INNOVATIONS IN TRANSPORTATION PLANNING

Presented by:

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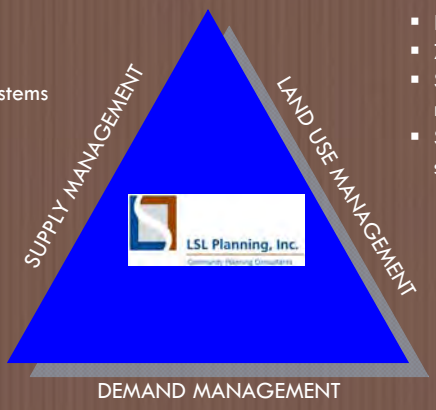
- Eli Cooper, City of Ann Arbor, MI
- TRB Access management Committee
- Complete Streets Organization
- And all those who passed along ideas

Outline of Presentation

- Transportation Planner's Role
- The Process
- Various Scales of Transportation
- Innovations
  - Network Planning and new street typologies
  - Improving traffic flow/safety, Access Management
  - Complete Streets
  - Non-motorized transportation
  - Transit/Transit-Oriented Development
  - Form-Based Codes

Transportation Planning

- Roadway Improvements
- Transportation System Management (TSM)
- Intelligent Transportation Systems (ITS)
- Transit
- Non-motorized



- Planning
- Zoning
- Subdivision regulations
- Street design standards

- Alternative Work Schedules
- Alternative Modes
- Employer Support Programs

A New Paradigm—Innovation

- Link Land Use with Transportation
  - Integrated rather than separate
  - Transportation for all users
  - Fit context, harmonize
  - Land use arrangement to reduce peak hour single occupant auto trips
  - Transportation investments as an economic development catalyst

EXISTING MODEL

Land Use → Forecast Trips → Deficiencies → Projects

INNOVATIVE MODEL

- Community Vision/Goals
- Land Use Scenarios
- Test Alternatives–performance outcomes
  - land use management
  - mode options
  - improvements
- Recommendations

Role of the Transportation Planner

- "Bridge the gap"
- Advocate for transportation to improve community sustainability
- Explain technical info to officials and public
- Lead the process

Transportation Acronyms and Jargon

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Planner as the translator…

$$s = \frac{\sigma}{\sqrt{n}}$$

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$\sigma = \sqrt{\frac{\Sigma\,(x-\bar{x})^2}{n}}$$

- Environmental justice
- Secondary and cumulative impacts
- Friction factor
- 85th percentile

Outcome-based Planning Process

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1. The Vision

Problem understanding → Goals and objectives → Performance measures

2. Evaluation

Identify alternatives or scenarios → Evaluation → Select alternative

3. The Plan

Long-range plan → Transportation improvement program → Implementation

Vision

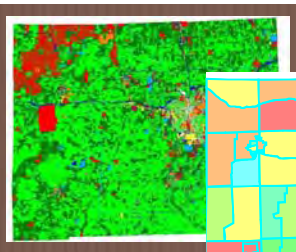
- Establish a Vision
- Measured by performance outcomes

  Examples:
  - *Accommodate growth with less VMT growth* (Ann Arbor 2009 Plan)
  - *Accommodate growth with a reduction in VMT* (Los Angeles County 2008 Plan)

Goals and objectives
- Mobility and accessibility
- Environmental quality
- Economic development
- Quality of life
- Social Equity

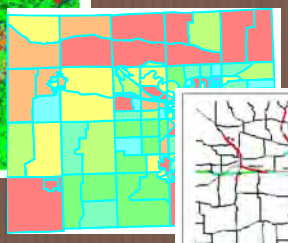
Ann Arbor, MI TOD Redevelopment Simulation

Regional MPO Plan

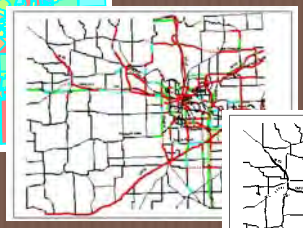


Future Land Use Plans

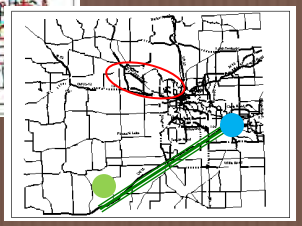
- Assumes FLU is valid
- Assumes community will develop per its plan



