ACKNOWLEDGMENT

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Learning Objective

- Essential steps in preparing a TIS
- Best sources of information
- Methodology
- Pitfalls
- Mitigation measure examples

When are Traffic Impact Studies Prepared?

Environmental Laws

- **Nat'l Environmental Policy Act (NEPA)**
  - Environmental Impact Statement (EIS)
  - Negative Declaration (ND)
  - Finding of No Significant Impact (FONSI)
- **California Environmental Quality Act (CEQA)**
  - Environmental Impact Report (EIR)
  - Negative Declaration (ND or MND)

Exemptions

- Maintenance and repair (most)
- Disaster response
- Denied actions
- Most tolls, fares, parking charges
- Increase of rail passenger service
- Most railroad grade separations
- Traffic control devices

Thresholds For Conducting Studies

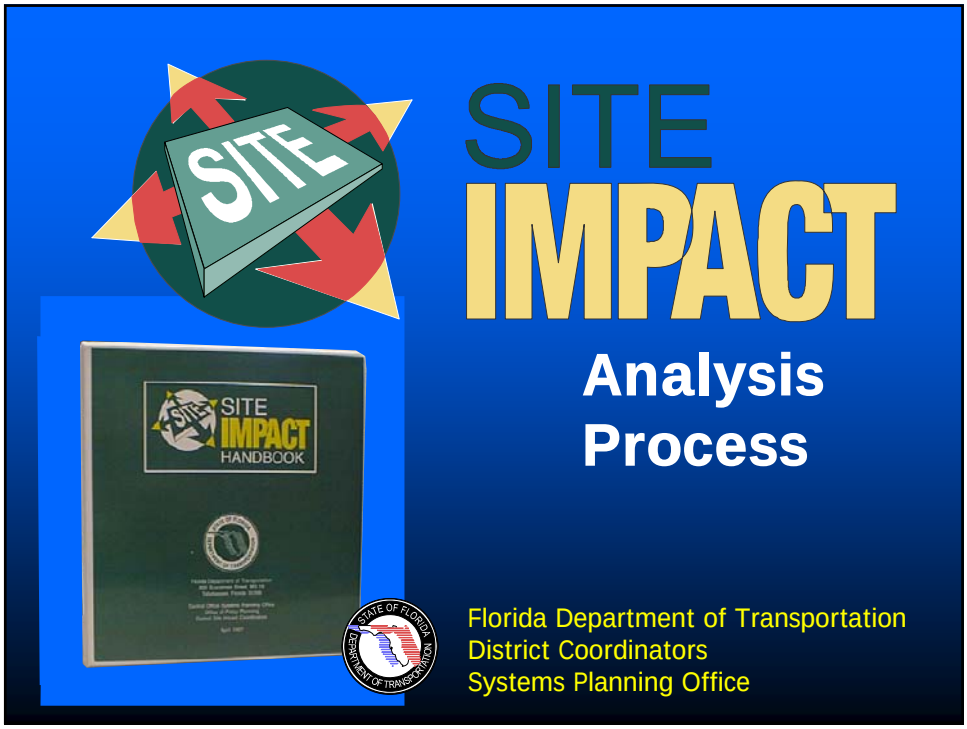
- 50 to 100 peak hour trips (in highest hour)
- 1% added to sum of critical movements
- Safety problem (existing or future)
- Sensitive area/controversial project
- LOS of nearby intersections is 'D' or worse

Table 1. Examples of Land Use Thresholds Based on Trip Generation Characteristics[1,2,3]

Land Use	100 Peak-Hour Trips	500 Peak-Hour Trips
Residential:		
Single-Family	92 units	547 units
Apartments	163 units	920 units
Condominiums/Townhouses	178 units	1,272 units
Mobile Home Park	179 units	1,073 units
Shopping Center (GLA)[4,5]	5,250 SF	65,350 SF
Fast Food Restaurant with Drive-In (GFA)	2,750 SF[6]	13,700 SF
Convenience Store with Gas (GFA)[4,7]	1,375 SF or 4 pumps	6,850 SF or 24 pumps
Banks with Drive-In (GFA)	2,300 SF and 1 drive-in	11,450 SF and 9 drive-ins
Hotel/Motel	133/178 rooms	711/944 rooms
General Office	43,400 SF[5]	383,450 SF
Medical/Dental Office	26,000 SF	126,500 SF
Research and Development	70,250 SF	497,150 SF
Light Industrial	N/A	463,000 SF
Manufacturing	134,000 SF	668,900 SF

Thresholds for various land uses

Source: Site Impact Handbook Florida DOT



What is the Purpose of a TIS?

- Determine if significant impact exists
- Recommend mitigation and responsibility
- Use most intense land use for analysis
- Input to environmental impact report

Who Should Prepare a TIS?

- Agency (unlikely!)
- Regional MPO (unlikely)
- Consultant hired by developer (conflicts)
- **Consultant hired by agency (preferred)**
- Developer pays for TIS cost

What Should a TIS Do?

- Assess traffic volumes
- Inventory existing infrastructure
- Evaluate site plan
- Include Operations and Safety Analyses
- Identify off-site improvements
- Address cumulative impacts
- Identify mitigation responsibility

TIS Outline

- Existing counts
- Trip generation
- Trip distribution
- Parking demand/signal timing/crashes
- Pedestrian/bicycle access
- Mode split/transit access/ADA
- Construction impacts
- Development and evaluation of mitigation measures

Pre-Study Preparation

Land Use and Traffic Data

- Accurate description of land uses by gross SF, DU, rooms, acres, beds, seats
- Current site plan
- Knowledge of key areas of concern: parking, access, safety, signal progression, residential impacts
- Approved scope of work by agency

Note: Developers change their minds frequently!

Data Collection

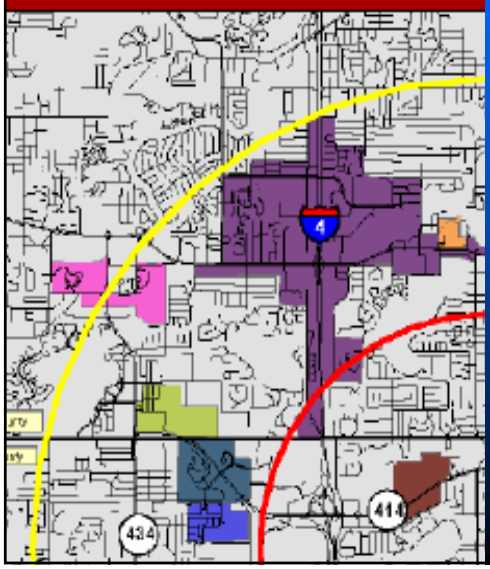
- Site visit to observe: traffic conditions, street geometrics, queuing, pedestrians, transit, parking demand, sight distance etc.
- Conduct traffic counts: peak hour, ADT, parking occupancy, signal timing, collisions
- City/County Circulation Element
- Other EIRs/TIS for nearby developments
- Cumulative land use data for future projects

Defining Study Area

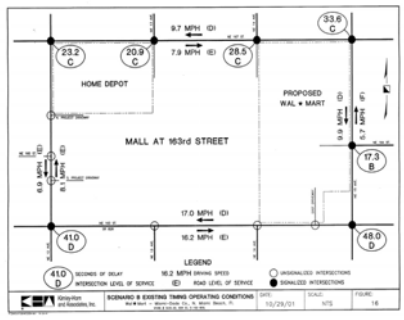
- Discretionary but not arbitrary
- Potentially impacted intersections
- Typically 1 to 10 square miles (size of project)
- Use a map as attachment to form
- Negotiate with approving agency before study begins

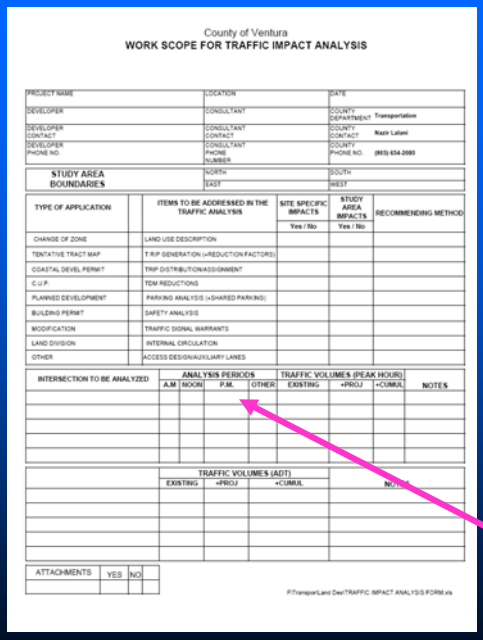
Two Basic Traffic Studies

Long Range Planning



Short Range Planning





County of Ventura
WORK SCOPE FOR TRAFFIC IMPACT ANALYSIS

PROJECT NAME	LOCATION	DATE	
DEVELOPER	CONSULTANT	COUNTY DEPARTMENT	Transportation
DEVELOPER CONTACT	CONSULTANT CONTACT	COUNTY CONTACT	Nazir Lalani
DEVELOPER PHONE NO.	CONSULTANT PHONE NUMBER	COUNTY PHONE NO.	(805) 654-2080
STUDY AREA BOUNDARIES	NORTH	SOUTH	
	EAST	WEST	

