FLORIDA'S

Mobility Management Process

(Congestion Management System)

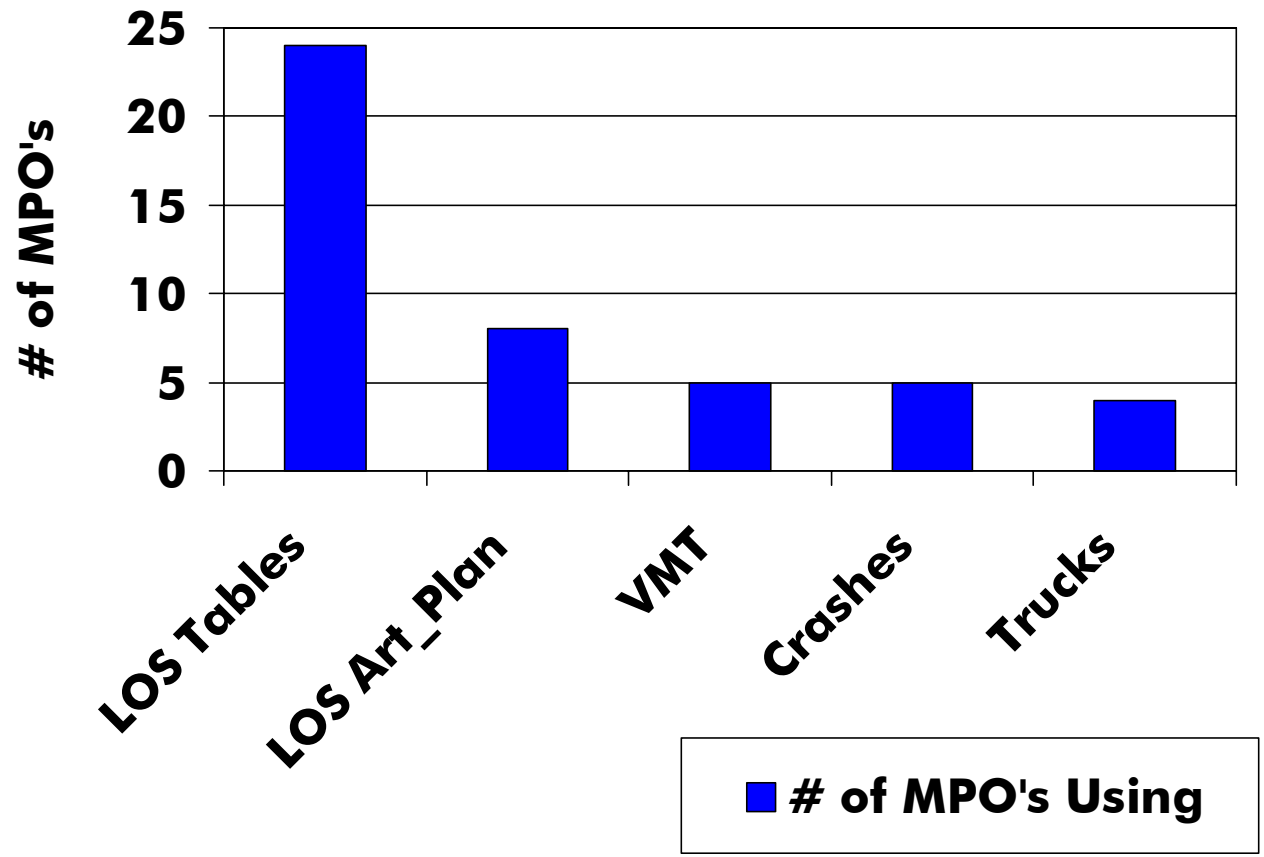
Multimodal Performance Measures

Martin Guttenplan - FDOT

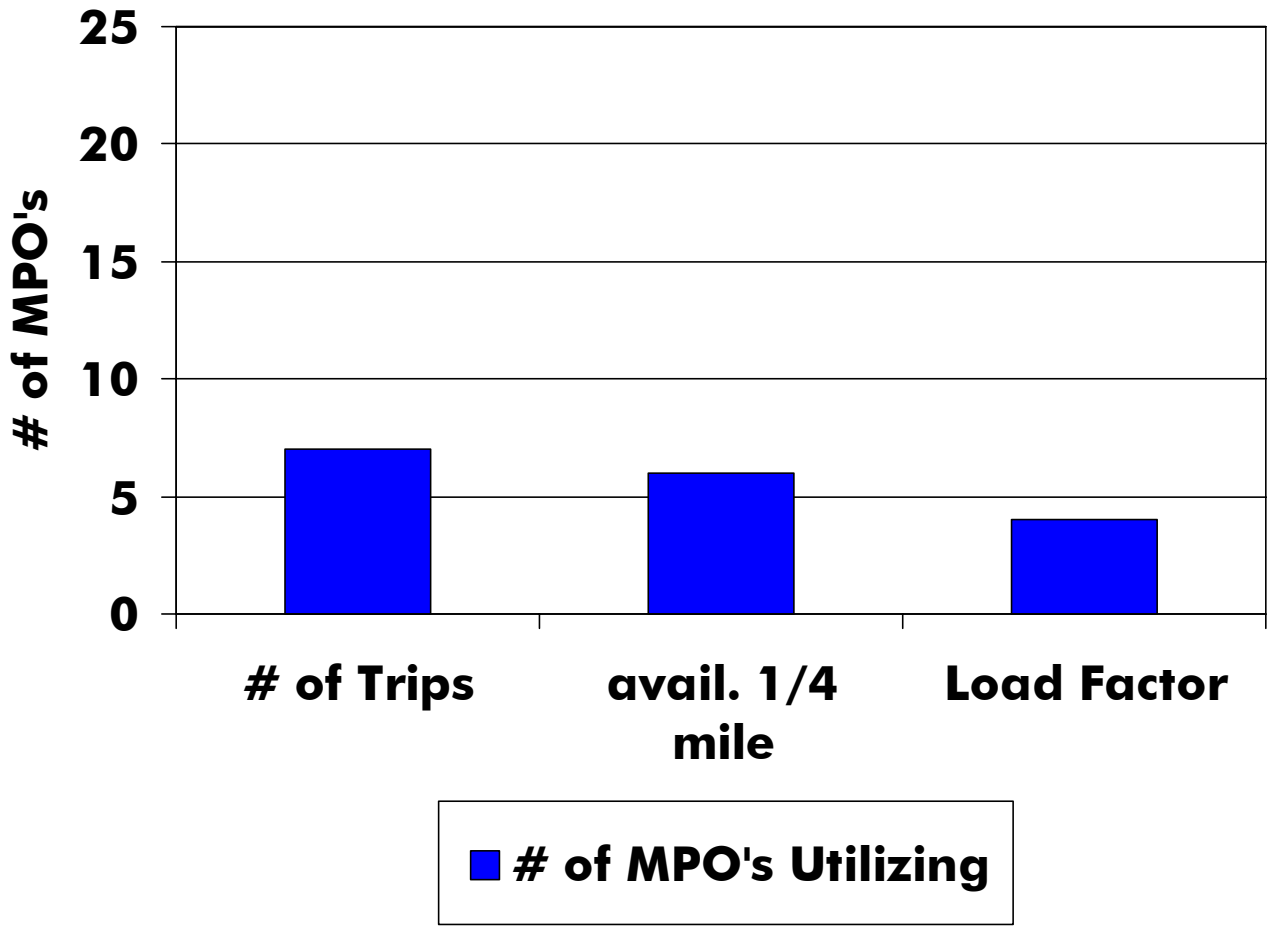
MMP Analysis

- Matrix by MPO MMP
- Items Tracked
  - Performance Measures
    - Highway & Alternate Modes
  - Public Involvement
  - Use of ITS
  - Best Practices
  - Local Team Organization
  - Current Funding

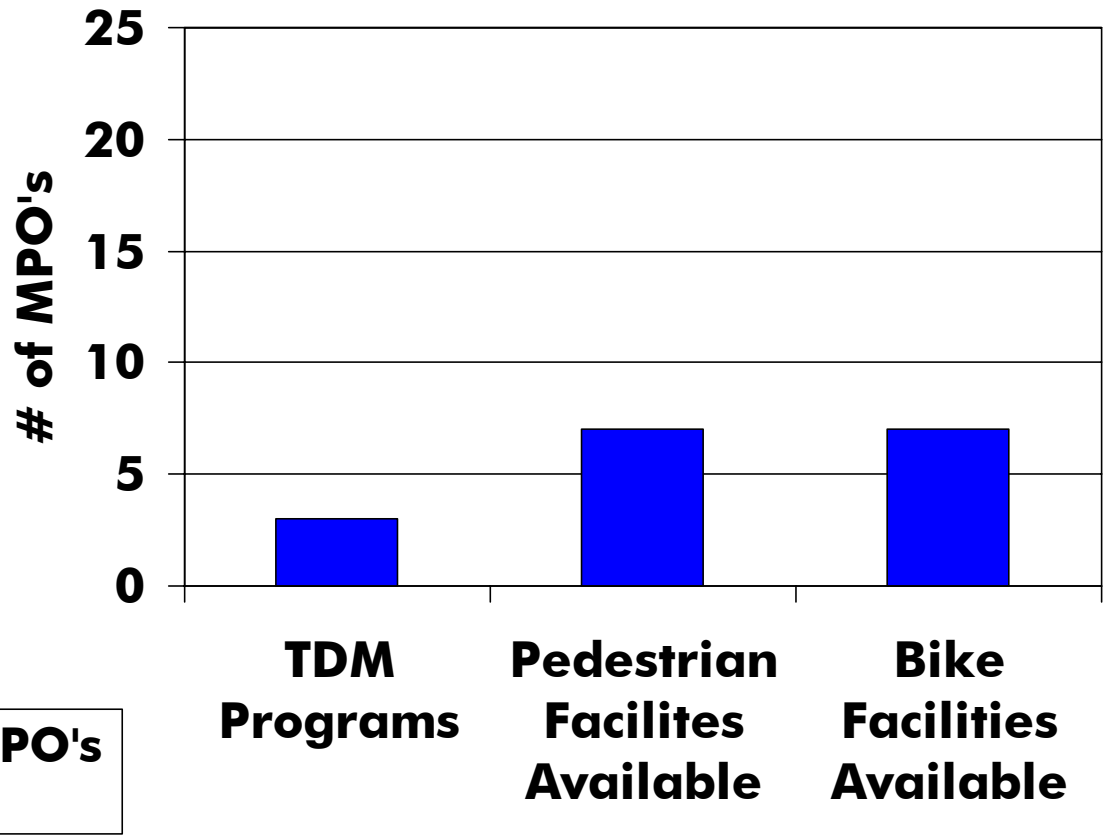
Highway Performance Measures



Transit Performance Measures



Performance Measures
Bicycle, Pedestrian, TDM



Funding MMP/CMS Projects

Gainesville

- Reduced number of funding categories in STP $$ Priority List
  - Went from 13 to 5 categories of projects
