LEVEL OF SERVICE

The concept of roadway level of service (LOS) is defined as a range of operational conditions that exist within a traffic stream. These conditions involve travel speed, travel time, maneuverability, interruptions, comfort, convenience and safety. These factors, integrated into an established methodology, produce a measure of the number of vehicles that can reasonably be expected to occupy a segment of roadway at each level of service. Generalized definitions of the various categories as described in the 1985 TRB Highway Capacity Manual are given below:

1. LOS A: Highest LOS which describes primarily free-flow traffic operations at average travel speeds. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at intersections is minimal.

2. LOS B: Represents reasonably unimpeded traffic flow operations at average travel speeds. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tensions.

3. LOS C: Is in the range of stable flow, but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now

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affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

4. LOS D: Represents high-density, but stable, flow. Speed and freedom to maneuver are severely restricted, and the driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

5. LOS E: Represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Freedom to maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor, and driver or pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor disturbances within the traffic stream will cause breakdowns.

6. LOS F: Is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are

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characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. It should be noted, however, that in many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. Nevertheless, it is the point at which arrival flow exceeds discharge flow which causes the queue to form, and level-of-service F is an appropriate designation for such points.

In Table 1 the major roadways in Dunnellon have been assigned a level of service based on the average daily volume of traffic that has been referenced to volume thresholds established by FDOT in their Generalized Daily Level of Service Maximum Volumes tables for rural areas (Figure 2). This comparison of actual volume on the road to computed volume thresholds of traffic at each level of service allows for the establishment of a specific level of service on each roadway section.

Roads under State jurisdiction must meet minimum level of service standards according to their functional classification as established by FDOT. US 41/SR 45, as a principal arterial, must operate at level of service C or better. This is achieved on the four lane section but, as can be seen in Table 1, the 2 lane

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section of US 41 on the northern end of town is now operating at LOS D. As this is unacceptable, improvements are necessary to provide additional capacity for this road section, which would be the construction of two additional lanes. The most recent FDOT 5-Year Work Plan (adopted 9/19/90) does not include roadway improvements to US 41 within the Dunnellon city limits. Also, review of the Marion County Traffic Circulation Element (6/91 transmittal) does not indicate improvements scheduled for the immediate Dunnellon area within the next five years. The County's Traffic Circulation Element, however, does identify a need for a two lane improvement to US 41 south of CR 484 to the Citrus County line by 1996.

The implications of a deficient level of service would involve a severe limitation on growth along this corridor which serves as a primary center of commerce for the City. Therefore, because the roadway is not constrained, is not scheduled for major capacity improvements in the FDOT 5-Year Work Program, and does not currently meet the minimum acceptable level of service, the section of US 41 from Powell Road to the north City limit is classified by this Plan as backlogged. Due to such special considerations, the City may adopt a level of service to "maintain and improve" this road segment. As such, the FDOT and the City must commit to not further degrade operating conditions of the roadway below the current average travel speed until the roadway is upgraded. After roadway or operational improvements are made, the roadway should

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operate at or above level of service C, peak hour.

The major collector rural roads, CR 40 and CR 484 are under County jurisdiction and must also operate at level of service C or better, concurrent with the standards to be adopted in the Marion County Traffic Circulation Element. Currently these roads are operating within acceptable conditions at level of service C or better.

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TABLE 1: EXISTING TRAFFIC VOLUMES AND LOS - 1990

Roadway	From	To	Functional Class	No. Lanes	Average Daily Traffic	LOS C Volume Threshold	LOS
US 41	S. City Limits	Powell Rd.	Principal Arterial	4	12,330	24,900	C
US 41	Powell Rd.	N. City Limits	Principal Arterial	3/4	8,995	7,450	D
CR 484	US 41	E. City Limits	Major Collector	2	3,050	6,100	C
CR 40	US 41	W. City Limits	Major Collector	2	3,570	6,100	C

Source: 1. FDOT 1989 factored to 1990.
2. Henigar & Ray 1989 factored to 1990.

ACCIDENTS

Information on high accident locations was obtained from the Marion County Traffic Circulation Element. This data, obtained from FDOT District 5 and the Marion County Sheriff's Office, focuses on high accident intersections within the county. As can be seen in Table 2, most are located in areas that experience higher traffic volumes than Dunnellon, mainly around Ocala and I-75.