TYPE OF APPLICATION	ITEMS TO BE ADDRESSED IN THE TRAFFIC ANALYSIS	SITE SPECIFIC IMPACTS Yes / No	STUDY AREA IMPACTS Yes / No	RECOMMENDING METHOD
CHANGE OF ZONE	LAND USE DESCRIPTION			
TENTATIVE TRACT MAP	TRIP GENERATION (+REDUCTION FACTORS)			
COASTAL DEVEL PERMIT	TRIP DISTRIBUTION/ASSIGNMENT			
C.U.P.	TDM REDUCTIONS			
PLANNED DEVELOPMENT	PARKING ANALYSIS (+SHARED PARKING)			
BUILDING PERMIT	SAFETY ANALYSIS			
MODIFICATION	TRAFFIC SIGNAL WARRANTS			
LAND DIVISION	INTERNAL CIRCULATION			
OTHER	ACCESS DESIGN/AUXILIARY LANES			

INTERSECTION TO BE ANALYZED	ANALYSIS PERIODS A.M.	NOON	P.M.	OTHER	TRAFFIC VOLUMES (PEAK HOUR) EXISTING	+PROJ	+CUMUL	NOTES

	TRAFFIC VOLUMES (ADT) EXISTING	+PROJ	+CUMUL	NOTES

ATTACHMENTS	YES	NO

P:\Transport\Land Dev\TRAFFIC IMPACT ANALYSIS FORM.xls

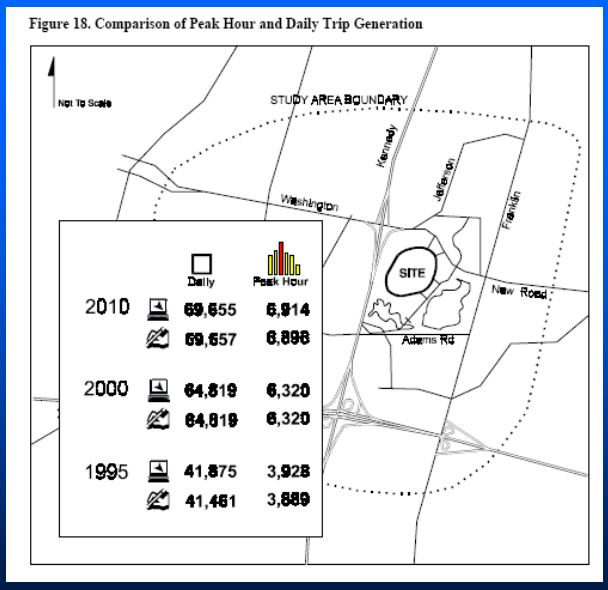
Work Scope form for Traffic Impact Studies

Existing and Proposed Land Uses

- Specific as possible
- Permitted uses under general plan
- GSF, DU, ACRES, ROOMS, SEATS etc.
- Other characteristics (operating hours, employees, deliveries)
- Use reasonable worse case

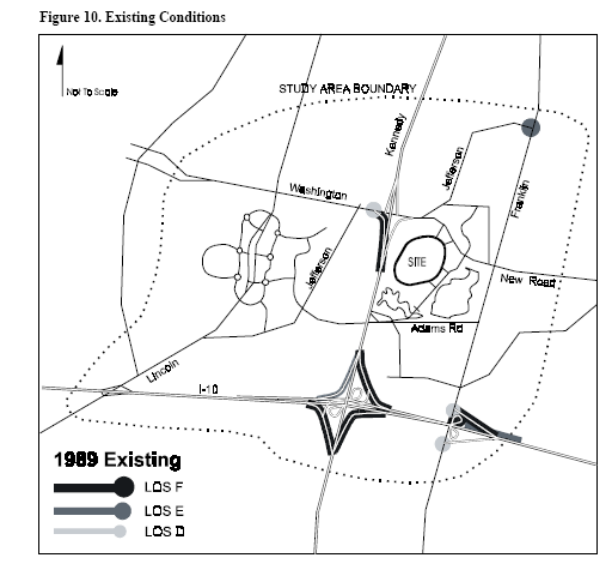
Existing Street Network

- Geometrics – lane configurations
- Traffic volumes
- Intersection control
- Street lighting
- Crosswalks/transit stops



Peak hour volume is 10% of ADT

Source: Site Impact Handbook Florida DOT



Example of existing conditions

Source: Site Impact Handbook Florida DOT

Traffic Analysis

- Existing
- Existing + project without mitigation
- Existing + project with funded mitigation
- Existing + project + cumulative without mitigation
- Existing + project + cumulative with mitigation

Trip Generation

Trip Generation

- ITE rates
- SANDAG (San Diego Assoc. of Govts)
- Special studies of similar uses
- Know how data was obtained: sample size, location, based on actual counts

Trip Generation

- Institute of Transportation Engineers *Trip Generation* Report
- Three volumes, over 1,000 pages
- Essential for any transportation library
- Trip generation rates based on driveway counts
- Number of data points varies

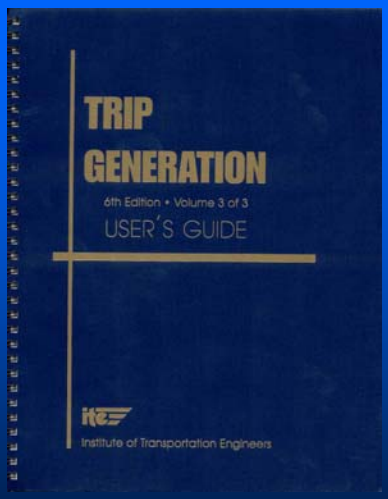
Trip Generation Rates

- Daily
- Weekend
- Peak hour of the street
- Peak hour of the generator
- Directional split of traffic
- Mode split included in rates

Trip Generation Report

and use of the 7th Edition

ITE Trip Generation Report and Handbook



Trip Generation – Users Guide

Trip Generation Example

- 100 new homes proposed for a 20-acre parcel, with a 20,000 s.f. shopping center
- Trip Gen Rates: 10 trips/day per SFDU;

  50 trips/day per 1,000 s.f.
- Answer: (100 x 10) + (20 x 50) = 2,000 daily vehicle trip-ends

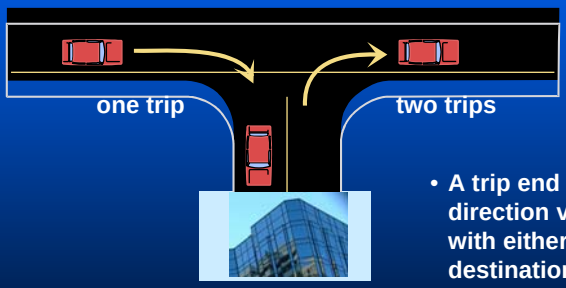
ITE Trip Generation Report

Not a Manual

- **National data** – Florida, Arizona and California, played big role
- **Suburban** locations with little or no transit
- Some **small sample** sizes for new **(though important)** uses
  - Discount clubs (861)
  - Stand-alone drug stores (881)
- **May not work downtown**

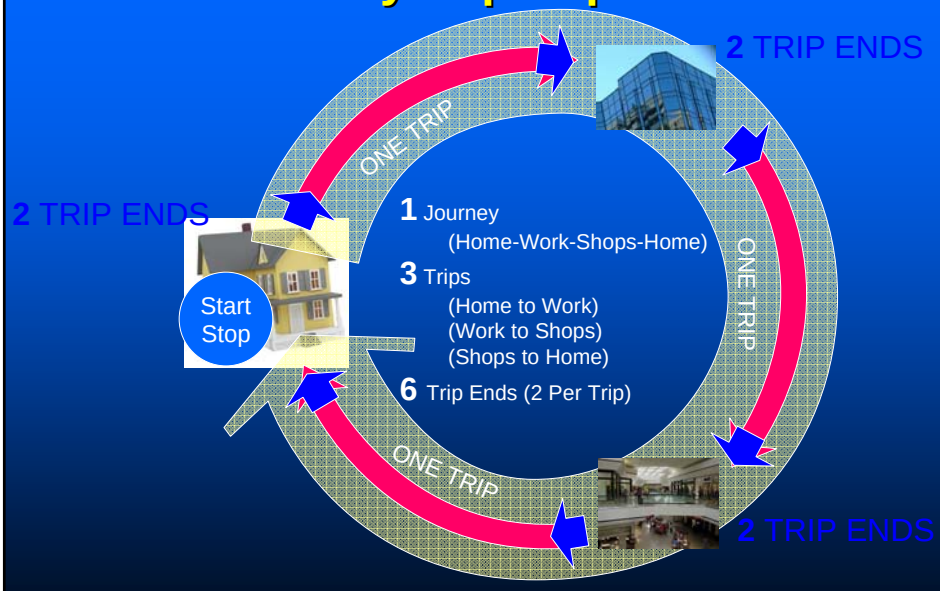
What is a Trip End?