  - Allows for modal flexibility
- Purchase of 5 Buses Top Item on List
  - Top roadway project # 2 on same list

Four Important Definitions

Quality of Service - a user based qualitative assessment of how well a service or facility is operating

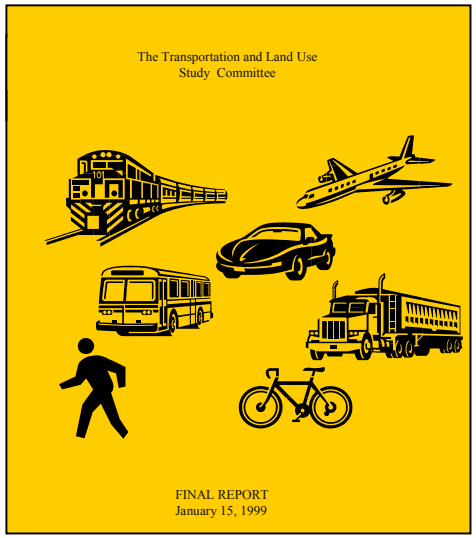
Level of Service - a quantitative breakdown of the "quality of service" of a service or facility into six letter grade levels with "A" describing the highest quality and "F" describing the lowest quality

Highway - roadway with all transportation facilities (e.g., lanes, bus pull-outs, paved shoulders, sidewalks, signals) within the right of way

Multimodal - more than one highway mode (auto, bicycle, bus, pedestrian, truck)

