments must meet. According to CUTR, the best codes are ones that provide a balance between *predictability* regarding what is expected of developers and *flexibility* to enable the best and most appropriate improvements. Predictability is important to transit agencies, who generally do not have the staff available to review and comment on every development application, nor to negotiate improvements with every developer. Predictability is also important to developers, who get a better idea earlier on what the total cost of their development will be. Flexibility is important where (1) transit service is not yet provided and (2) to avoid being locked into a particular improvement or location that may be inappropriate for a particular situation. An example of flexibility is a requirement to provide an easement along the property for a shelter, with the location to be determined when service is provided.

Examples of things that could be built into a land development code that support alternative modes include:

- Street facility standards that specify the provision and size of pedestrian and bicycle facilities.

- Provisions for dedicating land or providing an easement for a transit shelter along existing or future transit streets, where insufficient space would exist between the curb and the sidewalk, or vehicle sight distance issues would arise.

- Provisions for stubbing electrical conduit to the sidewalk edge, for use with a future bus shelter.
- For larger developments, employee shower and changing facilities, and bicycle storage.
- Bicycle racks for use by customers.
- Building orientation, setbacks, and provision of direct pedestrian connections to the street.

Level of Service Mechanisms

Measuring the "adequacy" of a facility requires performance measures and standards. For the auto mode, levels of service have been the usual way of determining adequacy. A developer will submit a traffic impact study as part of the development application, identifying current traffic conditions, future traffic conditions without the development, the expected number of auto trips generated by the development, future traffic conditions with the development, and any mitigation required to restore adequate traffic operations following the opening of the development.

The transit LOS measures in the TCQSM, which take the passenger point-of-view, are not well-suited for identifying development impacts on transit service, as they cover such things as the availability of service and its comfort and convenience. Two of the measures, reliability and transit-auto travel time, would be expected to be negatively affected by the additional traffic generated by a development, but no analytical procedures exist for estimating the amount of this impact. Other tools that exist that could be more closely related to development impacts are (1) transit speed LOS, proposed by the TCRP A-7 project, and (2) the pedestrian crossing difficulty factor developed by the Florida DOT and proposed for inclusion in the TCQSM 2nd Edition. More discussion of these tools occurs later in this document.

The pedestrian and bicycle LOS measures adopted by the Florida DOT include traffic volumes, traffic proximity, and facility type and width, among other factors, and could serve to assess the impact of a development on those modes. These measures are discussed further later in this document.

To date in Florida, roadway LOS has been used to assess transit impacts. Broward (Ft. Lauderdale) and Hillsborough (Tampa) counties have made arrangements for developers to contribute operating funds or provide private shuttles when they cannot demonstrate that roadway improvements will meet roadway concurrency. Hillsborough County has also proposed allowing a lower roadway LOS when a minimum transit service frequency is provided along the roadway.

Transit improvements have been seen in Florida mainly as a way of getting around the need for improving roadway LOS, rather than as a means for improving overall mobility. Buses stuck in the same traffic as everyone else offer little incentive for travelers to switch modes, and increased congestion may increase the transit agency's operating costs, as travel times increase and additional buses are needed on routes to maintain headways.

The City of Gainesville, and Broward and Miami-Dade counties, have developed transportation concurrency exception areas (TCEAs) to secure bus transit facilities. Florida allows jurisdictions to designate TCEAs in areas where any of the following will occur: urban infill development, urban redevelopment (in economically distressed areas), or downtown revitalization, and where certain other conditions are met. Developments within TCEAs are exempt from meeting roadway concurrency standards, but must provide other means of meeting the area's transportation needs. In Gainesville, a developer funded bus shelters, sidewalks, and crosswalk improvements. In Miami-Dade County, the developer of a large mixed-use center intended to become a new downtown area funded a transit center with six bus bays, a covered waiting area with benches, a restroom facility for bus operators, a kiosk/transit information center, and 40 park-and-ride spaces.

Obtaining funding for transit operations is more difficult. Developers generally want to complete a project and move on to the next one as quickly as possible, to minimize their financing costs. Up-front costs are more acceptable than long-term commitments to provide funding. In Florida, ongoing transit operations funding has typically been obtained from institutional users such as hospitals. In addition, large office developments have agreed to operate private shuttles or fund public shuttles connecting the development to the public transit system.