- Number of trips that come in or go out of a development
  - (Volume at Driveways)

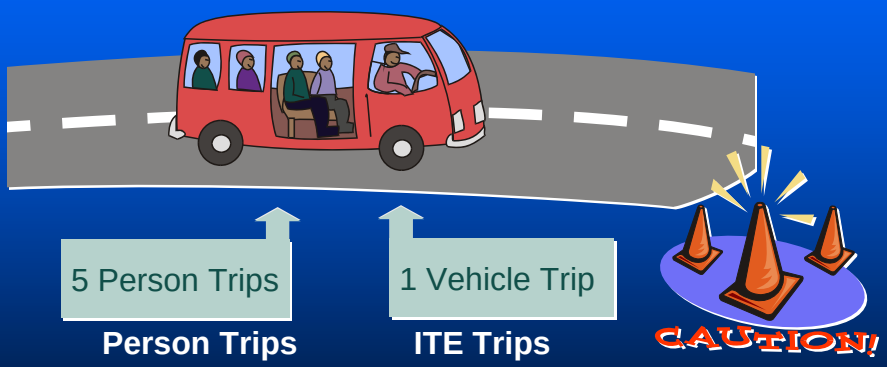


- **A trip end is a single or one-direction vehicle movement with either the origin or destination (exiting or entering) inside the study site.**

Journey/Trip/Trip Ends

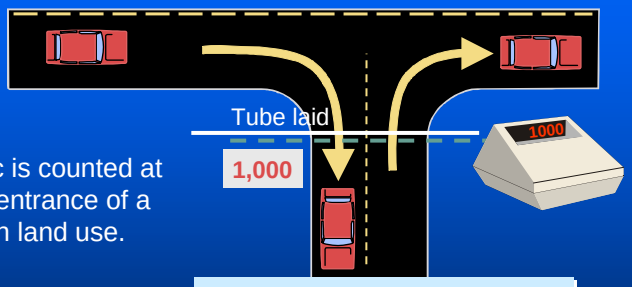


Vehicle Trips (ITE) vs. Person Trips



Person Trips **ITE Trips**

How Are Trip Generation Rates Determined?



- Traffic is counted at each entrance of a certain land use.

Traffic is then studied in relation to the size of certain "independent variables."

10,000 sq ft store

250 employees

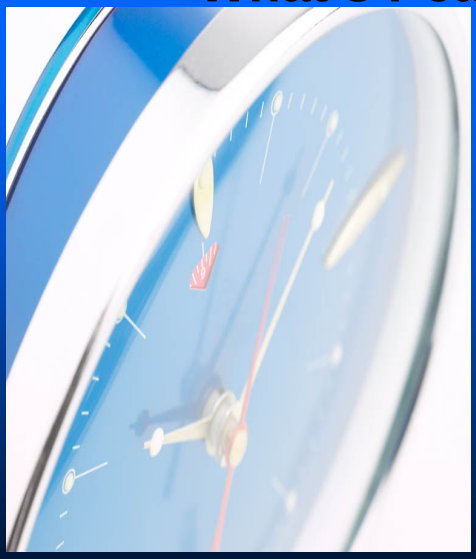
What is Meant by "Daily Trips"?

- For our use, we usually mean the number of WEEKDAY TRIPS.

SUN	MON	TUE	WED	THU	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

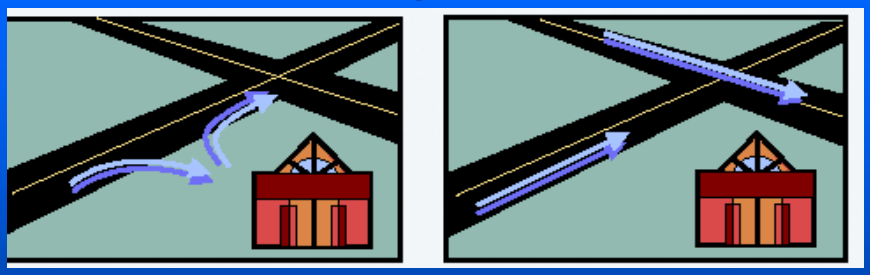
The ITE Manual Also Has Some Data On:
- **Saturday**
- **Sunday**
- **Christmas Holiday Season**

What's Peak Hour?



- Any 4 consecutive 15 minute periods that equal the highest 1 hour volume
- There are usually morning and evening
  - Some lunch time peaks are important
- We are usually using peak hour of **Adjacent Street Traffic**
- Can be 3 hours!

Generator vs. Adjacent Street Traffic



- Usually the same PM peak for shopping, office and residential
- Hospitals, industrial and schools may be different due to different work shifts
- Fast food restaurants have short trip durations and peak during mid-day peak periods

PM Peak Hour Trips Aren't Always Equal

Shopping Center (820)

– 202,400 sq.ft = **1,000** Peak Hour trips

»480 in

»520 out

See peaking characteristics

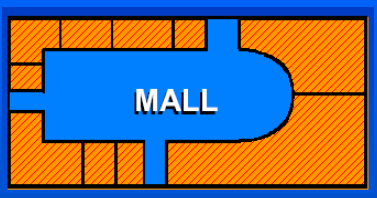
General Office (710)

– 821,300 sq.ft = **1,000** Peak Hour trips

»170 in

»830 out

Gross Leaseable Area (GLA)



- GLA is only the area that can be used by shops
- Does not include parking areas or common pedestrian areas

Gross Floor Area (GFA)

- GFA includes all enclosed area for each floor

Specialty Retail vs. Shopping Center

Shopping Center (820)

407 studies

379,000 sq.ft. Gross Leasable average

Rate in PM Peak = **3.75**

Specialty Retail Center (814)

5 studies

69,000 sq.ft. Gross Leasable average

Rate in PM Peak = **2.71**

Read the Descriptions in the ITE Report

Read Descriptions – Full of Information

Land Use: 814
Specialty Retail Center

Description

Specialty retail centers are generally small strip shopping centers that contain a variety of retail shops and specialize in quality apparel; hard goods; and services, such as real estate offices, dance studios, florists and small restaurants. Shopping center (Land Use 820) is a related use.

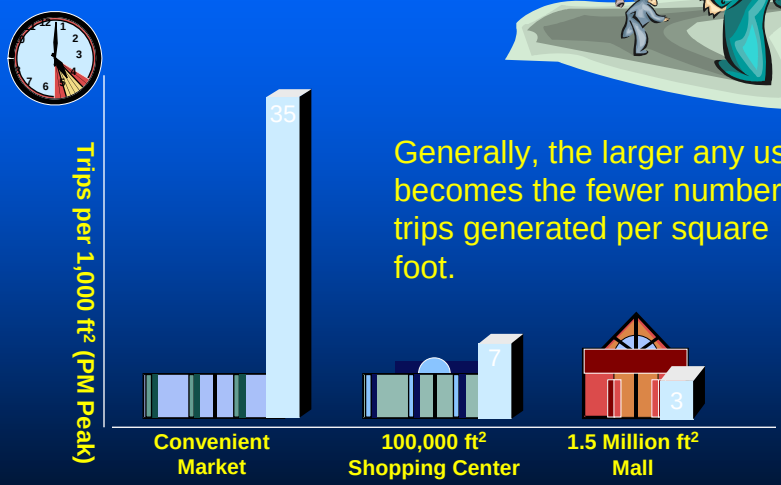
Additional Data

The sites were surveyed from the late 1970s to the 2000s in California, Florida, Georgia, New York and Pennsylvania.

Offices Using Different Independent Variable

- Business Park (770)
- 28 acres average
- 379,000 sq.ft. Gross Floor Area average
  - » average density = 379/28= 14K sq.ft. per acre
- An analyst could hide trips by using "acres" if the development was higher than the average

Size Does Matter



Generally, the larger any use becomes the fewer number of trips generated per square foot.