Need for Highway Multimodal LOS Analyses

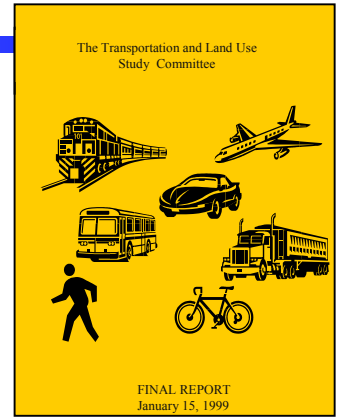
- Transportation Equity Act for the 21st Century (TEA-21) – mainstream
  - Transit, pedestrian, bicycle into
  - Planning, design, operations
- CMS performance measures
- Theme of Post-HCM2000
- Desires of others (MPOs, communities)
- Florida's Transportation and Land Use Study Committee



Charge - Evaluate transportation and land use planning and coordination issues in Florida

- 40 recommendations
- #3 - Allow multimodal transportation districts
- #4 - Local governments are encouraged to employ alternative techniques for measuring level of service, including multimodal

Legislation Resulting from Transportation and Land Use Study Committee Report



- FS 163.3180 (1)(b) now states:
- Local governments shall **use professionally accepted techniques** for measuring level of service for automobiles, bicycles, pedestrians, transit and trucks. These techniques **may be used to evaluate increased multimodal accessibility and reduced VMT** in an area.
- **FDOT shall develop methodologies** to assist local governments in implementing this multimodal level of service analysis
- DCA and **FDOT will provide technical assistance** to local governments in applying these methodologies

Multimodal Transportation Districts

163.3180 (15)(a) now allows the establishment of **Multimodal Transportation Districts** under a local government comprehensive plan areas which assign:

Primary priority to:

Safe, comfortable, & attractive pedestrian environment
Convenient interconnection to transit

Secondary priority to vehicle mobility

“The National Document”

HCM200 Highway System Structure

Point +

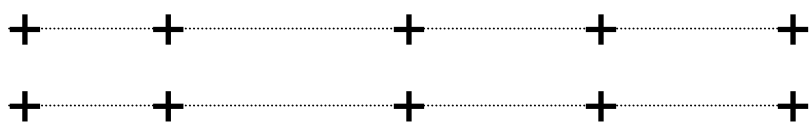
A boundary between segments, usually a signalized intersection

Segment + + A portion of roadway extending from one point to another, usually a signalized intersection

Facility + + + + +

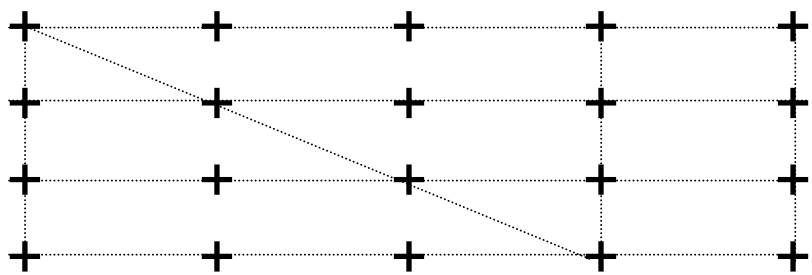
A length of roadway consisting of points and segments

Corridor

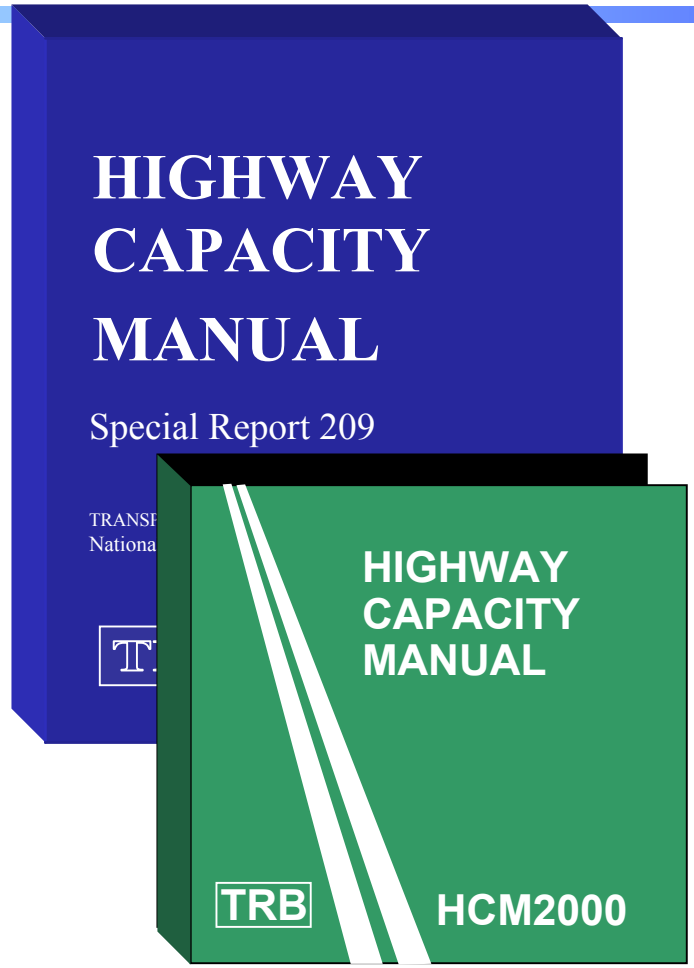


A combination of generally parallel facilities

Areawide Analysis



A combination of all facilities in an area



View of HCM

(1997 or 2000 editions)

Bus – 1997 - Bus speed
2000 - QOS

Pedestrian - How crowded the facility is (space)

Bicycle - How crowded the facility is (hindrance)

Are these really the best measures for quality of transportation service?