Broward County has proposed changing its concurrency system to one focused on transit. This system is intended to ensure that reasonable service (and not just facilities) are available. Under the proposal, the County would be divided into Transportation Concurrency Management Areas (TCMAs) which could opt to use the new transit-oriented system, or remain with the current roadway-oriented concurrency system. Developers would pay a one-time fee into the TCMA that would be proportionate to the development's transportation impact. These fees would contribute to the funding of the five-year transit development plan. Developers would be able to determine the cost of their contribution early on in the process, and Broward County would avoid the need to monitor and enforce agreements for service provision. It should be noted that this system requires ongoing development to sustain itself.

Impact Fees

Impact fees have a considerable number of legal restrictions placed on them, including identifying the projects the fees will be used for, the amount of revenue that can be raised, the demonstrated proportional relationship to a development's impacts, and the amount of time the funds can be held before being spent. Impact fees cannot be used to address existing deficiencies, nor can they be used for operations or maintenance costs.

Because most of transit's costs are operational costs, impact fees are of no help in that area. However, a number of potential capital improvements exist that could benefit bus service that have not been widely tried to date. An exception is Montgomery County, Maryland, where proposed changes to the county's development impact tax would make the following kinds of projects eligible for impact fee funding: additional roadway capacity that benefits transit service, new or expanded park-and-rides, new buses and shelters (not replacement), and sidewalks. Broward County, Florida allows impact fees to be used for any capital costs identified in the Transit Development Plan, including transit centers, buses, shelters, information kiosks, Intelligent Transportation System (ITS) improvements, and bus bays.

Trip Reduction Ordinances

Trip reduction ordinances require property owners and employers to implement transportation demand management measures designed to reduce single-occupant vehicle use. They are generally directed to larger employers (e.g., 50 employees or more). The exact measures to be used are usually not specified, and are left to individual property owners and employers to decide, so long as the measures chosen meet the desired single-occupant vehicle trip reduction. These measures can include such things as:

- preferential parking spaces for carpools
- employee transit pass subsidy
- showers, changing facilities, and bike storage facilities for bicyclists
- shared company car available for employee use for traveling to mid-day meetings
- participation in shuttle programs sponsored by area employers

Special Financing Districts

In Florida, special assessments are fees charged against property within a defined area which are used to pay for specified capital improvements that benefit those properties. Special assessment districts can use public borrowing power to reduce financing costs, and give property owners a say in decisions on what improvements will be built. Special assessments are different than tax increment financing, which does not impose a new fee on properties, but rather captures all or a portion of the increased property tax revenue from properties benefiting from capital improvements bonded by the revenue. Portland, Oregon has used tax increment financing to provide local funding for the downtown Portland Streetcar and the Interstate Avenue light rail extension. Neither form of financing would likely be applicable to local circulator service, as property values would not be likely to increase as a result of the service, but might be applicable to bus rapid transit service.

Non-Regulatory Approaches

Non-regulatory approaches rely on negotiations between jurisdictions and developers to obtain desired pedestrian, bicycle, and/or transit facilities or services. According to CUTR, three things need to occur for these approaches to be successful:

1. The local government and/or the transit agency, and the private land developer each have something uniquely valuable to offer to the others in the partnership.

2. Incentive programs (e.g., density bonuses, lower parking requirements, or expedited permitting) and negotiations should not take the place of a strong land development code. In the presence of land development regulations, the existence of incentive programs signals to the developer that there is some flexibility in the process. Incentives also show that there is the desire on the part of the local government to negotiate to achieve the best outcome, not just a legal outcome.

3. Local government planning and permitting staff have effective negotiating skills. The staff also should understand enough about development financing to recognize what requests are too costly for the developer to accomplish.