(NOT SO)

BRIEF GUIDE OF VEHICULAR TRAFFIC GENERATION RATES FOR THE SAN DIEGO REGION

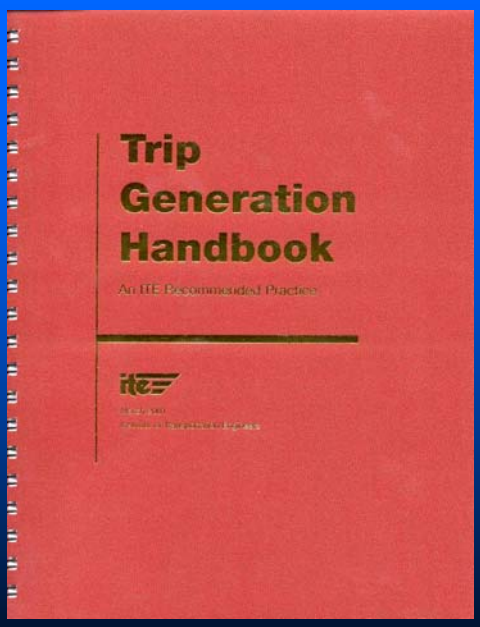
APRIL 2002

SANDAG
401 B Street, Suite 800
San Diego, California 92101
(619) 699-1900 • Fax (619) 699-1950

NOTE: This listing only represents a *guide* of average, or estimated, traffic generation "driveway" rates and some very general trip data for land uses (emphasis on acreage and building square footage) in the San Diego region. These rates (both local and national) are subject to change as future documentation becomes available, or as regional sources are updated. For more specific information regarding traffic data and trip rates, please refer to the San Diego Traffic Generators manual. *Always check with local jurisdictions for their preferred or applicable rates.*

LAND USE	TRIP CATEGORIES (PRIMARY:DIVERTED:PASS-BY)*	ESTIMATED WEEKDAY VEHICLE TRIP GENERATION RATE (DRIVEWAY)	HIGHEST PEAK HOUR % (plus IN:OUT ratio) Between 6:00-9:30 A.M.		Between 3:00-6:30 P.M.		TRIP LENGTH (Miles)*
AGRICULTURE (Open Space)	[80:18:2]	2/acre**					10.8
AIRPORT	[78:20:2]						12.5
Commercial		60/acre, 100/flight, 70/1000 sq. ft.* **	9%	(6:4)	8%	(5:5)	
General Aviation		6/acre, 2/flight, 6/based aircraft* **	9%	(7:3)	18%	(5:5)	
Heliports		100/acre**					
AUTOMOBILE*							
Car Wash							
Automatic		900/site, 600/acre* *	4%	(5:5)	8%	(5:5)	
Self-serve		100/wash stall**	4%	(5:5)	8%	(5:5)	
Gasoline	[21:51:28]						2.8
with Food Mart		160/vehicle fueling space**	7%	(5:5)	8%	(5:5)	
with Food Mart & Car Wash		155/vehicle fueling space**	8%	(5:5)	9%	(5:5)	
Older Service Station Design		150/vehicle fueling space, 900/station**	7%	(5:5)	9%	(5:5)	
Sales (Dealer & Repair)		50/1000 sq. ft., 300/acre, 60/service stall* **	9%	(7:3)	9%	(4:6)	
Auto Repair Center		20/1000 sq. ft., 400/acre, 20/service stall*	9%	(7:3)	11%	(4:6)	
Auto Parts Sales		60/1000 sq. ft.* *	4%		10%		
Quick Lube		40/service stall**	7%	(6:4)	10%	(5:5)	
Tire Store		25/1000 sq. ft., 30/service stall* *	7%	(6:4)	11%	(5:5)	
CEMETERY		5/acre*					
CHURCH (or Synagogue)	[64:25:11]	9/1000 sq. ft., 30/acre** (quadruple rates for Sunday, or days of assembly)	9%	(6:4)	8%	(5:5)	5.1

http://www.sandag.org/uploads/publicationid/publicationid_1140_5044.pdf



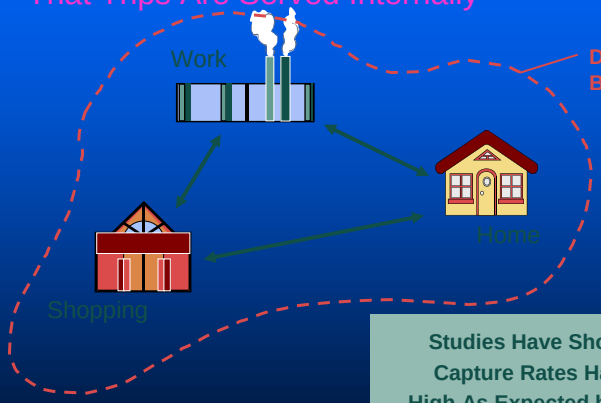
Trip Generation Handbook

Trip Generation Handbook Topics

- Estimating trip generation
- Conducting a trip generation study
- Internal trip capture for multi-use development projects
- Pass-by and diverted trips

Is Internal Capture Optimistic?

Some Developments Are So Large and Diverse That Trips Are Served Internally

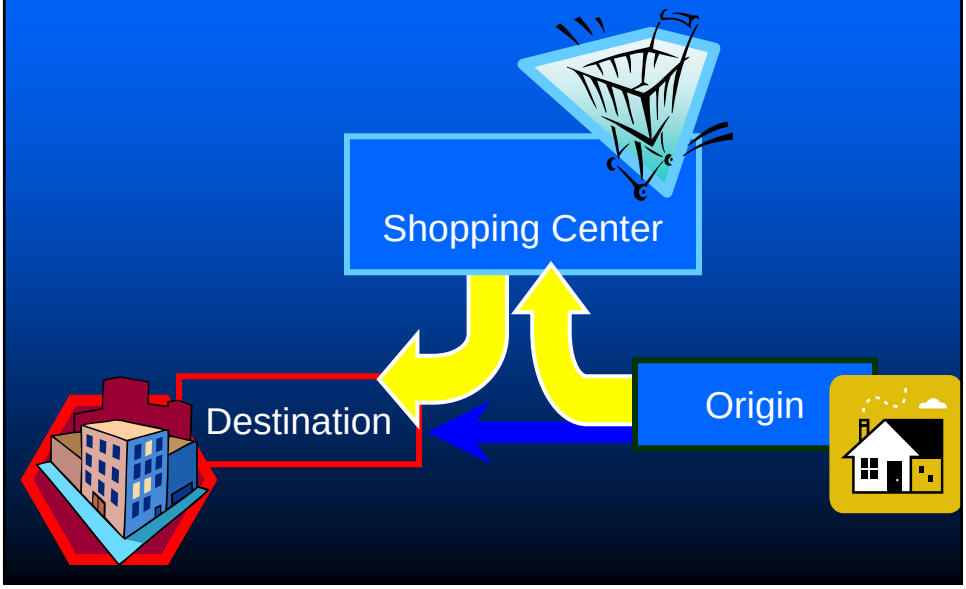


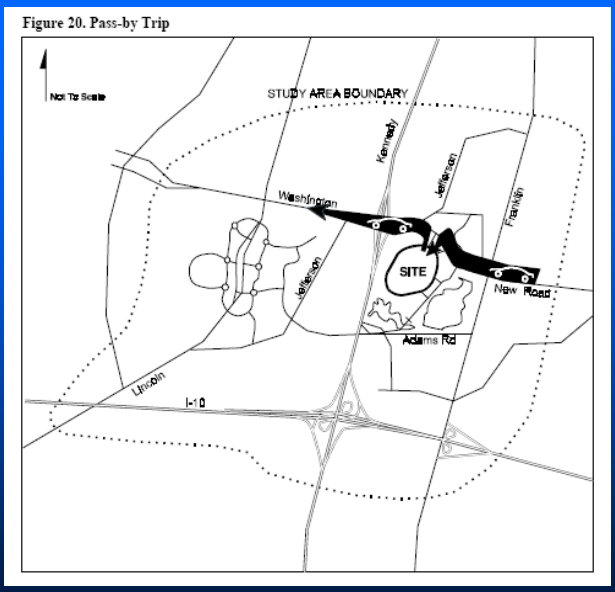
Studies Have Shown That Internal Capture Rates Have Not Been As High As Expected by Their Developers

Trip Capture Rates

- Trip Generation Handbook Topic
- Tables 7.1 and 7.2
- Unconstrained Rates for Trip Origins
- Residential to Retail Midday Peak Hour: 34%

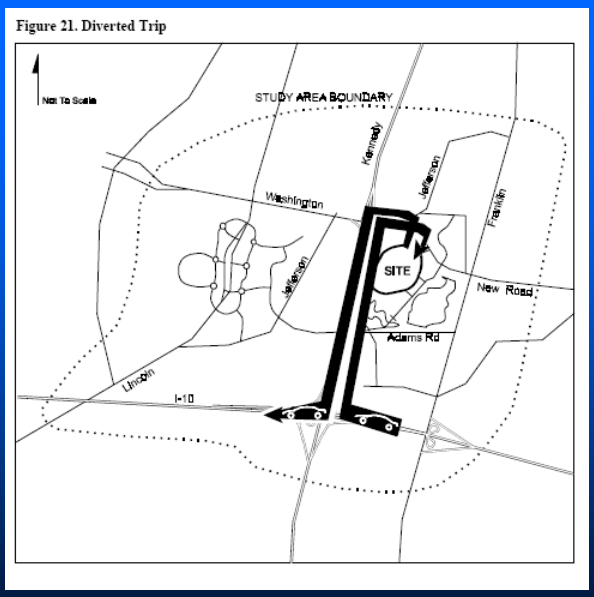
What are Pass-By Trips?





Trips attracted from passing traffic

Source: Site Impact Handbook Florida DOT

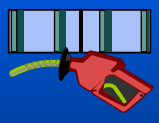


Diverted trips from passing traffic

Source: Site Impact Handbook Florida DOT

Are Pass-by Trips Over Predicted?

The smaller and more "convenience-oriented" a business is, the higher the proportion of trips generated that are already on the road.