Automobile Level of Service

Level of Service	Automobile
A/B	
C/D	
E/F	

Pedestrian Level of Service Model

- Initial concept developed in 1997 based on Bicycle LOS Model
- Early applications in Tampa and Phoenix
- Model developed in 2000 from FDOT sponsored research in Pensacola

HCM Concept of Pedestrian Level of Service

Factors Affecting Pedestrian Level of Service

- Presence of a sidewalk
- Lateral separation of pedestrians and motorized vehicles
  - Includes presence of barriers and buffers, i.e. parked cars, trees
- Motorized vehicle
  - Volume
  - Speed

Lateral separation

Photo by SCI

Photo by SCI

Photo by SCI

Sidewalk/Roadway Protective Barrier

Pensacola, Florida

March 18, 2000

- Significant in-migration
- Right mix of walking environments
- Local agencies willing to help
- State bike/ped coordinator's meeting


FunWalk for Science
End
Segment
#
Begin
Segment
1
NAVY
Photo by SCI

Course Design Challenges

- Variety of urban forms and walking environments
- Length of course & duration of event
- Capturing the feedback


STUPID
News
Journal
Photo by SCI


Photo by SCI

Pedestrian Level of Service

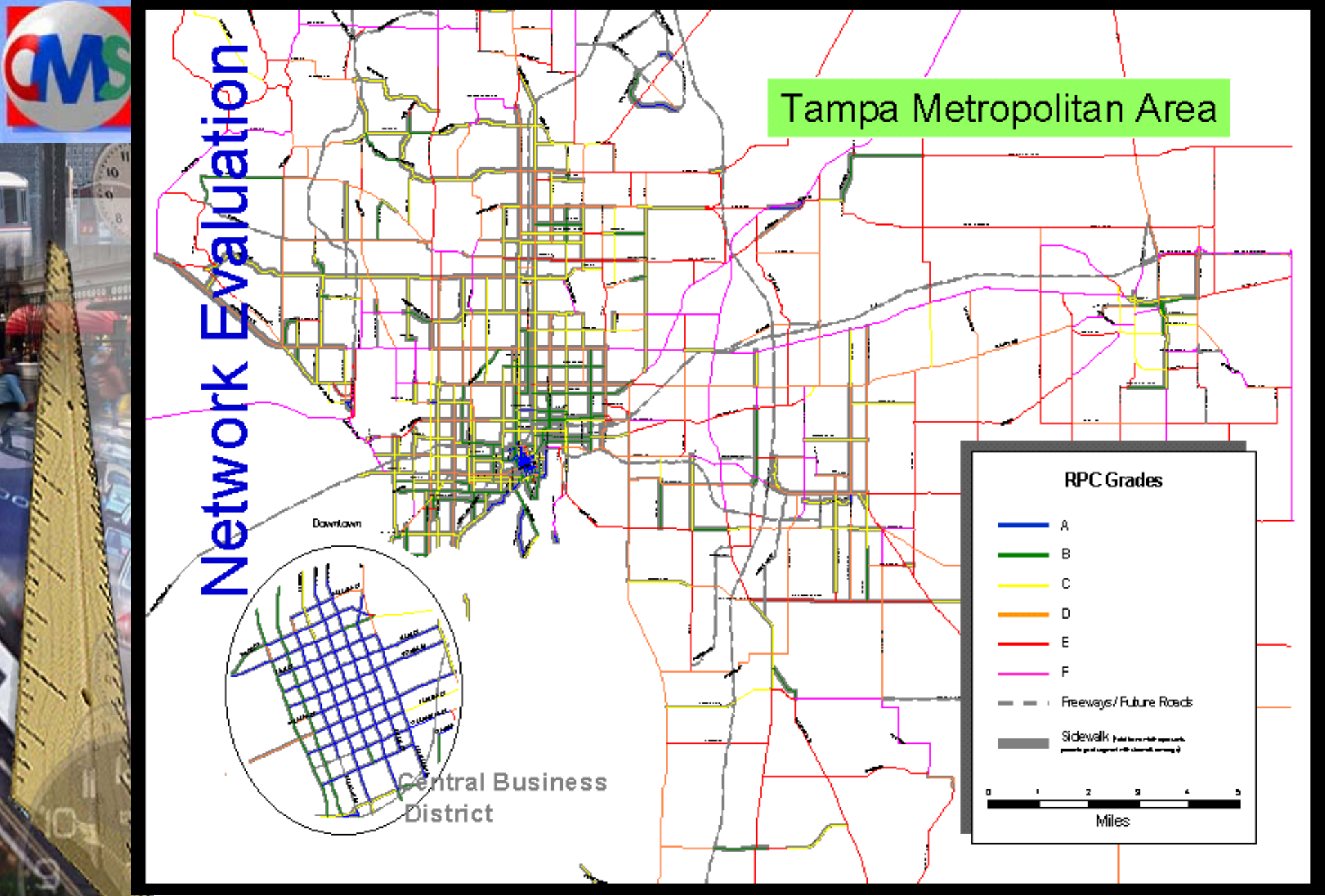
$$PLOS = -l.2276 \ln (Wol + Wl + fp \times \%OSP + fb \times Wb + fsw \times Ws) + 0.0091 (Vol15/L) + 0.0004 SPD2 + 6.0468$$

W_{ol} = Width of outside lane (feet)
W_l = Width of shoulder or bike lane (feet)
f_p = On-street parking effect coefficient (=0.20)
%OSP = Percent of segment with on-street parking
f_b = Buffer area barrier coefficient (=5.37 for trees spaced 20 feet on center)
W_b = Buffer width (distance between edge of pavement and sidewalk)
f_{sw} = Sidewalk presence coefficient = $6 - 0.3W_s$
W_s = Width of sidewalk (feet)
Vol_{15} = average traffic during a fifteen (15) minute period
L = total number of (through) lanes (for road or street)
SPD = Average running speed of motor vehicle traffic (mi/hr)

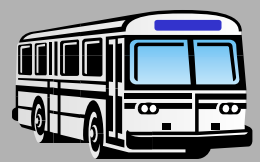
Pedestrian Level of Service

Pedestrian (and Bicycle) Level-of-Service Thresholds

LEVEL-OF-SERVICE	Score
A	≤ 1.5
B	>1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	>4.5 and ≤ 5.5
F	> 5.5


Network Evaluation
Tampa Metropolitan Area
Downtown
Central Business District
RPC Grades
A
B
C
D
E
F
Freeways / Future Roads
Sidewalk
0 1 2 3 4 5
Miles