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Table 2

High Accident Locations
by Intersections
Marion County, 1988

ID	LOCATION	NUM.
1	Interstate 75 @ SR 326	61
2	Interstate 75 @ SR 40	20
3	Interstate 75 @ CR 484	79
4	Interstate 75 @ SR 200	24
5	Interstate 75 @ CR 318	37
6	Interstate 75 @ US 27	8
7	SR 40 @ SR 19	7
8	SR 40 @ SR 35	15
9	SR 40 @ CR 314	11
10	SR 40 @ SW 60th Ave	8
11	SR 40 @ SW 16th Ave	19
12	SR 40 @ SW 85th Ave	5
13	SR 40 @ SW 27th Ave	29
14	SR 40 @ CR 314-A	21
15	SR 40 @ NE 36th Ave	19
16	US 441/US 301 @ SE 52nd St	19
17	US 441/US 301 @ SW 17th St	22
18	US 441/US 301 @ NW 1st St	19
19	US 441/US 301 @ SR 326	17
20	US 441/US 301 @ CR 329	13
21	US 301 @ CR 316	9
22	SR 200 @ CR 484	11
23	SR 200 @ SW 27th Ave	20
24	SR 200 @ SW 60th Ave	6
25	SR 464 @ SR 35	8
26	CR 316 @ CR 315	10

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Draft Revised 10/19/90

Source: Marion County Traffic Circulation Element, 1990

Figure 2

GENERALIZED DAILY LEVEL OF SERVICE MAXIMUM VOLUMES FOR FLORIDA'S RURAL (<5,000) AREAS

(valid for use from January 1989 through December 1990)

UNDEVELOPED AREAS AND FREEWAYS

FREEWAYS

Lanes	Level of Service				
	A	B	C	D	E
4	17,100	26,300	37,600	45,400	48,800
6	25,600	39,500	56,300	68,000	73,200
8	34,100	52,700	75,100	90,700	97,500

MULTILANE UNINTERRUPTED HIGHWAYS

(less than 1 signalized intersection every 4 miles)

Lanes	Level of Service				
	A	B	C	D	E
4	15,700	22,800	30,900	38,000	47,500
6	23,500	34,200	46,300	57,000	71,200

TWO-LANE UNINTERRUPTED HIGHWAYS

(less than 1 signalized interection every 4 miles)

55 MPH Posted Speed

Lanes	Level of Service				
	A	B	C	D	E
2	2,900	5,800	9,400	15,000	24,200

45 MPH Posted Speed

Lanes	Level of Service				
	A**	B	C	D	E
2	—	2,800	7,500	12,300	23,300

INCORPORATED AND DEVELOPED AREAS

(cities, developed but unincorporated areas or roadways influenced by signalized intersections)

TWO-WAY ARTERIALS

Group A (cities or developed areas with no signalized intersections, or roadways with 0.25 to 0.75 signalized intersections per mile)

Lanes/ Divided	Level of Service				
	A**	B**	C	D	E
2 Undiv.	—	—	7,500	11,300	15,100
4 Undiv.	—	—	25,100	27,400	30,300
4 Div.	—	—	26,400	28,800	31,900
6 Div.	—	—	39,900	43,400	48,000

Group B (0.76 to 1.5 signalized intersections per mile)

Lanes/ Divided	Level of Service				
	A**	B**	C	D	E
2 Undiv.	—	—	7,100	10,700	14,200
4 Undiv.	—	—	23,700	26,300	28,700
4 Div.	—	—	24,900	27,700	30,200
6 Div.	—	—	38,300	41,900	45,400

Group C (more than 1.6 signalized intersections per mile)

Lanes/ Divided	Level of Service				
	A**	B**	C**	D	E
2 Undiv.	—	—	—	10,500	13,900
4 Undiv.	—	—	—	25,500	28,400
4 Div.	—	—	—	26,800	29,900
6 Div.	—	—	—	41,100	45,100

COLLECTORS AND LOCAL STREETS

(signalized intersection analysis)

Lanes	Level of Service				
	A**	B**	C	D	E
2	—	—	6,100	9,500	10,800

* The table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are average daily traffic maximum volumes (based on peak hour volumes) for levels of service and are based on the 1985 Highway Capacity Manual and Florida traffic data. Roadways with more than the number of lanes shown should be treated on a case by case basis. The table's input value assumptions and level of service criteria appear on the back.

** Cannot be achieved.

Source: Florida Department of Transportation, 1988.

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ANALYSIS OF FUTURE CONDITIONS

The projection of future traffic was based on traffic volumes since 1986, which were used as input into a linear regression projection model. Historic traffic counts, listed in Table 3, were available from FDOT for stations on US 41. As limited historic count data was available for CR 484 and CR 40, a 4% growth rate was used for projections on these collector roads. Based on the linear regression projection methodology and due to an overall decline in recent traffic volume on US 41 between Powell Road and the north city limits (which may be partly explained by the inclusion of an axle adjustment factor in traffic counts since 1989), the existing level of service D condition would improve to level of service C by 1995. Future development of planned developments of regional impact together with other city and regional development is expected to change this trend.Add to this the application for development approval for Cold Springs Villages, projections of a declining traffic volume are deemed unreasonable, and thus this road segment is classified as backlogged at this time. If however, the decline were to continue, the Comprehensive Plan could then be amended accordingly by removing this segment from the backlogged classification. Traffic counts along this stretch of US 41 should be monitored closely and any improvements that may become necessary to maintain level of service C conditions should be closely coordinated with the Florida Department of Transportation.