CUTR Recommendations

The CUTR report makes the following recommendations for local jurisdictions and transit agencies to follow to maximize local developer participation in alternative mode improvements (recommendations relating specifically to Florida have been omitted):

1. Start with a comprehensive plan providing strong and clear policies on transit-friendly land development patterns, that is coordinated with the local transit development plan.
2. Consider the adoption of an urban growth boundary and transit service corridors, to focus public and private resources.
3. Incorporate alternative-mode development provisions into the land development code, striking a balance between predictability and flexibility.
4. Consider using conditional, incentive, and/or overlay zoning to secure private sector contributions.
5. Develop guidance manuals illustrating preferred development design concepts.
6. Establish alternative mode LOS standards and use these as the basis for requesting the provision of transit facilities and/or operations funding as part of the land development negotiation process.

7. Prioritize elements most needed for the bus system, starting first with elements of service availability, and secondarily on passenger comfort and convenience (e.g., amenities).
8. Establish a means to enable local governments to charge development for bus transit improvements that do not necessarily serve that development, but go toward development of routes which may be extended to serve that development in the future.
9. Consider adoption of other regulatory approaches, such as trip reduction ordinances and special financing districts, to provide for capital facilities and transit operations.
10. Consider offering incentive programs to land developers, such as density bonuses or lower parking requirements, in exchange for facilities supporting alternative modes.
11. Invest in professional development training for staff to improve their knowledge of the economics of land development, and to improve their negotiation skills.
12. Consider using a combination of regulatory and non-regulatory approaches.

Example Applications

The CUTR report contains a number of examples where the techniques described above have been applied. The following table summarizes the relevant examples; refer to the CUTR report for details.

Location	Approach
INCENTIVE ZONING	
Orlando, FL	Developers receive density and parking bonuses in exchange for a minimum contribution to the mass transit fund
Rosslyn, VA	Additional density granted for urban design benefits, off-site amenities, and economic development benefits
CONDITIONAL ZONING	
Orlando, FL	Transit-friendly design incorporated into development code; standards set for transit amenities warranted by the number of passengers and routes served
Fairfax County, VA	Developers agree to provide all facilities needed in exchange for an advanced date of approval
Prince William County, VA	Developers proffer development conditions beyond those required for unconditional uses
OVERLAY ZONING	
Pleasant Grove, UT	More intensive use allowed, when developers provide a safe, pleasant environment oriented towards pedestrians and transit users
TAX INCREMENT FINANCING	
Orlando, FL	Funds used to implement improved downtown circulator
SERVICE STANDARDS	
Lee County, FL	Requires provision of access to transit facilities (walkways, signage, shelters)
Hillsborough County, FL	Contribution to extending bus service in lieu of roadway improvements
Broward County, FL	Developer-funded community shuttles
IMPACT FEES	
Hillsborough County, FL	Impact fees allocated based on mode share
Orlando, FL	Impact fee credits for public transportation related improvements
Broward County, FL	Transit impact fees in lieu of road impact fees in infill areas
Montgomery County, MD	Proposal to allow impact fees to be used for transit capital projects
Portland, OR	System development charges allocated among various modes
TRANSPORTATION CONCURRENCY EXCEPTION AREAS	
Gainesville, FL	Shelter/sidewalk/crosswalk improvements in lieu of roadway widening
Kendall, FL	New transit center negotiated as part of concurrency exception

SEMINOLE COUNTY, FLORIDA

Seminole County, Florida, located northeast of Orlando, is in the process of developing a multi-modal concurrency system. The County has decided to take this approach in part because traditional roadway LOS methods leave no options for improving mobility once feasible improvement measures have been used up, and because—unlike other aspects of concurrency, such as water supply or schools—transportation demand increases in response to added capacity.

The County hired a consultant, Glatting Jackson Kercher Anglin Lopez Rinehart, Inc., to recommend approaches to improving the County's existing transportation concurrency system. Glatting Jackson prepared a white paper, *Expanded Approaches to Transportation Concurrency,* which explored three options for doing so.

The first option was to develop a level of service (LOS) measure for each transportation mode, and to combine the scores into an overall level of service score. The strengths of this approach are that LOS measures are quantifiable, objective, and readily calculated. Challenges are that LOS measures are abstract, not directly relatable to school grades despite the similar "A" to "F" grading system, are subjective in terms of where the thresholds between LOS grades are set, are [for roadways and transit] not based on consumer market research, may be complex to calculate or require continually updated data, and tend to produce an adversarial process—projects are tested against a standard and denied if they fail to meet that standard.