Transit Quality of Service

Level of Service	Bus
A/B	 >4 buses/hour
C/D	 2 to 4 buses/hour
E/F	 ≤ 1 bus/hour
	

Transit Capacity and Quality of Service Manual

Prepared for
Transit Cooperative Research Program
TRB

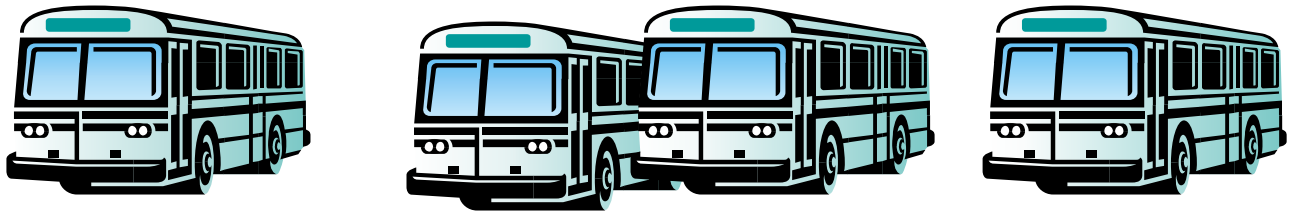
January 1999

Transit Quality of Service

- "The overall measured or perceived performance of transit from the passenger's point of view"
- National TCQSM document provides A-F levels of service comparable to highway levels of service

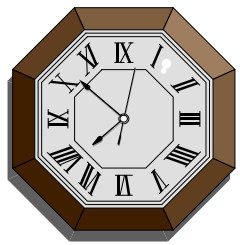
FDOT's Key Factors Affecting Transit Quality of Service along an Arterial (Route Segment)

- **Availability!** (bus frequency)



- Pedestrian LOS (accessibility)
  - Mid-block crossing difficulty
  - Obstacle to bus stop

- Hours of service



Availability Measures: Transit Stops Headway LOS

LOS	Headway (min)	Frequency (bus/h)	
A	<10	>6	Schedules not needed
B	10-14	5-6	Riders consult schedule
C	15-20	3-4	Maximum desirable wait time
D	21-30	2	Unattractive to choice riders
E	31-60	1	Service provided during hour
F	>60	<1	Unattractive to all riders

Transit Frequency Adjustments

Table 2 – 3

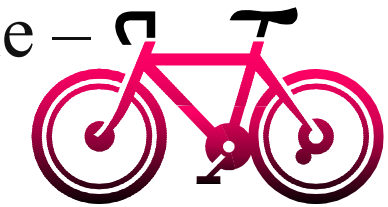
PEDESTRIAN LOS ADJUSTMENT FACTORS ON BUS LOS

Pedestrian LOS	Adjustment Factor
Pedestrian LOS A	1.15
Pedestrian LOS B	1.10
Pedestrian LOS C	1.05
Pedestrian LOS D	1.00
Pedestrian LOS E	0.80
Pedestrian LOS F	0.55

View of HCM

Bus –

Pedestrian -

Bicycle – 

How crowded the bicycle facility is (hindrance)

Bicycle Level of Service

Level of Service	Bicycle
A/B	
C/D	
E/F	

Factors Affecting Bicycling Level of Service

- Proximity of bicyclists to motorized vehicles
- Motorized vehicle
  - Volume
  - Speed
  - Type
- Pavement condition
- On-street parking

Bike Lane/Paved Shoulder

Outside Lane Width

Outside Lane Width

Assumed lengths


Desirable


Typical


Undesirable

$$BLOS = a_1 \ln(Vol_{15}/L) + a_2 SP_t (1+10.38HV)^2 + a_3 (1/PC_5)^2 - a_4 (W_e)^2 + C$$

Where

BLOS	=	perceived hazard of the shared roadway environment
Vol_{15}	=	volume of directional traffic in 15 minutes time period
L	=	total number of *through* lanes
SP_t	=	effective speed limit (see below)
		$SP_t = 1.12 \ln(SP_P - 20) + 0.81$
		SP_P = Posted speed limit
HV	=	percentage of heavy vehicles
PC_5	=	FHWA's five point surface condition rating
W_e	=	Average effective width of outside through lane
a_1 - a_4	=	Coefficients of the terms in the model form
C	=	Constant from the regression analysis

Best Source for LOS Analysis?

Auto ✓

Bicycle ??

Bus ??

Pedestrian ??

Truck ✓

Recommended Modal Approaches

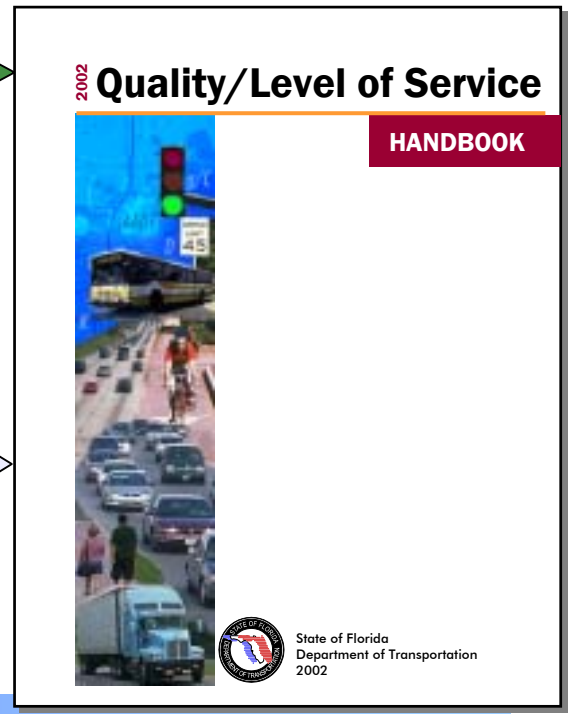
- Auto  HCM
- Truck  HCM
- Transit  TCQSM
- Bicycle  Bicycle LOS
- Pedestrian  Pedestrian LOS
- Combined ?  -no

