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Department of Transportation

LEVEL OF SERVICE STANDARDS AND HIGHWAY CAPACITY ANALYSIS FOR THE STATE HIGHWAY SYSTEM

PURPOSE:

To provide implementation procedures and criteria for the Florida Department of Transportation's Level of Service Standards for the State Highway System.

AUTHORITY:

Sections 20.23(4)(a) and 334.048(3), Florida Statutes (F.S.)

SCOPE:

This procedure will be used by all offices of the Florida Department of Transportation (Department) for the planning, design and operation of the automobile mode on the State Highway System. No specific level of service requirements are established for other highway modes (e.g., bus, pedestrian, bicycle). Rather, these modes are determined on a case by case basis in accordance with guidance in the Department's ***Quality/Level of Service Handbook***. This procedure may also serve as a reference document for other entities involved with highway capacity and quality/level of service analyses of the State Highway System.

REFERENCES:

- Sections 334.03, 334.044(10)(a), (12), (19), and 339.155(2), F.S.
- Level of Service Standards for the State Highway System, Policy No. 000-525-006
- Plans Preparation Manual, Topic No. 625-000-007
- Project Development and Environment Manual, Topic No. 650-000-001
- New or Modified Interchanges, Topic No. 525-030-160
- Project Traffic Forecasting Procedure, Topic No. 525-030-120
- System Planning Office's Quality/Level of Service Handbook
- System Planning Office's Interchange Access Request User's Guide
- Transportation Research Board's Highway Capacity Manual

DEFINITIONS:

Automobile Mode: A travel mode that includes all motor vehicle traffic using a roadway such as trucks, recreational vehicles, motorcycles, and tour buses, with the exception of transit buses.

Facility: A length of roadway consisting of a combination of points and segments.

Capacity: The maximum number of vehicles or persons that can reasonably be expected to pass a point on a roadway during a specified time period under prevailing roadway, environmental, traffic, and control conditions.

Standard K Factor: The ratio of the peak hour traffic volume to the annual average daily traffic, based on a roadway's characteristics and location.

Level of Analysis: Analytic methods relating to transportation phases of planning, project development, design and operations; or to the transportation system structure of points, segments or facilities.

Level of Service (LOS): A quantitative stratification of the quality of service to a typical traveler of a service or facility into six letter grade levels, with "A" describing the highest quality and "F" describing the lowest quality. LOS "C" and "D" represent generally acceptable moderate to heavy traffic flows or operating conditions. For further clarification as it relates to specific LOS grades see ***Quality/Level of Service Handbook***.

Managed Lane: Exclusive lane(s) on a freeway accessible to those who pay a toll, carpool, or ride in public transit vehicles.

Peak Hour(s): Hour(s) of the day in which the maximum volume occurs.

Performance Measure: A quantitative or qualitative characterization used to evaluate a particular aspect of travel quality.

Point: A place along a facility where conflicting traffic streams cross, merge, or diverge.

Quality of Service: A traveler based perception of how well a service or facility is operating.

Segment: A portion of a facility from one point to the next consecutive point.

Standard: A specification to be employed for the majority of conditions and applications for which it is defined.

State Highway System (SHS): The interstate system and all other roads within the state which were under the jurisdiction of the state on June 10, 1995, and roads

constructed by an agency of the state for the State Highway System, plus roads transferred to the state's jurisdiction after that date by mutual consent with another governmental entity, but not including roads so transferred from the state's jurisdiction. These facilities shall be facilities to which access is regulated.

Transportation Impact Assessment: An analysis conducted to determine the impacts to the transportation system of a proposed development.

Urbanized Area: A geographic region comprising as a minimum the area inside an urban place of 50,000 or more persons, as designated by the United States Bureau of the Census, expanded to include adjacent developed areas as provided for by the Federal Highway Administration regulations.

1. BACKGROUND FOR LEVEL OF SERVICE STANDARDS AND HIGHWAY CAPACITY CONCEPTS

Since publication of the ***Highway Capacity Manual (HCM)***, LOS has been the primary technical tool used for planning and designing the nation's highways. Early common practice was for highways to be planned and designed towards LOS "C". By the mid-1970's, common practice in urbanized areas has been to design highways to achieve LOS "D".

1.1 HIGHWAY CAPACITY MANUAL

The ***HCM*** is widely recognized as the leading reference document on highway capacity and LOS in the United States. It contains analytical methodologies, but does not address what levels of service are desirable.

The first ***HCM*** was published by the Bureau of Public Roads in 1950. Subsequent major updates were published by the Transportation Research Board (TRB) in 1965, 1985, 2000 and 2010. The 2010 ***HCM*** is multimodal in approach, simultaneously addressing automobile, transit, pedestrian and bicycle modes. Collectively, these travel modes represent the major highway modes of travel. The Department has been actively involved with the ***HCM*** since the early 1990's. In fact, many traffic engineering/planning advances developed in the Department's operating procedures and handbooks were incorporated in the 2010 ***HCM***.

The concept of highway (i.e., automobile mode) LOS first appeared in the 1965 ***HCM***. While the primary users of the ***HCM*** are practicing traffic engineers, LOS became the primary method to explain technical traffic planning and engineering analyses to elected officials, as well as the general public.

1.1.1 HIGHWAY CAPACITY SOFTWARE

To facilitate the use of the HCM analytical methodologies, the ***Highway Capacity Software (HCS)*** was created to replicate the ***HCM*** analytical methodologies. Nationally,

it is widely regarded as the leading software package implementing the ***HCM***. ***HCS*** is owned and maintained by the University of Florida McTrans Center.