The second option was to specify performance criteria that eventually produce multi-modal capacity; the criteria specify the physical items that are required, rather than their results. Criteria could include number of local street connections from a subdivision, percent of floor area within a certain walking distance of a transit stop, and so on. A performance standard could be expressed as, for example, "a continuous sidewalk network, with out-of-direction travel limited to 20%, should extend to all trip destinations." Strengths of this approach are that it generates design guidelines that express how a community would like to develop, it gives developers flexibility in choosing how to meet the guidelines, and it is more efficient than the other two options. Challenges with the approach are that the criteria are still abstract, and could potentially result in designs that meet the criteria but do not achieve the intended result.

The final option was a multi-modal sector plan. Under this approach, an area plan would be developed showing a conceptual plan for all of the modal elements, including sidewalks, crosswalks, transit stops, etc. Some site design concepts would also be incorporated, such as internal street networks and building placement. Strengths of this approach are that it helps engage the public through the use of graphics, it uncovers potential issues at an earlier stage in the process, and is more easily explained than either LOS measures or performance criteria. Challenges with the approach are the amount of effort required up front to develop the initial plan, and the unknown amount of effort required to update the plans (how often do they need to be updated?).

Glatting Jackson recommended a two-pronged approach to concurrency. First, a multi-modal LOS point system should be used countywide, using the LOS measures developed by the Florida DOT, but with local weightings applying to the amount of priority given each mode in different environments: rural areas, development corridors, mixed-use centers, and neighborhoods. In areas where meeting the LOS standard can no longer be feasibly achieved, and that have been identified in the County comprehensive plan for redevelopment, a multi-modal sector plan should be developed to guide how the redevelopment should occur.

Seminole County is currently proceeding with identifying a pilot location to develop a multi-modal sector plan for. Subsequent work will identify desired design characteristics, a concept plan, a detailed 20-year special area master plan, and an implementation plan.

BROWARD COUNTY, FLORIDA

The following is a position paper produced by the Broward County Department of Planning and Environmental Protection (the County MPO) for local politicians and decision makers to educate them on the new transit-oriented concurrency mechanism designed for Broward County.

"Creating A Transit-Oriented Concurrency System for Broward County"

On August 29, 2000, the Broward County Commission directed staff to study the concept of modifying the County's transportation concurrency system, in order to orient it towards transit improvements. This concept paper describes a general approach that would accomplish that objective, discusses key legal, financial and jurisdictional issues involved, and presents a tentative implementation plan, should the County Commission direct staff to proceed in this direction.

The focus of a transit-oriented concurrency system would be to have proposed developments contributing a "fair share" towards transit improvements, as mitigation for transportation concurrency, instead of constructing or paying for roadway improvements. This concept is strongly aligned with the County Commission Strategic Goal concerning increasing transit ridership.

Devising a concurrency system based on transit improvements has only recently been made feasible, due to national and State development of meaningful measurement tools to determine the quality of transit service for a given area. These new tools enable transit service standards to be set, much like Level of Service "D" is a concurrency standard for roadways.

Staff is proposing that the County be divided into concurrency districts, called Transportation Concurrency Management Areas (TCMAs) under State law. Each district would either use the new transit-oriented system, or could opt out of the program and use a conventional concurrency system in which the developer implements a project selected from a variety of modes. For the Transit TCMAs, which are the focus of this effort, a developer would pay a fee, proportionate to the transportation impact of the proposed development, to help implement an adopted five-year transit plan.

In order for this to occur, the County Commission, with input from the MPO, would need to adopt a financially feasible five-year transit plan, using reasonable projections of expected revenues. A projection of revenue from the new concurrency system would be included. This plan would contain enhancements that would achieve and maintain, within five years, the transit service standards that are set for each Transit TCMA. The County must intend to fund transit, in each District, to achieve the same quality of service that the development community is being asked to contribute towards.

The proposed transit-oriented concurrency would be "pay-and-go" system, and staff is proposing that the payment be made at the site plan stage, when the specific nature of each development is well-defined. This will enable much more accurate calculation of the expected impact of each project, and eliminate substantial effort currently needed for monitoring and enforcement.