LOS Operational, Conceptual Engineering and Generalized Planning Techniques

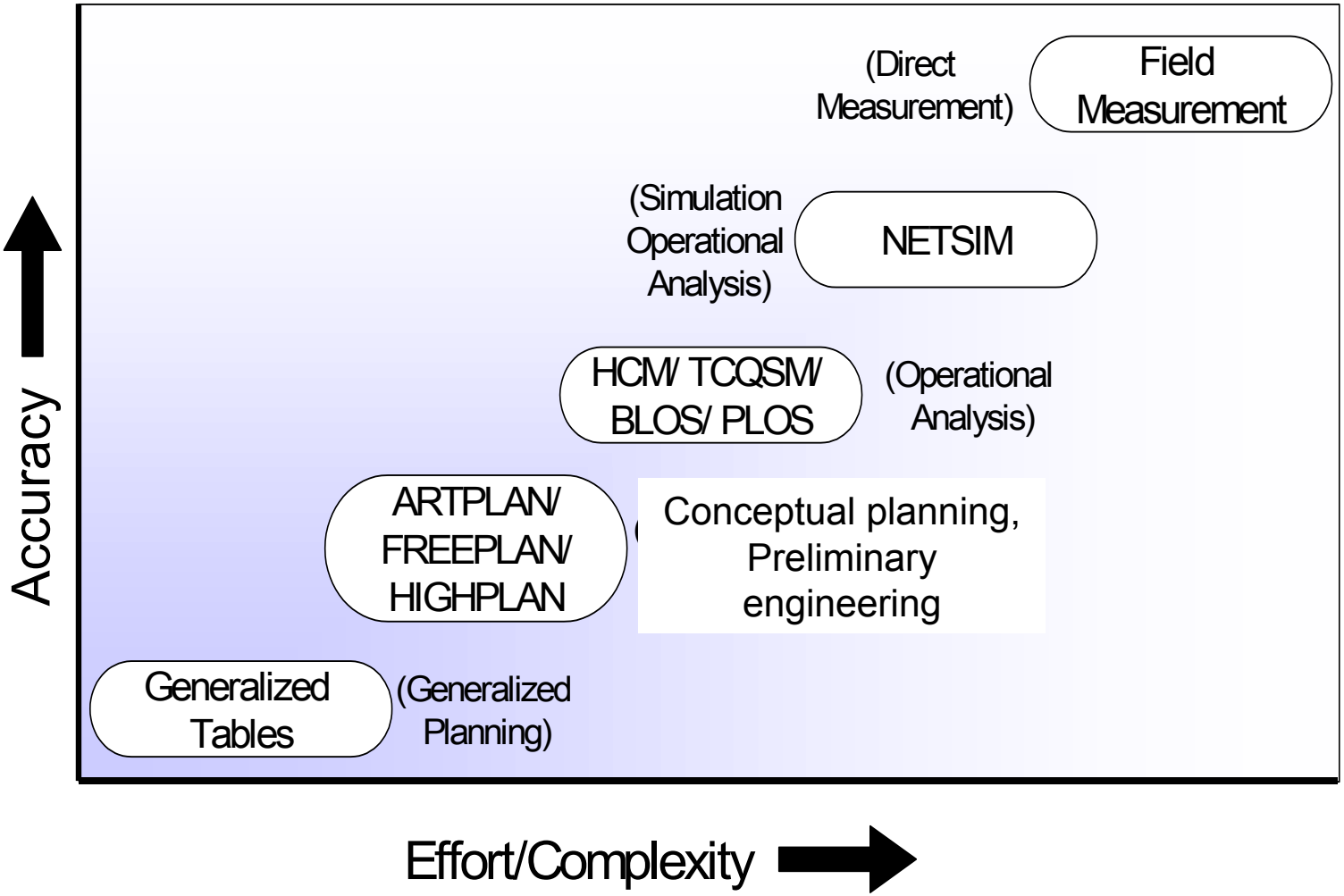
(Operational)

(Conceptual planning, Preliminary engineering & Generalized planning)

TCQSM
BLOS
PLOS



Level of Service Analyses and Evaluation Tools



Levels of Analysis

- Generalized **(Planning)**
  - "In the ball park" LOS estimate
  - Extensive use of defaults
  - Generalized Tables
- Conceptual (Conceptual planning, Preliminary engineering **)**
  - Design concept and scope
  - Alternatives analysis
  - Software **(ARTPLAN, FREEPLAN, HIGHPLAN)**
- Operational **(Final Design & Traffic Engineering)**

Level of Service Planning Tools

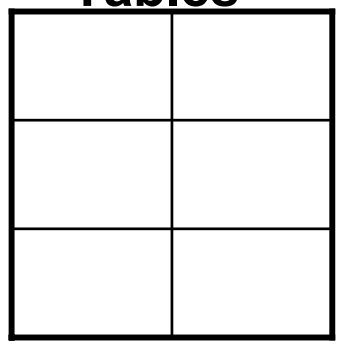
Conceptual planning, Preliminary engineering Models