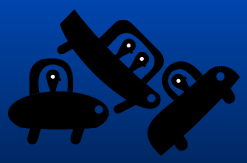
Gasoline /Convenience Mkts ITE #845
45 - 80% (measured - but use caution)

Shopping Center ITE #820
20% and more (measured - but use caution)

Source: ITE Trip Generation, Handbook

Pass-By Trips

- **Definition:** Trips that would have traveled on a street adjacent to a **Retail Center** even if the retail was not constructed
- Applied only to retail-oriented land uses
  - Shopping centers
  - Convenience markets
  - Gas stations
  - Fast-food restaurants
  - Drive-in banks



- Results in reduction of new trips added to network attributable to retail center

Generator	Percent of Site Traffic
Banks with drive-thru windows	14 %
Supermarkets	28 %
Hardware Stores	8 %
Convenience Stores	16 %
Fast-food Restaurants	45 %
Service Stations	58 %
Shopping Center, sq feet GLA:	
> 1 million, 2 centers, range 12%-25%	19 %
800,000 to 1 million, 3 centers, range 9%-25%	15 %
600,000 to 799,999, 2 centers, range 14%-23%	19 %
400,000 to 599,999, 6 centers, range 15%-48%	32 %
200,000 to 399,999, 4 centers, range 17%-56%	41 %
100,000 to 199,999	50 %
< 100,000, 4 centers, range 51%-72%	60 %

Source: Traffic Institute, Northwestern University [3].

Trips attracted from passing traffic

Pass-by Reasonableness Checks

- The number of pass-by trips should not exceed **10 percent** of the adjacent street traffic during peak hour
- Strong justification must be provided to document pass-by rates greater than **25 percent** of the total external trip generation for the developments retail portions
  - Ensure proposed development displays ideal characteristics to generate pass-by trips

Don't Count Twice,

It's not alright

If internal capture is considered:

Use internal capture first;

then apply pass-by percentages to **shopping external trips** *only*

Trip Generation
- Internal Capture
= External Trip Generation

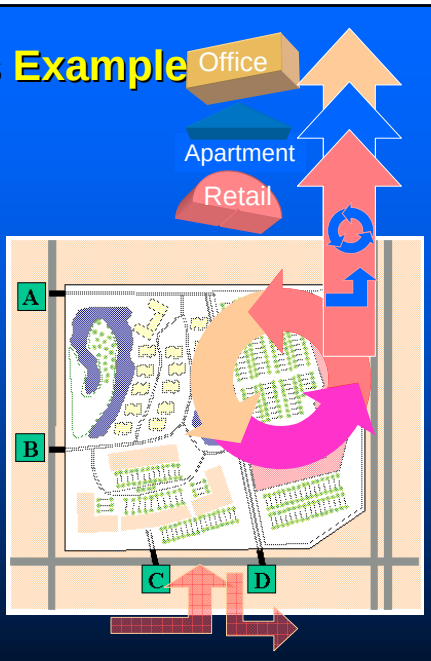
- Pass-By Trips (% of External)
= New External Trip Generation

Pass-by Trips Example

Total Trip Generation
- Internal Capture

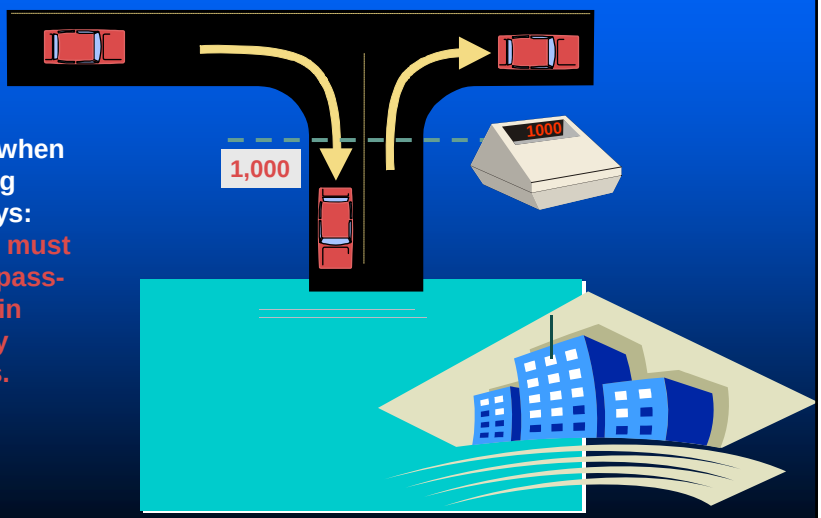
= External Trips
- Pass-by Percent

= External Trips New to the System



Driveway Traffic Will Include All Of The Pass By Traffic

Beware when analyzing driveways: analysis must include pass-by trips in driveway volumes.



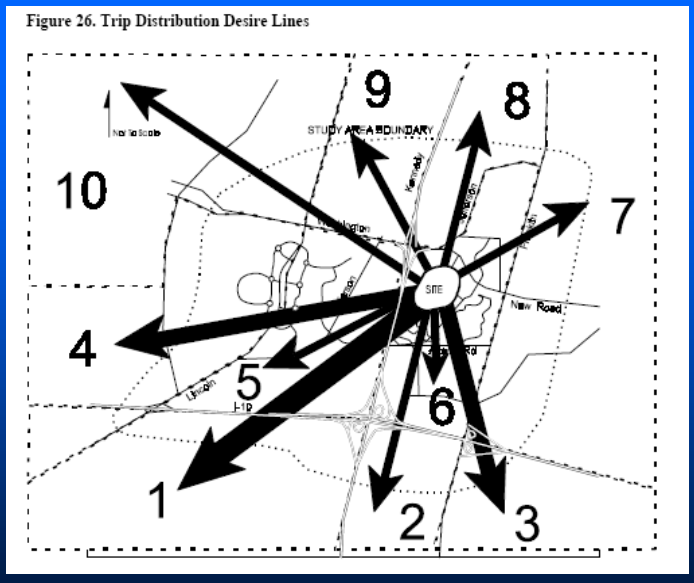
Trip Distribution

Trip Distribution

- No standard reference - subjective
- Analyst experience or “feel”
- Pattern of traffic along corridor
- Where do the trips *go*?
- Distribution is done for each purpose

Trip Distribution Methods

- Points of the compass
- Existing counts/turning movement patterns
- Data from nearby development TIS
- Existing and future land uses
- TIS Models/Select Link Analysis



Trip distribution desire lines

Source: Site Impact Handbook Florida DOT

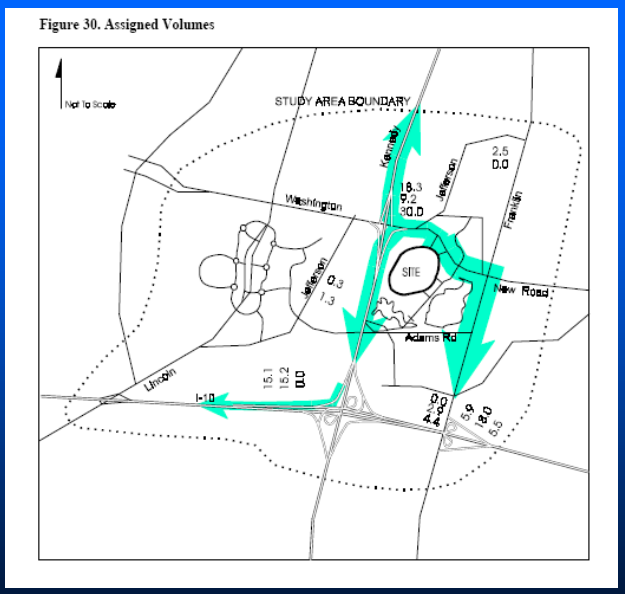
Trip Assignment

Route Assignment

- How does a particular trip get from “A” to “B”?
- People wish to minimize travel time
- In highway network, more than one path
- Not all traffic will select one path
- Most important in congested networks
- *It has to make sense!*

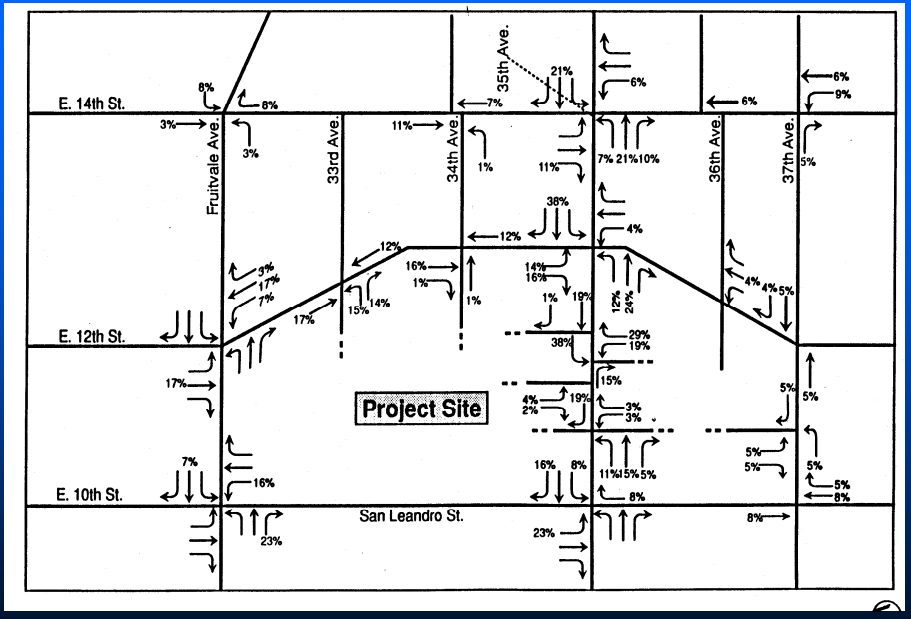
Route Assignment (2)

- Process is iterative
- Various speed/flow curves
- Most common assumption: Wardrop's principle: "In equilibrium, no person can unilaterally change his/her travel path and achieve a lower travel time."