This concurrency concept would replace both the current roadway concurrency system, and the road and transit impact fees currently assessed. Exception areas (such as urban infill) and exemptions (such as de minimis) would be eliminated.

The adoption of this type of concurrency system would not, by itself, require additional public funding for transit. The transit service standards adopted by the County Commission for each TCMA would have to be based on a reasonable projection of revenues. Any increase in these standards above current service levels would have to be justified in terms of additional funding sources.

Because this proposed program is unprecedented in the State of Florida, there are a substantial number of legal, fiscal and intergovernmental issues that should be resolved prior to adoption of this proposal.

If the County Commission desires to proceed with implementation, staff has developed a series of steps, and a draft schedule, that could put such a system in place by the middle of 2003. The initial steps suggested to begin this process would be:

- Initiate an amendment to the Transportation Element of the Broward County Comprehensive Plan, which would be a policy statement of the County's intent to pursue this concept;

- Request each municipality to indicate, by October 2001, its preference between a conventional concurrency system and a transit-oriented system;

- Request the MPO, using the input from the municipalities, to recommend a set of concurrency districts by April 2002, along with recommendations for transit service standards for each Transit District; and

- Authorize staff to hire a consultant, during FY 2002, to review the specific Comprehensive Plan amendment establishing this system.

Measurement Tools

The County is currently considering several measurement tools to quantify the quality of transit service. In particular, the Florida DOT recently funded the development of a Transit Level of Service (TLOS) database for the County, using the software developed by the DOT's Public Transit Office. The TLOS performance measure, percent person-minutes served, accounts for where, when, and how long transit is provided, and the software identifies areas within walking distance of transit service using actual walking paths. The Broward County work also developed a pedestrian-crossing factor that reduces transit availability at a stop in proportion to the difficulty of crossing the transit street at a given bus stop, based on observed distances that pedestrians are willing to walk.

MIAMI-DADE COUNTY, FLORIDA

Miami-Dade County has implemented a transit overlay zone used in areas adjacent to Miami's heavy rail system. The following information is summarized from CUTR's report *Land Developer Participation in Providing for Bus Transit Facilities and Operations,* and supplemented with information from the Miami-Dade County Code and the codes of incorporated cities which contain portions of the heavy rail system.

The Miami-Dade Transit Agency was established in 1974, taking over the operations of the former Metropolitan Transit Authority. The agency is a department within the Miami-Dade County government.

The County established the Rapid Transit Zone in 1978 in areas in the vicinity of planned Metrorail heavy rail stations (the system did not open until 1984). The intent of the zone was to maximize the benefits of the largest public works project undertaken in the County by providing "maximum opportunities for development to serve as financial assistance to the system, and [providing] incentives

for joint development with the private sector." Incorporated cities containing Metrorail stations also adopted the County's zoning language into their respective city codes.

The following uses are allowed outright within the Rapid Transit Zone:

- Fixed guideways, stations, maintenance facilities, substations, and other facilities necessary for the operation, construction, and maintenance of Metrorail
- Parking lots, parking structures, bus stops, bus shelters, and landscaping
- Streets, sidewalks, and bikeways
- Parks and playgrounds

Other uses, including commercial, office, and residential uses, that are "appropriate to and compatible with the operation of the Rapid Transit System and the convenience of the ridership thereof" can be allowed, but require an extensive planning process and eventual development of subzones which are adopted into the County code. The general process is as follows:

- Requests for development within the Rapid Transit Zone are considered a special exception for site plan approval which must be considered and acted upon by the County Board of Commissioners, or the local City Council, depending on the jurisdiction.
- The Station Area Design and Development Process Program, a joint County-local government program, will prepare proposed master plan development standards for the proposed uses. This step includes negotiations with the developer, balancing jurisdictional needs to accommodate the development transportation impacts and jurisdictional desires for how the development occurs, with the developer's willingness and ability to pay for the proposed improvements.
- The proposed standards will be reviewed by the Rapid Transit Developmental Impact Committee, which is composed of the County's Developmental Impact Committee and two representatives from each of the following cities: South Miami, Coral Gables, Miami, and Hialeah. As the transit agency is a unit of County government, is it represented through the County Developmental Impact Committee.
- The committee issues a report on the proposed standards, which is forwarded to the appropriate city or County decision-making body for review and adoption. Once adopted, the subzone standards control all public land use decisions on the development, and other future development within the subzone. The County may request judicial review of local city decisions that it disagrees with.