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TABLE 3: HISTORIC TRAFFIC COUNTS

Roadway	From	To	1983	1984	1985	1986	1987	1988	1989	1990
US 41	S. City Limits	Powell Rd.	8733	9444	9702	11857	N/A	11675	10683	12330
US 41	Powell Rd.	N. City Limits	6539	6639	7501	9602	8466	8050	8649	8995
CR 484	US 41	E. City Limits	----	----	----	----	----	----	2933	3050
CR 40	US 41	W. City Limits	----	----	----	----	----	----	3430	3570

Source: FDOT and Henigar & Ray, Inc. 1990.

Table 4 depicts traffic projections for Dunnellon's major roadways for the years 1996, 2001 and 2010. It should be noted that a growth rate of 4% is high for a small city like Dunnellon, however, the proximity of DRIs (Developments of Regional Impact) such as The Villages of Rainbow Springs, Rainbow Lake Estates and Citrus Springs will generate substantial vehicle traffic. Dunnellon serves as a sub-regional center as it is the closest city providing a variety of basic goods and services for the surrounding area. Consequently much of the existing and projected traffic is generated from the surrounding area rather than the City's residents. To illustrate this point, Table 5 lists the major developments located in areas adjacent to Dunnellon that already have or will impact roadways within the City. If these subdivisions develop to capacity, it is likely that they will put increased stress on Dunnellon's ability to manage traffic within its corporate limits.

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TABLE 4: FUTURE TRAFFIC VOLUMES AND LOS - 1996, 2001 AND 2010

Roadway	From	To	Functional Class	No. Lanes	1996 Average Daily Traffic	LOS	2000 Average Daily Traffic	LOS	2010 Average Daily Traffic	LOS
US 41	S. City Limits	Powell Rd.	Principal Arterial	4	14,835	C	16,440	C	22,775	C
US 41	Powell Rd.	N. City Limits	Principal Arterial	4*	11,150	C	13,310	C	18,440	C
CR 484	US 41	E. City Limits	Major Collector	2	3,780	C	4,515	C	6,250	C
CR 40	US 41	W. City Limits	Major Collector	2	4,425	C	5,280	C	7,320	C

* Assumed to be 4 lane divided by the year 1996.

Source: Henigar & Ray 1990.

TABLE 5: SUBDIVISIONS AND APPROXIMATE CAPACITIES NEAR THE CITY OF DUNNELLON

SUBDIVISIONS	APPROXIMATE DWELLING UNITS *
Villages of Rainbow Springs	11,860
Rainbow Lakes Estates	12,215
Citrus Springs	33,860
Rio Vista	293
Rainbow Acre	1,486
Cold Springs Villages	15,445
Total	75,159

*These numbers are estimations; totals may vary upon completion.

Source: Marion County Planning Dept., 1988

As can be seen in Table 4, with the exception of the backlogged segment of US 41 between Powell Road and the north city limit, the roadways in Dunnellon are expected to be operating within acceptable levels of service throughout the ten-year planning horizon. By 2008, however, the section from CR 484 to Park Avenue will fall to LOS D. Similarly, the segment from Park Avenue to Powell Road will deteriorate to LOS D by 2004 and decline further to LOS E by 2008. In addition, the segments for CR 484 and CR 40 will both fall to LOS D in the next decade. Figures 3 and 3A, the

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Future Traffic Circulation Network Maps, depicts the transportation system at the end of the planning horizon in 2010.

It is not financially feasible for the City to fund improvements to the facility currently operating at level of service "D", as the City's first priority is the health, safety and welfare of Dunnellon citizens. Thus, upgrading its sewage treatment facility to meet water quality standards is first priority in the Capital Improvements Element. Further, Dunnellon has no control over the development permits issued by Citrus County, Marion County, and all other traffic generators outside the City. According to FDOT's "Florida Highway System Plan, Level of Service Standards and Guidelines Manual", January 1989, Appendix F, Guidelines for Backlogged Facilities, "The Department is primarily responsible for improving roads on the State highway system". Therefore, the City has the following plan of action to meet traffic needs within the City:

a. adopt a level of service for the backlogged facility that is consistent with FDOT standards. That means that the City's concurrency management system shall be designed to ensure that development permits issued maintain operating conditions, which is considered by the Department to be: "a peak hour increase in traffic of 5 percent or a decrease in average speed of 1 mph as a reasonable indicator of devaluation from the maintained condition. The maintained condition is the best available data at the time of plan adoption, a 1990 FDOT traffic count of 8,348.

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b. coordinate with Marion County, FDOT and Citrus County to notify them of this limitation on the facility, and ensure that all DRIs and other development approved that impact this facility meet the backlogged standard.

c. petition the Ocala MPO to list improving this facility in its six-year Traffic Improvement Program. (The facility is currently scheduled for improvement in the year 2015. This will ensure that FDOT will modify its five-year work program to include upgrading the facility.

d. seek an interlocal agreement with Marion County, the WRPC and Citrus County to ensure that Dunnellon's concerns are addressed prior to approval of any DRI or other large development that impacts facilities within the City.

The City has determined that parallel access roads may also be an appropriate means to reduce traffic impacts, particularly for large commercial developments. Therefore, the goals, objectives and policies include a policy that such a requirement will be evaluated during development of the land development regulations.

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