Trip assignment

Source: Site Impact Handbook Florida DOT



Capacity Analysis

Traffic Impacts

- Calculate levels of service
- Compare to level of service standard
- Compare to threshold of significance
- Identify potential mitigation measures
- Recalculate with mitigation measures

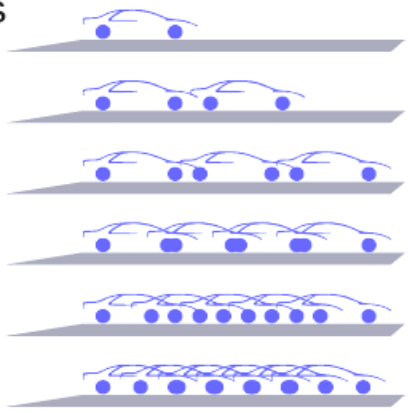
Capacity Analysis Methods

- Analysis method determined by agency
- HCM or ICU
- Intersections
- Segments
- Roundabouts (FHWA Study)

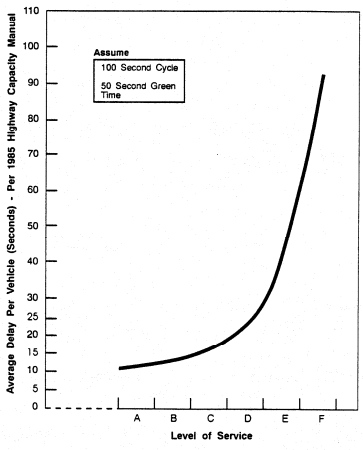
Some Basics Level of Service (LOS) Fundamentals

Measures describing operating conditions of roadways

Six levels



Why Use Level of Service "D" ?



Delay increases exponentially

	Rural Areas[2]	Transitioning Urbanized Areas[3], Urban Areas[4] or Communities[5]	Urbanized Areas[6] under 500,000	Urbanized Areas over 500,000	Roadways Parallel to Exclusive Transit Facilities[7]	Inside Transportation Concurrency Management Areas[8]	Constrained[9] and Backlogged[10] Roadways
INTRASTATE[11]							
Limited Access Highway (Freeway)[12]	B	C	C(D)	D(E)	D(E)	D(E)	Maintain[15]
Controlled Access Highway[13]	B	C	C	D	E	E	Maintain
OTHER STATE ROADS[14]							
Other Multilane	B	C	D	D	E	*[16]	Maintain
Two-Lane	C	C	D	D	E	*	Maintain

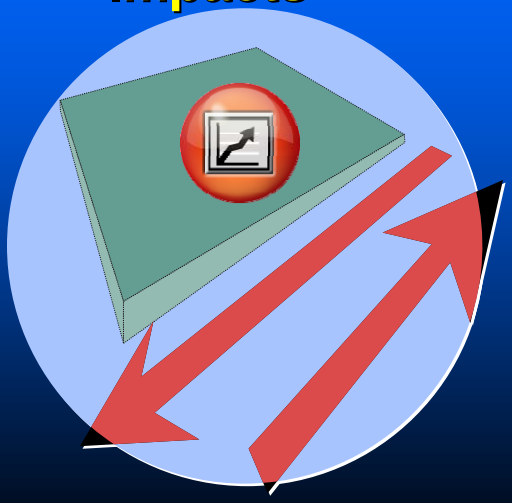
Typical Minimum LOS Standards

Source: Site Impact Handbook Florida DOT

Thresholds of Significance*

Existing Level of Service	Increase in V/C or Trips Greater Than
LOS A	0.20
LOS B	0.15
LOS C	0.10
LOS D	10 Trips
LOS E	5 Trips
LOS F	1 Trip
LOS F ++	0 Trips

Background Traffic and Trends for Analysis of Cumulative Impacts

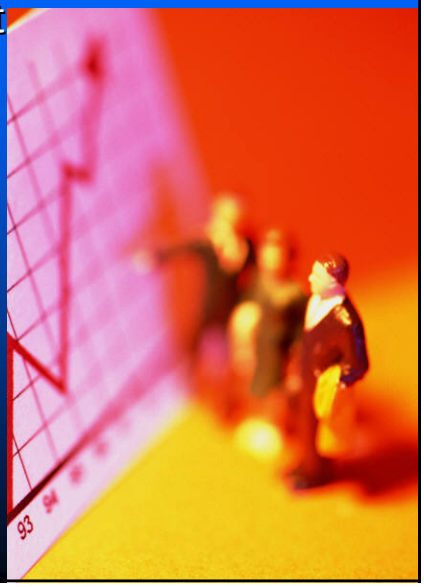


Basis For Cumulative Impacts

- Impacts from new project
- Impacts from approved “un-built” projects and projects in pipe line
- Background growth in thru trips – based on historical count data
- Agency general plan model projections – okay to use if projects are consistent with plan
- Other traffic impact study data

Trend Analysis

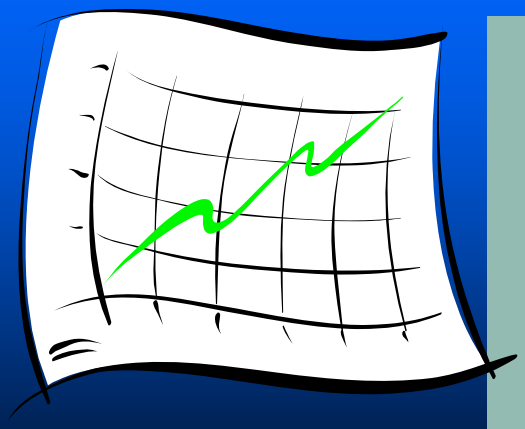
- Historical data for at least the last five years
- Check for major transportation changes
  - Which change capacity and attract new trips
- Check for major development changes



Different Types of Trends

- Linear growth
- Geometric growth
- Declining growth

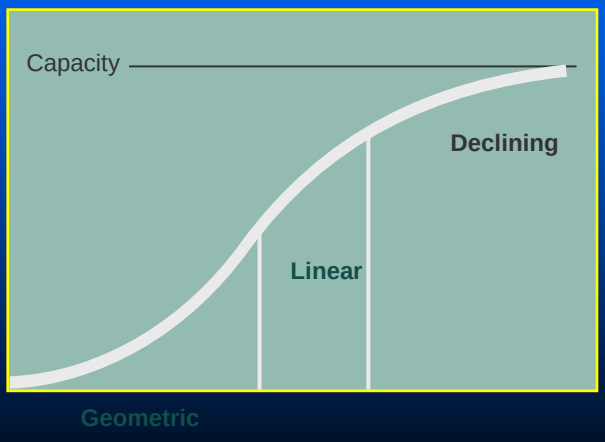
Some Historical Volumes



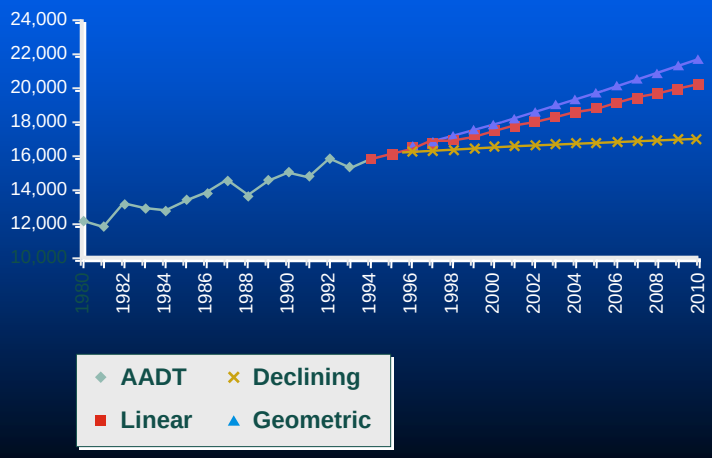
Year	Volume (AADT)
1997	12,300
1998	12,000
1999	13,500
1998	13,220
1997	13,000
1996	13,775
1997	14,125
1998	15,000
1999	14,000
2000	15,000
2001	15,600
2002	15,300
2003	16,500
2004	15,900
2005	16,500