Generalized Planning Tools

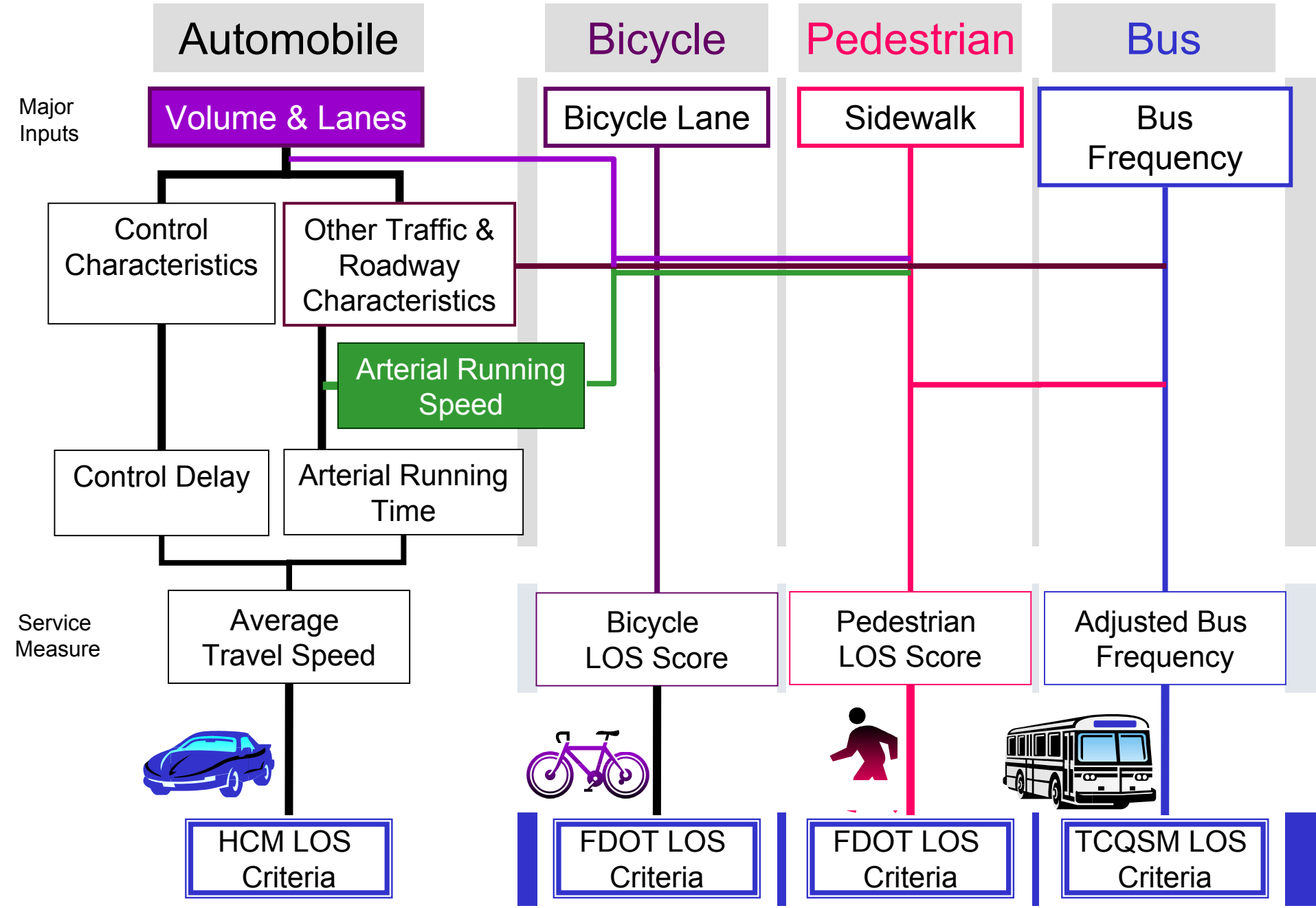
Quality/Level of Service Handbook

FDOT 2002

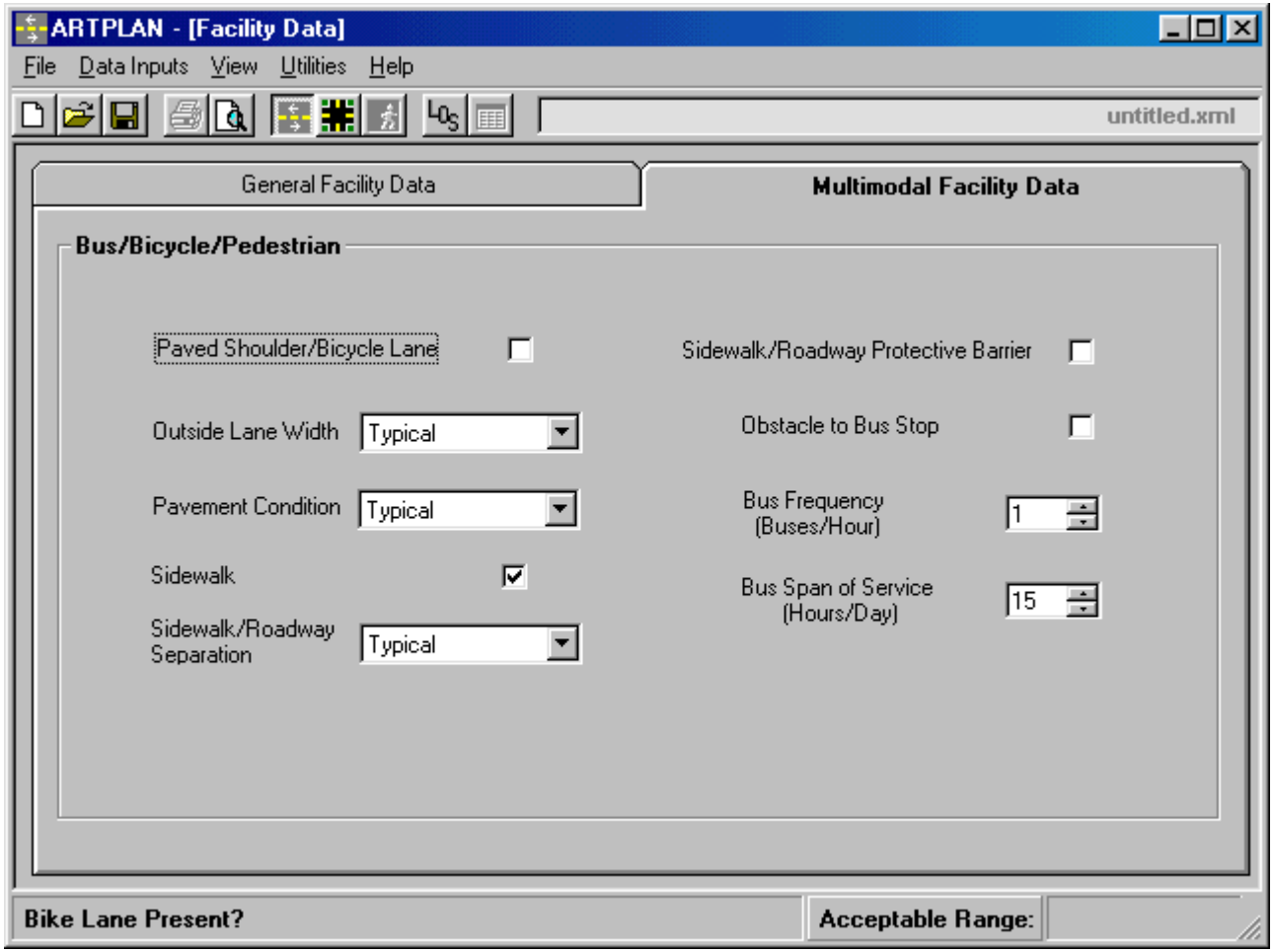
Generalized LOS Tables



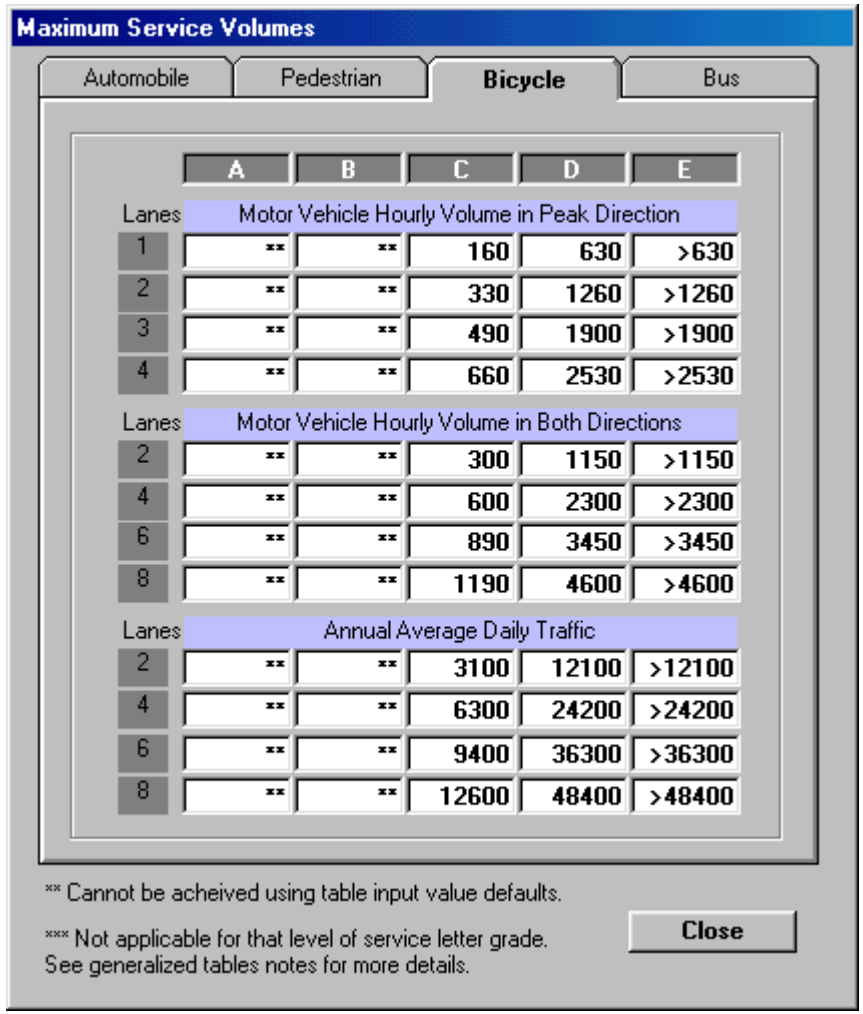
Simplified Multimodal Flow Chart



ARTPLAN
Multimodal Facility Data Screen