Employment & Household Projections (by TAZ)



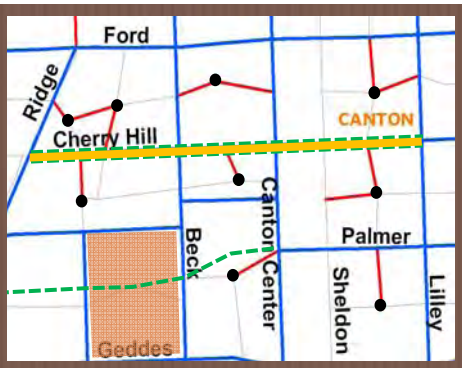
Projected Deficiencies (congestion) and Alternatives Analysis

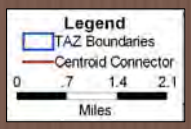


Recommended Changes – typically to add capacity

Traditional Travel Network Demand Forecasting

- Traffic analysis zones
- Population/employment
- Estimate trips
- Trip distribution – where?
- Mode choice – how?
- Trip assignment
- Calibrate (test)
- Model for future design year
- Identify deficiencies
- Test alternatives
- Air quality modeling





- Model: Cherry Hill over capacity
- Growing TAZ to south
- Widening or new link

Innovative Modeling

- Movement toward activity based models
- Challenges – data, cost
- Reduce trips out of the TAZ (external trips) through mixed use and connectivity

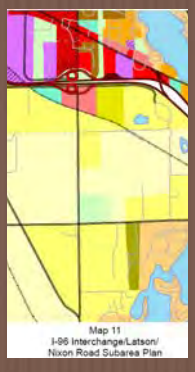
Land use design (with same density) can impact trip distribution

Community-Wide Transportation Plan

1. Goals/performance outcomes
2. Future demand/scenarios
3. Alternatives (all modes)
4. Evaluation
5. Priorities
6. Funding

Project Specific Study

- Types
  - Widening
  - New Street
  - Interchange
  - Bridge
  - Transit
  - Non-motorized
- Micro-simulation (Synchro, VISSIM)
- NEPA process (if federally funded)



Corridor Simulations

Simulation provided by: URS

National Environmental Policy Act (NEPA)

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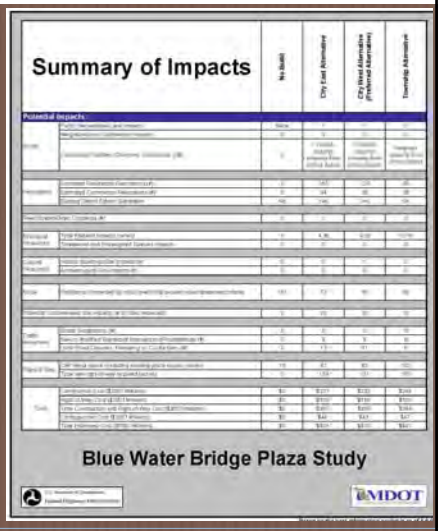
- Typical NEPA elements:
  - Purpose and need
  - Public involvement
  - Evaluate adverse environmental effects
  - Alternatives to proposed action
  - The relationship between short-term uses of the environment and the long-term productivity
  - Any irreversible and irretrievable commitments of resources
- Process must be completed before an agency makes a final decision on a proposed action.

NEPA: three basic types

- Environmental Impact Statement (EIS) – projects that will have a significant effect on the environment.
- Environmental Assessment (EA) – projects where significance of environmental impact not clearly established, results in a Finding of No Significant Impact (FONSI) or the need for an EIS.
- Categorical Exclusions for actions that do not have a significant effect on the environment.

NEPA: Impact Evaluation Example

- Environmental
- Endangered species
- Noise
- Historic & cultural
- Parks and schools
- Land use
- Economic/fiscal
- Costs
- Engineering feasibility
- Displacement
- Environmental justice



Any questions so far?

Traditional methods focus on auto travel and likely identify more projects than available funding…

and community may not find project acceptable.

"Can we build out of congestion?"

So it's time to be *innovative* —

How can we meet the needs for a safe, efficient, attractive, and sustainable transportation system?