To date, the County has adopted six subzones, all of which occurred between 1980 and 1982, although specific subzone requirements were amended from time to time. Two of the subzones were incorporated in 1999 into the larger Kendall Urban Center Zoning District.

An example of a development occurring within the Rapid Transit Zone was the 1994 Dadeland Station mixed-use development at the Dadeland North station. The developer proposed to lease 9.2 acres from the County, which would be used for 320,000 square feet of retail in an initial phase, followed by hotel, office, and residential uses in two subsequent phases. As part of the negotiations relating to mitigating the development's transportation impact, the developer agreed to incorporate a transit plaza into the development, and provide 9,600 square feet of "transit convenience retail." The lease arrangement with the developer, which is separate from the Rapid Transit Zone, guarantees the County minimum rent and gross income from the project. The County estimates it will receive between $40 and $100 million in income over the 99-year lease period.

The County believes that although the transit overlay zone currently applies only to MetroRail station areas, it could also work well for larger bus facilities, such as the South Dade Busway, where higher densities are desired in station areas. Such a zone could also facilitate the development approval process for transit support facilities such as park-and-ride lots.

MULTI-MODAL ANALYSIS TOOLS

Public Transit

Transit Capacity and Quality of Service Manual

The TCQSM was first published in 1999 as a result of an identified need to provide a single source document for transit capacity procedures, and to develop measures of service quality as perceived by passengers. It is intended to be the transit counterpart to the *Highway Capacity Manual,* and portions of the manual pertaining to on-street transit operations were incorporated into the HCM 2000. The TCQSM has undergone a testing period since its release, and the information derived from this testing is being applied to the development of a 2nd Edition. This new edition, scheduled for publication in early 2003, is intended to fill gaps in the first edition that the original project budget did not allow to be addressed, and to make revisions based on the feedback received from the testing.

The TCQSM presents six LOS measures: three relating to the availability of transit service (frequency, hours of service, and service coverage) and three relating to the comfort and convenience of transit service (passenger loads, reliability, and transit-auto travel time). All six measures currently appear in the first draft of the 2nd Edition, although most have been tweaked in terms of revised LOS thresholds, or additional factors used to calculate the measure.

None of the measures can be used at present to directly estimate the impact of development on worsening the quality of service experienced by riders, in the same manner that a development's impact on roadway LOS can be estimated. A development would generate new transit ridership, which would affect passenger loads, but no estimation tool currently exists for predicting the amount of ridership that would occur, in a manner similar to the ITE *Trip Generation* manual. Increased automobile traffic could affect the variability of transit travel times and thus on-time performance, but no estimation tool currently exists to predict this effect. Increased automobile traffic would also impact transit speeds, but would also impact auto speeds, and thus might have little effect on the relative difference between transit and auto travel times.

Early in the development of the 1st Edition of the TCQSM, when updates to the HCM transit chapter were being prepared, it was proposed to use transit travel speed (average speed including stops, traffic congestion, traffic signal delays, etc.) as the sole transit LOS measure for the HCM, similar to the other HCM chapters, which almost invariably present only a single LOS measure. This idea was not popular with the project panel, and resulted in the panel viewing the measure unfavorably, even in combination with other measures. However, given the challenges in calculating transit-auto travel time LOS (a system-wide measure), and an identified need to measure the impact of development on transit service, it may be appropriate for the TCQSM to revisit a travel speed measure. Such a measure was developed by the TCRP A-7 project and documented in TCRP Report 26.

The TCQSM acknowledges that there are other aspects of transit service, such as access to bus stops, and amenities at bus stops, which are important to passengers, but which are more difficult to quantify in terms of level of service. These secondary measures are identified and discussed within the TCQSM, but no LOS measures are presented.