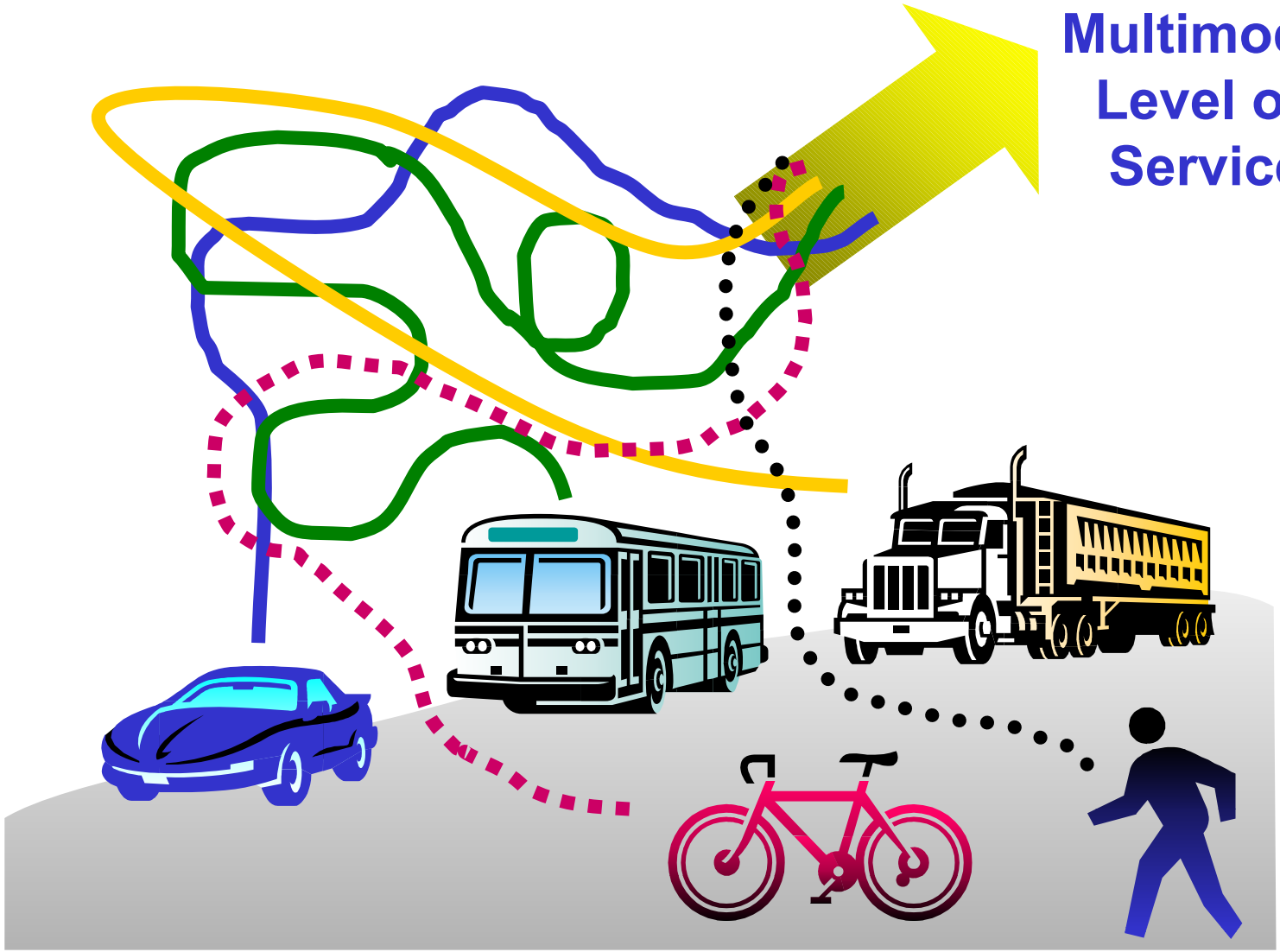
ARTPLAN
Bicycle Service Volume Screen



Testing the Segment Methodology

- Developed using data sets from MetroPlan and Lynx
- City of Gainesville & RTS
- District 1 – selected state routes
- District 7 – Central Pinellas

Planning levels vs. operational


Multimodal
Level of
Service