Sustainable Transportation

To reduce carbon footprint/greenhouse gas emissions:

- Switch some auto trips to transit/biking/walking
- Reduce delays/emissions (ITS)
- "Clean goods movement" – focus of signal coordination
- Replace fleets with green vehicles
- Reduce auto trips with mixed use
- More comprehensive transportation planning

Los Angeles County Transportation Plan notes one VMT = one pound of CO2

Congestion Management

- HOT-High occupancy toll lanes
- HOV-High occupancy vehicle lanes
- Reversible lanes
- TOT- Truck Only Toll
- Congestion pricing
- Ramp metering

Ramp metering (New Zealand)

HOV lanes

Washington, D.C. reversible lanes

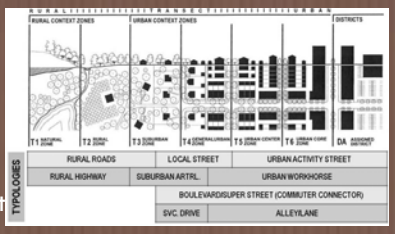
Employee Demand Management

- Van pool
- Flex schedule
- Park and ride
- Ride share programs
- Variable parking pricing
- Employer supported program

Richmond, VA van pool

New Network Typologies

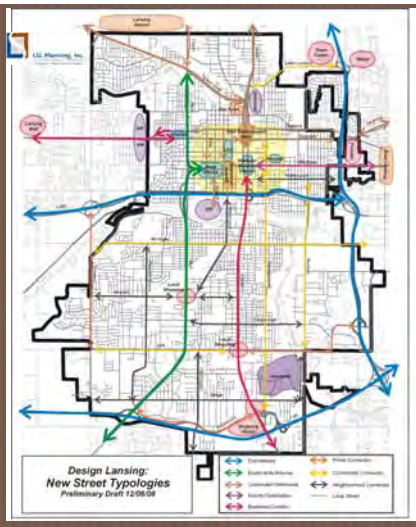
- Traditional Functional Classification based on character of vehicular service
- New (nested) network/typology based on wider scope:
  - Function of street
  - Street width
  - Streetscape
  - Relationship to land use and form
  - Non-motorized transportation/transit
- Quality of travel by street by mode



From Duany Plater-Zyberk

See upcoming ITE Recommended Practice

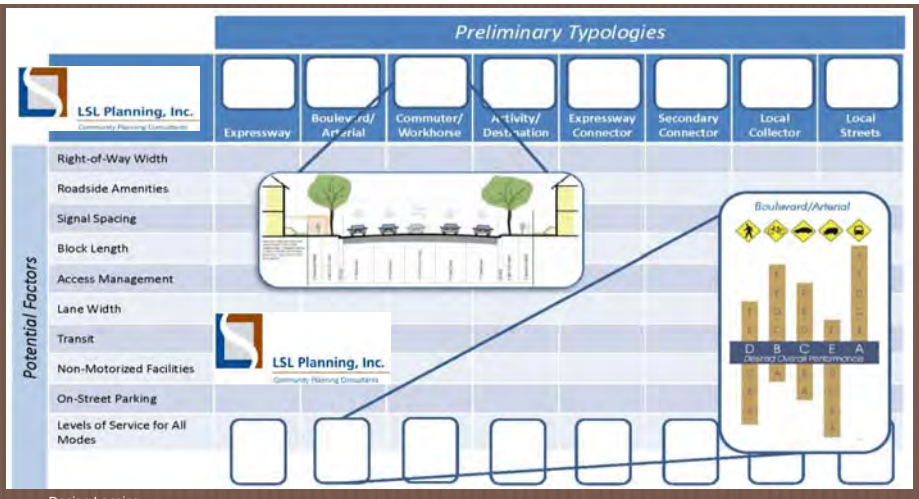
Case Study: Design Lansing



Street Typologies

- Expressway
- Boulevards/Arteries
- Commuter/Workhorse
- Activity/Destination
- Business Corridor
- Prime Connector
- Community Connector
- Neighborhood Connector
- Local Street