The draft of the 2nd Edition of the TCQSM proposes an additional factor for service coverage LOS that measures the difficulty of crossing the street to get to a transit stop. This factor is based on one originally developed for the Florida DOT Transit Level of Service Indicator. This factor reduces the effective service coverage area of a stop in proportion to the amount of delay experienced by pedestrians crossing a street. Studies have shown that 75-80% of a bus stop's users come from within ¼ mile of the stop, and the percentage of users traveling no further than a given distance has been documented. This distance can be related to a walking time, based on assumed typical walking speeds (e.g., ¼ mile is equivalent to 5 minutes walking time). The pedestrian crossing factor assumes that average delay in excess of 30 seconds—the point at which a typical pedestrian starts to become impatient and may exhibit risk-taking behavior—takes away from the time that pedestrians are willing to spend walking. A reduction in walking time also reduces the maximum walking distance, and results in fewer people being considered served by a given stop. The factor includes lane widths, median type, traffic volumes, and traffic control type (signalized or unsignalized) in its calculation.

Florida DOT

The Florida DOT's new *Quality/Level of Service Handbook* identifies a single LOS measure for each alternative mode. For transit, the DOT uses the frequency measure from the TCQSM, but modifies the frequency by a factor relating to the facility's pedestrian LOS (described later). Some simplifying assumptions relating to signal timing and how routes using only a portion of an arterial are treated are also incorporated into the procedure.

Under the FDOT procedure, a pedestrian environment equivalent to pedestrian LOS "D" has no affect on the frequency LOS threshold given in the TCQSM. Better pedestrian LOS values give a 5-15% bonus to the calculated frequencies—in effect, transit service can be provided at slightly longer headways in a good pedestrian environment to achieve the same transit LOS. Worse pedestrian conditions give a 20% (LOS "E") or 45% penalty (LOS "F")—higher transit frequencies are required to achieve the same transit LOS.

Transit Level of Service Indicator

The Florida DOT's Public Transit Office commissioned the Transit Level of Service (TLOS) Indicator to provide a more detailed assessment of where and when service was provided, compared to existing methodologies. If service is offered hourly, and the bus went by the stop five minutes ago, a traveler would not consider that he or she had access to transit service at that minute in time. Rather, transit service would not be available again until the next bus arrived. Further, transit service is not available in all portions of a community, due to the distances required to walk to a stop and, potentially, an unsafe pedestrian environment, and service is generally not offered at all hours of the day or all days of the week.

The performance measure used is *percent person-minutes served*—the average percentage of time a location, a neighborhood, a city, or an entire transit system receives service. Users can determine maximum walking distances to transit (FDOT recommends 5 minutes for local bus service and 10 minutes for rail and busway service) and the amount of time each transit vehicle is assumed to provide service, equivalent to a maximum desired wait time if the schedule is not known (FDOT recommends 5 minutes). The measure can be calculated for timeframes ranging from fifteen minutes to one week.

The TLOS Indicator directly reflects the amount of service offered: if service frequencies are doubled along the route, the indicator value doubles. The measure values can be converted to equivalent LOS values, based on LOS thresholds for frequency and hours of service given in the TCQSM. The measure can be calculated using a spreadsheet for localized areas, but requires the use of stand-alone software for use on a city-wide or system level. The amount of effort required initially to develop the data required for the full software can be considerable, and depends in large part on whether or not transit stop, transit

route, street and pathway, and population and job data already exist in GIS format, and on the complexity of the transit schedules used.

A Guidebook on Developing a Transit Performance-Measurement Program

This Guidebook will be a TCRP publication designed to help transit agencies and others develop programs to measure transit performance. The project has identified over 400 performance measures relating to the passenger, community, agency, and vehicle points of view. These measures will be described in the Guidebook, which is scheduled for publication early in 2003.

Pedestrian LOS

Prior to the HCM 2000, pedestrian LOS measures were mainly based on the average area provided per pedestrian. This measure is appropriate for crowded sidewalks in the downtown areas of very large cities, and for sizing transit platforms, but is less appropriate in other environments. Recently, other measures have been developed as alternatives.