1.2 QUALITY/LEVEL OF SERVICE HANDBOOK

The Department began publishing its ***Quality/Level of Service (Q/LOS) Handbook*** in 1989, with the purpose of serving Florida as a planning guide to the ***HCM***. It is maintained by the Systems Planning Office and updated as needed or approximately every four years.

The ***Q/LOS Handbook*** contains simplifying assumptions to the more detailed ***HCM*** procedures, extensions and modifications to the ***HCM*** procedures, maximum acceptable capacity volumes to be used in Florida and descriptions of the ***LOSPLAN*** software. It also contains generalized service volume tables which are frequently used around the United States. Analytical methods are provided for the automobile, bus, pedestrian and bicycle modes.

1.2.1 LOSPLAN SOFTWARE

The Department's ***LOSPLAN*** (LOS planning) software contains the core tools for site and project specific planning-level analyses. The software is based on the ***Q/LOS Handbook*** and tied directly to the ***HCM*** analytical methodologies. ***LOSPLAN*** is distributed as part of the ***HCS***.

2. ACCEPTABLE OPERATING LOS STANDARDS

It is the Department's intent to plan, design, and operate the SHS at a generally acceptable LOS for the traveling public. LOS standards for the automobile mode on the SHS during a peak hour(s) are "D" in urbanized areas and "C" outside of urbanized areas. LOS standards represent goals for Department and other entities to achieve and maintain. No specific LOS standards are established for other highway modes (e.g., bus, pedestrian, bicycle).

2.1 APPLICATION OF LOS STANDARDS

Except for toll and managed lane facilities, including express lanes, the standards are applied by the Department from planning through design phases for all facility level analyses. In the planning phase, the LOS standards are considered in prioritizing the funding of projects and are used in the reporting of LOS as part of the Department's performance measurement activities. In identifying future transportation needs, the LOS standards are the primary measure of existing and future mobility needs of the traveling public. In project development and design, the LOS standards serve as the principal mobility goal.

Department documents tied directly to the application of the LOS standards include:

- Systems Planning's ***Q/LOS Handbook***
- Systems Planning's ***New or Modified Interchanges***, Topic No. 525-030-160
- Transportation Statistics' ***Project Traffic Forecasting Procedure***, Topic No. 525-030-120
- Environmental Management's ***Project Development and Environment Manual***, Topic No. 650-000-001
- Design's ***Plans Preparation Manual***, Topic No. 625-000-007

Use of Department's LOS standards and guidance on acceptable highway capacity and LOS methods (including software) apply to all Department reviews and assessments of proposed developments directly impacting the SHS. In the review of plans and designs of other entities directly impacting the SHS, the Department recommends the adoption and use of the Department's LOS standards. Regardless of adoption or use by non-Department entities, the Department will use the LOS standards for the review of actions directly affecting the SHS for its planning and permitting processes.

The LOS standards apply to peak hour(s) using Standard K factors at a facility level with guidance provided on application to other levels of analysis (e.g., signalized intersections). Having the LOS standards directly applied at the facility level provides both reasonable consistency and flexibility at a project level for appropriate planning and design of highway facilities.

3. APPLICABILITY OF HIGHWAY CAPACITY AND LOS METHODS AND SOFTWARE

3.1 HIGHWAY CAPACITY MANUAL

Since the 1970's, more sophisticated tools like signal optimization and complex microsimulation programs have been developed to offer the potential for more accuracy in addressing traffic engineering issues. Conversely in recent years, less sophisticated traffic engineering/planning tools have been developed which require less analytical effort. In the broad spectrum of LOS analysis tools, the ***HCM*** falls approximately in the middle in terms of complexity and potential accuracy. Although the ***HCM*** is nationally viewed as the leading resource document on highway capacity and LOS and has national consensus behind it, its methodologies do not necessarily provide the greatest accuracy at either the national or state levels.

Given its generally acceptable principles, the Department's primary source for highway capacity and LOS analysis methodologies is the ***HCM***. However, some evaluation methodologies may be overridden or supplemented by those documented in the ***Q/LOS Handbook*** or in other Department procedures. In general, ***HCM*** capacity methodologies and ***HCS*** analyses take precedence over other techniques for

operational analyses at the point and segment levels of analysis. Frequently, other analytical methodologies take precedence at the facility level.

3.2 QUALITY/LEVEL OF SERVICE (Q/LOS) HANDBOOK

On the SHS the following planning-level analysis techniques described in the ***Q/LOS Handbook*** may be used in lieu of the techniques in the ***HCM/HCS*** or other related methodologies:

- Generalized service volume tables
- Freeway facility capacities
- Rural freeway LOS criteria
- Arterial facility LOS criteria
- Arterial free flow speed determinations
- Passing lanes on two-lane highways

4. TRAINING

No mandatory training is associated with this procedure; however, technical training is the optimal practice.

At the planning level, the Central Office Systems Planning Office provides training in the Districts upon each update of the ***Q/LOS Handbook***, as well as regional trainings approximately every 2 years between updates.

At the design and operational levels, as funding allows, the Systems Planning Office provides regional training on the ***HCM*** and ***HCS*** approximately every 4 years. In addition to the Department, other entities may provide additional ***HCM*** and ***HCS*** training on an as-needed basis.

5. FORMS

No forms are required as part of this procedure.