Different Types Of Traffic Growth

Natural Growth

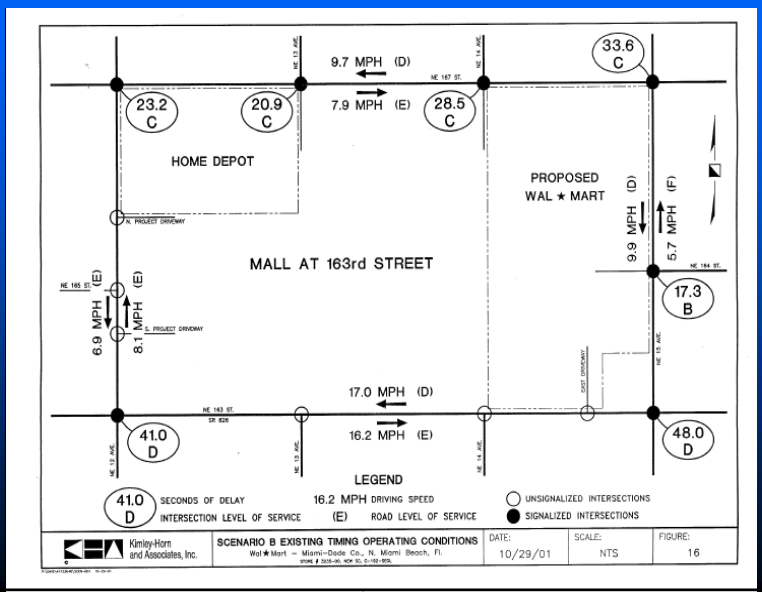


Results Comparison

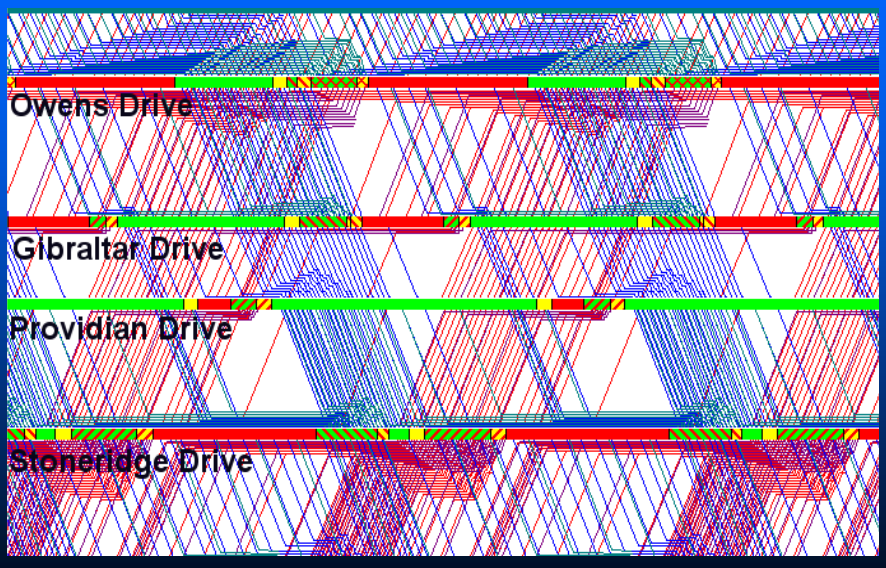


Operational Analysis

Operational Level Study

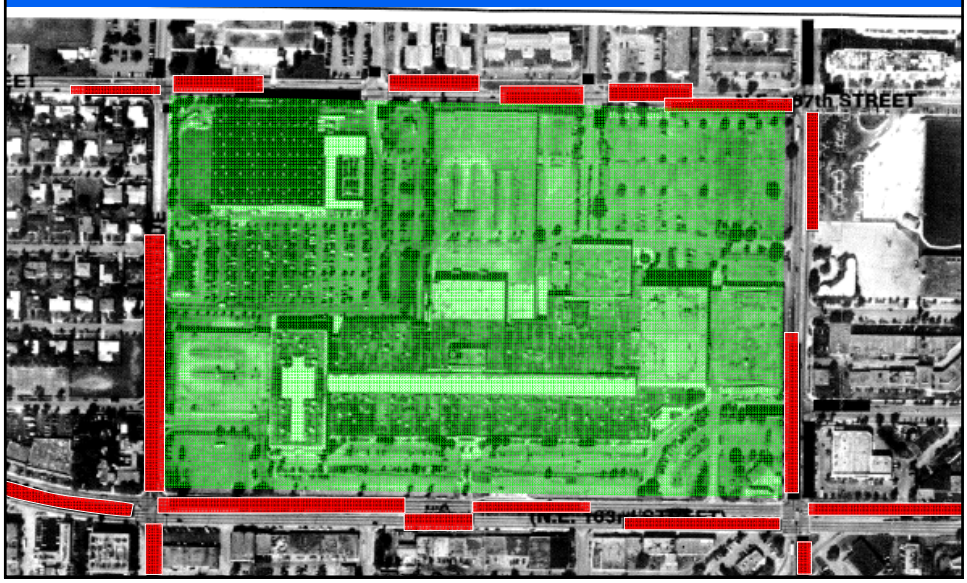


Operational Level Study - Syncro



Queue Analysis

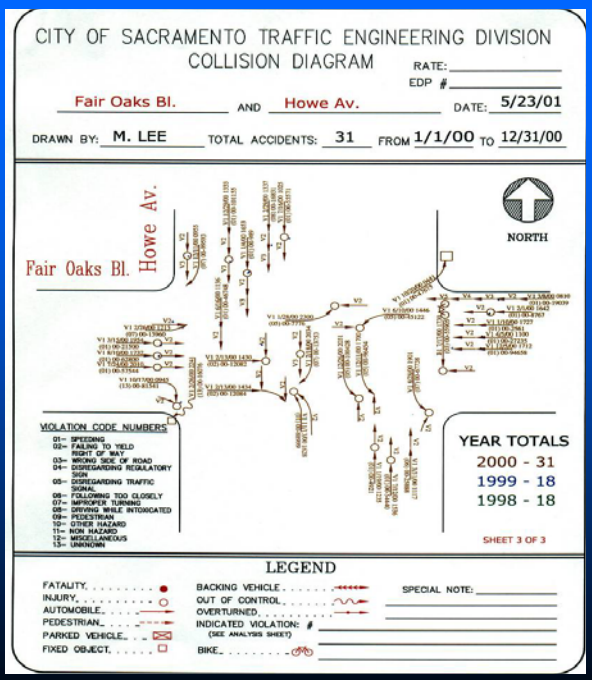
(for signal improvements and median opening changes)



Traffic Safety Analysis

Address Impacts to Locations with Known Safety Problems

- Impacts from new project
- Analyze collision patterns
- Identify mitigation measures
- Include in overall project mitigation



Collision Diagram

Narrow two-lane highway with hairpin bends

Grimes Canyon Quarries

Project Specific Mitigation Measures

Project Specific Mitigation

- Depend on results of analysis
- Determined by local LOS standards
- Funded versus un-funded
- Keep TDM measures separate
- Responsibility and timing important

Typical Mitigation Measures

- Reduction in project size
- Transportation Demand Management
- Enhancement of circulation system
  - New facilities
  - New lanes
  - Operational improvements
- Project denial

Mitigation Monitoring

- Public Resources Code 21081.6
- Site Plan Requirements
- Mitigations should be in EIR
- Enforcement by:
  - Liquidated Damages
  - Bonds
  - Cash Deposit Surety

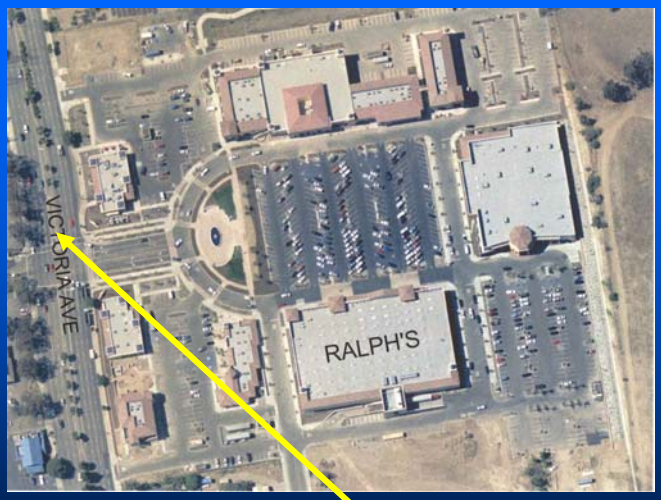
New casino constructed near Palm Springs

Site access improvements

Closest impacted intersection widened and signalized as part of mitigation measures

Roadway realigned as part of mitigation for residential tract

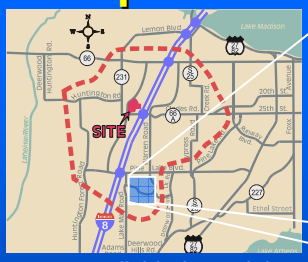
Roadway realigned as part of mitigation for residential tract