Highway Capacity Manual 2000

The pedestrian chapter of the HCM 2000 retains the previous walkway and waiting area LOS measures based on area per pedestrian, but introduces additional new LOS measures based on the amount of average delay pedestrians experience at signalized and unsignalized crossing locations. The new measures can be used to reflect the impact of street widening (to mitigate development traffic impacts) and additional traffic volumes (resulting from development) on pedestrians. However, neither measure assesses the quality of the pedestrian environment along a street or in an area.

Florida DOT

The Florida DOT commissioned the development of a pedestrian LOS methodology. A "Walk for Science" was held in Pensacola along different types of pedestrian facilities. Participants rated the overall quality of the pedestrian environment for each facility. A regression model was used to determine the relative importance of different factors on perceived quality. Finally, an equation was developed to convert the model results into scores (generally ranging from 0.5 to 6.5) that relate to levels of service. A score less than or equal to 1.5 is LOS "A", 1.5-2.5 is LOS "B", 2.5-3.5 is LOS "C", and so on.

The main factors affecting pedestrian LOS are the existence of a sidewalk, lateral separation of pedestrians from motorized vehicles, vehicle volumes, and vehicle speeds. The LOS thresholds have more of a scientific basis than do the HCM and TCQSM automobile and transit LOS thresholds, which were developed by committee. However, the index value by itself has no meaning to users, as it is not something that can be measured in the field and, in fact, can be achieved by a multitude of different combinations of volumes, speeds, amount of built sidewalk, etc. This is not necessarily a problem, as the whole point of level of service grades is to convert a technical performance measure into a form that is more easily communicated to the public and to decision-makers.

Bicycle LOS

Highway Capacity Manual 2000

Prior to the HCM 2000, the HCM did not present a LOS measure for bicycles. The HCM 2000 presents four bicycle measures: two measures for exclusive bicycle paths and shared use bicycle paths based on the frequency of encountering other users of the path, a measure for intersections based on average delay, and a measure for bicycle lanes based on average bicycle travel speed. Because of the multitude of facility types considered, it is difficult to compare different facility types to each other—is a low-volume residential street with no dedicated bicycle facilities better or worse than an arterial street with high traffic volumes and speeds that has a bicycle lane?

Florida DOT

The Florida DOT has adopted a bicycle LOS methodology developed similarly to the pedestrian LOS methodology, but predating FDOT involvement and that has received relatively widespread application. A "Bike for Science" was held in the Tampa area along different types of roadways offering differing levels of bicycle facilities and traffic volumes. Participants rated the overall quality of the bicycle environment for each facility. A regression model was used to determine the relative importance of different factors on perceived quality. Finally, an equation was developed to convert the model results into scores (generally ranging from 0.5 to 6.5) that relate to levels of service. A score less than or equal to 1.5 is LOS "A", 1.5-2.5 is LOS "B", 2.5-3.5 is LOS "C", and so on.

The main factors affecting bicycle LOS are the average effective width of the outside through lane (including a bicycle lane, if present), vehicle volume, vehicle speeds, truck volumes, and pavement condition. The same comments applying to the Florida DOT pedestrian LOS methodology also apply to the bicycle LOS methodology.

Bicycle Compatibility Index

The Federal Highway Administration sponsored the development of a bicycle compatibility index and associated levels of service. The methodology and index score used are similar to the Florida DOT methodology described above, but the rating process was based on participants viewing videotapes of different potential bicycling environments. This approach was chosen out of concern for bicyclist safety in bad environments for bicycling, and to allow the incorporation of a wide variety of environments from different cities. The index was developed based on the ratings of study participants in three cities (Olympia, WA, Austin, TX, and Chapel Hill, NC); no significant difference in ratings was observed between the groups of participants in the three cities.

The main factors affecting the bicycle compatibility index and the resulting LOS score are the presence of a bicycle lane or paved shoulder at least 3 feet wide, width of the bicycle lane or paved shoulder, curb lane width and volume, volume of traffic in other lanes in the same direction, 85th-percentile traffic speeds, the presence of a parking lane with more than 30% occupancy, type of roadside development (residential or other), truck volumes, amount of parking turnover, and right-turn volumes. The same comments applying to the Florida DOT bicycle and pedestrian methodologies apply to this methodology.

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