Develop Roadway Capacities

Description

The purpose of this procedure is to provide a consistent methodology in determining Level of Service (LOS) D capacities in a Comprehensive Transportation Plan (CTP). The data will be used during deficiency analysis.

Responsibility

The *TPB Project Engineer (PE)* - determine roadway capacities based upon the LOS D Standards.

The *Planning Group Supervisor (PGS*) - to review the capacities established by the PE.

Scheduling and Time Constraints

The determination of LOS D capacities for the highway element of the CTP should be completed after collecting existing roadway data and prior to beginning the deficiency analysis.

Procedure

Step	Action
1	Determine the "**Region**" of the roadway, using the TPB geographic areas as a guide: • **PIEDMONT:** Metrolina, Triad, and Triangle • **MOUNTAINS:** Mountains (Note – Areas like Hickory may have more of a Piedmont geography.) • **COASTAL:** Northeast and Southeast (Note – Areas like Fayetteville/Rocky Mount may have more of a Piedmont geography.)
2	Determine the "**Area Type**" of the roadway: o **RURAL** – Areas outside a municipality or Extraterritorial Jurisdiction (ETJ) o **SUBURBAN** – Areas within a municipality or ETJ, but not within Central Business District (CBD) or areas immediately surrounding a CBD o **URBAN** – Areas typically within a CBD or immediately surrounding a CBD
3	Determine the "**Facility Type**" of the roadway: • **FREEWAYS** – Multi-lane divided facilities with complete access control (interchanges only and no traffic signals) • **EXPRESSWAYS** – Multi-lane divided facilities with a high level of access control and no traffic signals (interchanges, limited at-grade intersections, right-in/right out access) • **BOULEVARDS** – Divided facility with moderate access control and traffic signals at major intersections. • **OTHER MAJOR THOROUGHFARES** – Undivided facilities that have low to moderate access control and traffic signals at major and some minor intersections. Other Major Thoroughfares can be US or NC routes containing 2

	to 5 lanes or secondary (SR) or local routes containing 4 to 5 lanes and are typically within a municipality or ETJ. • **MINOR THOROUGHFARES** – Undivided facilities that have low access control and traffic signals at major and minor intersections. Minor Thoroughfares can be secondary (SR) or local routes containing 2-3 lanes and are typically within a municipality or ETJ. • **RURAL TWO-LANE HIGHWAYS** – Two-lane undivided facility outside a municipality or ETJ. These facilities typically have a speed limit of 55 MPH and have low access control with numerous driveways and no traffic signals. *Note*: These facilities are classified on the CTP as Other Major Thoroughfares if they are a US or NC route and Minor Thoroughfares if they are a secondary (SR) or local route.
4	Based upon the Region (Step 1), Area Type (Step 2) and Facility Type (Step 3), determine which tables should be utilized. The "**Standard**" LOS D values in the tables will be suitable in most cases where collected and observed traffic is normal to the area. • If it is determined through extensive data collection and observation that a facility(s) in the CTP area does not perform in a normal way, the "**Minimum**" or "**Maximum**" LOS D values in the tables should be considered. These minimum and maximum values indicate, respectively, the typical lowest and highest capacities for a given facility. Numbers between the minimum and maximum values may be used as well, provided there is extensive data to validate them. **WARNING:** Although there may be a select number of facilities within the CTP area that perform better and/or worse than average, most roads will typically perform at a standard level. Consider the use of the Standard LOS D values for most roadways unless there is extensive data to prove otherwise. • There may be exceptions where collected and observed data fall outside the "**Minimum**" or "**Maximum**" LOS D values. In these cases, use NCLOS V2.1 to develop capacities. The "**Standard**" LOS D values represent an average LOS D for a given facility. It is the default value for a given region. The "**Minimum**" LOS D values represents conditions/inputs that result in a worst-case LOS D for a given facility and region. Conditions may represent a road with many access points or poor geometric design. The "**Maximum**" LOS D values represents conditions/inputs that result in a best-case LOS D for a given facility and region. Conditions may represent a road with few access points or superior/improved geometric design.
5	Determine the "**Standard**" LOS D capacity value: • **FREEWAYS Table** Based on the number of lanes per direction on the freeway, the truck percentage during the peak hour, and the type of terrain in mountainous areas, find the capacity in the appropriate column. *Note:* To determine peak-hour truck percentage, consult the closet freeway ATR station (preferably in the same county or, at minimum, region). • **EXPRESSWAYS Table** Based on the number of lanes per direction on the expressway, the truck

	percentage during the peak hour, and the type of terrain in mountainous areas find the capacity in the appropriate column. *Note:* To determine peak-hour truck percentage, consult the closest expressway ATR station (preferably in the same county or, at minimum, region). • **BOULEVARDS Table** Based on the number of lanes per direction and speed limit on the boulevard, find the capacity in the appropriate column. • **OTHER MAJOR THOROUGHFARES Table** Based on the number of lanes per direction, the lane width and speed limit on the other major thoroughfare, find the capacity in the appropriate column. • **MINOR THOROUGHFARES Table** Based on the number of lanes per direction, the lane width and speed limit on the minor thoroughfare, find the capacity in the appropriate column. • **RURAL TWO-LANE HIGHWAYS Table** Based on the lane-width of the rural two-lane highway, find the capacity in the appropriate column.
6	The PE shall review all established capacity values with the Planning Group Supervisor to ensure accuracy and consistency across the network. This is particularly important for facilities where capacity values other than the "**Standard**" LOS D values were used.
7	The PE inserts the established capacities in the appropriate column of the CTP Inventory and Recommendations Table.

Policy, Regulatory, and Legal Requirements

The Transportation Planning Branch (TPB) uses LOS D as a basis for establishing roadway capacities for systems level planning and identifying highway deficiencies. TPB uses LOS D in order to identify deficiencies and recommend solutions before roadways reach failing conditions.

Resources

- Level of Service D Standard Tables
- Level of Service D Standard Inputs
- Appendix A - Freeway Equations and Inputs
- Appendix B - Expressway Equations and Inputs
- Appendix C - Boulevard Equations and Inputs
- Appendix D - Other Major Thoroughfare Equations and Inputs
- Appendix E - Thoroughfare Equations and Inputs
- Appendix F - Rural Two-Lane Highway (55 MPH) Equations and Inputs
- NCLOS Data Needs and Sources
- LOS Training Presentation

Background

A volume-to-capacity (V/C) ratio is essential to identifying deficiencies in the roadway network. If a facility is near (0.80-0.99 V/C) or over (1.00+ V/C) capacity, this can greatly reduce the efficiency of the transportation system.

In 2005, the North Carolina Level of Service Version 2.1 (NCLOS V2.1) program was developed by the Institute for Transportation Research and Education (ITRE) at North Carolina State University. NCLOS V2.1 is based on the 2000 Highway Capacity Manual, published by the Transportation Research Board (TRB).

LOS D Standards for systems level planning were derived from NCLOS V2.1 as well as the 2000 Highway Capacity Software (HCS+T7F).

Record of Revision

The information contained in this procedure is deemed accurate and complete when posted. Content may change at any time without notice. We cannot guarantee the accuracy or completeness of printed copies. Please refer to the online procedure for the most current version. Contact TPB Staff Engineer with all the questions about this procedure.

Version	Section Affected	Description	Effective Date
1.1	Entire Procedure	Updated procedure template	10/10/14

Flowchart