Brand new shopping center where 150’ left-turn lane was not lengthened

Example Using the LOS Tables to Determine Proportionate Fair-Share

Proportionate Fair-Share Example



A development adds **300** peak hour directional trips to segment, causing the road to fail

- 4 Lane divided Arterial
- LOS Standard = D
- From Directional Peak Hour Tables, Urbanized Class II

Class II (2.00 to 4.50 signalized intersections per mile)

		Level of Service				
Lanes	Divided	A	B	C	D	E
1	Undivided	**	100	590	810	850
2	Divided	**	220	1,360	1,710	1,800
3	Divided	**	340	2,110	2,570	2,710
4	Divided	**	440	2,790	3,330	3,500

Proportionate Fair-Share Example

To maintain a LOS D, This road must go from 4 to 6 lanes

2,570
- 1,710
Service Volume Increase

Class II (2.00 to 4.50 signalized intersections per mile)

		Level of Service				
Lanes	Divided	A	B	C	D	E
1	Undivided	**	100	590	810	850
2	Divided	**	220	1,360	1,710	1,800
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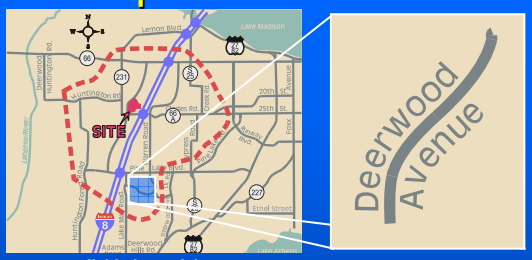
Proportionate Fair-Share Example



- 4 Lane divided Arterial
- From Directional Peak Hour Tables, Urbanized Class II, LOS D = 1,710

Development adds 300 Peak Hour directional trips to segment

1,710 Maximum Service Volume at LOS D (4 lanes)

Widening to 6 lanes would bring facility to 2,570 Maximum Service Volume

2,570 – 1,710 = 860

$$\frac{\textbf{300 Development Trips}}{\textbf{860 Service Volume Increase}} = \textbf{35\%}$$

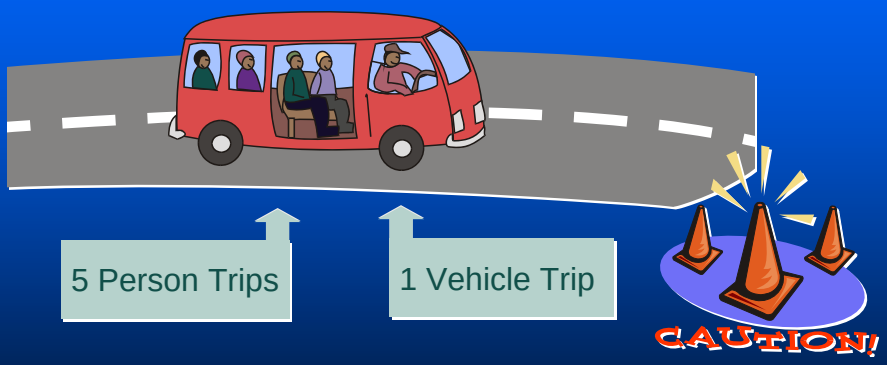
If the improvement were $1,000,000 Total
The developer's share would be $350,000

$1Million x 35% = $350,000

$350,000 could also be applied to transit service improvements

Transportation Demand Management

Vehicle Trips vs. Person Trips



Definitions and Outline

- TSM vs. TDM
- Types of actions and effectiveness
- Limitations
- Monitoring programs
- Long term success/failure

Program Definitions

- TSM = Supply-side actions
- TDM = Demand-side actions
- Voluntary vs. Mandatory programs
- Transportation Management Associations (TMAs)

TDM Program Essential Elements

- Define clear, measurable objectives
- Community review and education
- Work with developers & employers
- Coordinate with other agencies
- Clearly identify penalties
- Audit the monitoring process

TDM Action Categories

- Increased options for commuters
- Market (pricing) strategies
- Time-of-travel shifting
- Better land use planning
- Regulation of parking or driving

Common Features

- Low cost (relative)
- Low impacts
- Fast implementation
- De-centralized implementation
- Multi-party cooperation/communication

Options for Commuters

- Carpool matching
- Employer-sponsored vanpools
- Club bus/Subscription bus passes
- Preferential carpool parking
- Transit stops/Locker rooms
- Park-and-ride lots
- Telecommuting

Measured Effectiveness

- **Individual Employer Programs**
  - Travelers Insurance 25-48%
  - Hartford Steam Boiler 14%
  - 3M Co. 10%
  - ARCO (L.A.) 19%
  - State Farm Insurance (Orange Co.) 30%
  - NRC (Wash. DC Metro) 42%
  - US West (Bellevue) 47%

Market (Pricing) Strategies

- Parking fees (or parking tax)
- Parking "cash out"
- Rideshare subsidies
- Transit pass subsidy
- Tax incentives
- Road pricing (Central London fee)
- "HOT" lanes

Key Sources for More Information

- TCRP Project B-12, *Traveler Response to Transportation System Changes (Interim Handbook)* March 2000 (on web)
- ITE, *A Toolbox for Alleviating Traffic Congestion*
- ITE, *Transportation Planning Handbook*, Chapter 19 (1999)
- USDOT, *"Implementing Effective Travel Demand Management Measures: Inventory of Measures and Synthesis of Experience." Report DOT-T-94-02 (1993)*

Mitigation Monitoring

- California: Public Resource Code 21081.6 (AB 3180)
- Ensure mitigations implemented
- Include mitigations in EIR
- Enforcement by liquidated damages, cancellation of permits

Cumulative Mitigation Measures

Available Methods

- Sales Tax
- Traffic Mitigation Fees
- Reciprocal Agreements
- Assessment Districts
- Development Agreements

Current Practices in TIS Preparation

Common Criticisms of TIS

- Trip generation rates are fixed and do not reflect congestion or accessibility
- Adjacent similar developments produce differing results
- Relationships between variables may change over time
- The forecast is a “self-fulfilling prophecy”

Criticisms (cont'd)

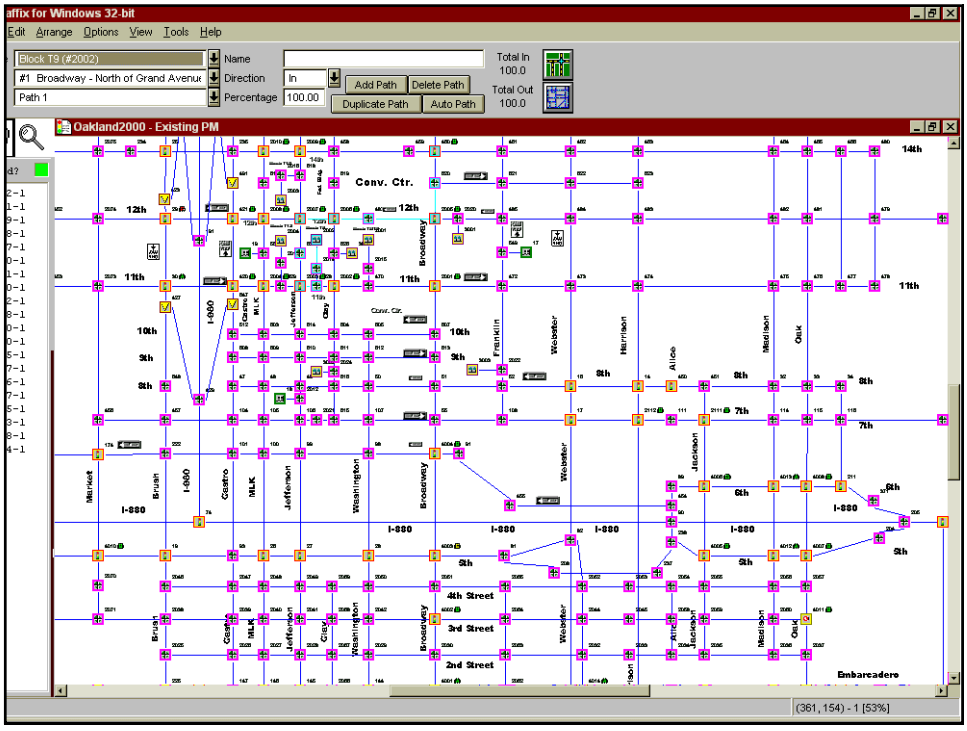
- ***Fuel price increases are not considered!!!***
- Model assumes "perfect information"
- Impacts to regional road network ignored
- Adjacent similar developments with different impacts
- More should be done to increase the modal split

Current Practices in TIS Preparation

- Trip generation ranges not just average rate (1 standard deviation)
- Multi-day counts
- HCM planning application method
- Segments AND intersections
- Mini TIS models

Software

- Trip distribution
- Street network simulation
- Turning movement projections
- LOS calculations



Web Sites

- FHWA Access Management Site: http://www.accessmanagement.gov
- ITE web site at www.ite.org and look under 'Publications'
- ULI web site at www.uli.org and look under "Bookstore"
- NCHRP Web Site: http://www4.nationalacademies.org/trb/onlinepubs.nsf