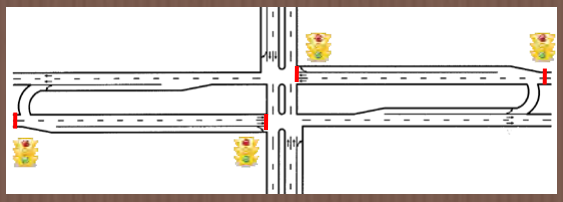
Case Study: Design Lansing



Design Lansing
Comprehensive Plan

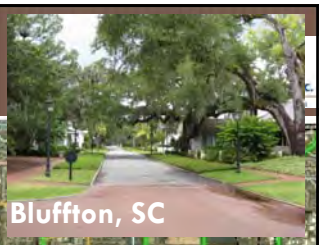
Super Streets

- For high volume commuter routes
- Indirect left turns (Michigan lefts)
- Very high through capacity
- Significantly fewer crashes
- Requires wide ROW



Corridor Planning

- Assess existing and desired and character (context)
- Traffic Operations (LOS)
- Non-motorized
- Transit
- Land use/form
- Access system
- Road and streetscape design



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Street Connectivity Example

- AADT on major streets 23,700
- Driving distance 2.4 miles

- AADT on major streets 18,600
- Driving distance 0.25 mile

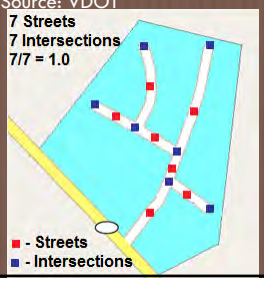
Street Connectivity

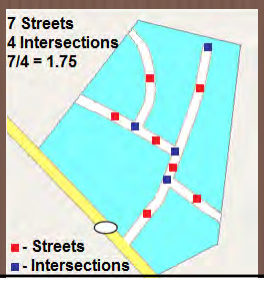
- Reduces burden on arterials
- Improves emergency response
- Reduces VMT and emissions
- Provides access options

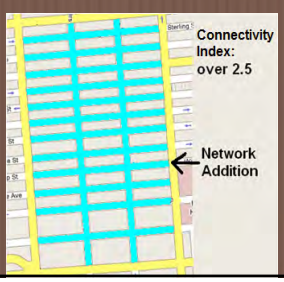
VDOT Connectivity Standards

- Compact – 1.6
- Suburban – 1.4
- Rural – minimum 1 connection

Source: VDOT







Access Management

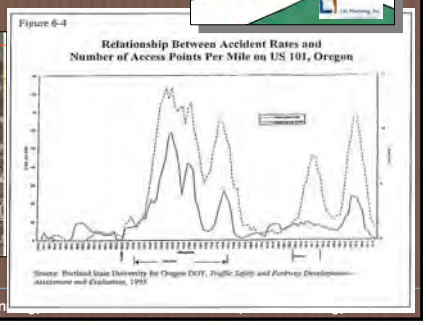
Cost effective traffic management methods to:

- Promote the flow of traffic
- Improve safety of pedestrians & vehicles
- Improve aesthetics of roadway areas

…by managing the location, quantity, type & design of access to a roadway

Corridor Access Management Plans

See TRB's *Access Management Manual*



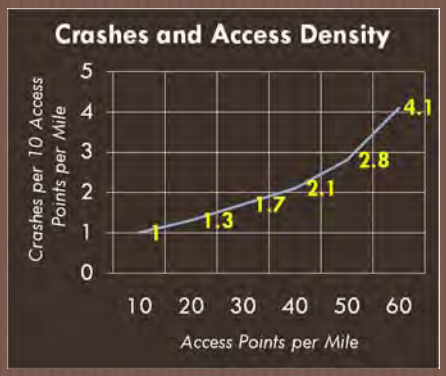
www.accessmanagement.info

TRB TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

Benefit: Safety

- Access management can help reduce injuries and property damage due to crashes
- Doubling of access density from 10-20 access points per mile often results in about a 40% increase in expected crash rates*

*according to the Michigan Department of Transportation



Access Management Implementation

Access Management Plan

- Identifies driveways to close, consolidate, or redesign
- Guidelines for new development

Zoning Regulations

- Typically overlay district
- Apply to change in use/site plan review
- Implement with road projects
- Other incentives

Sample Plan Recommendations

Roundabouts

- Not the same as traffic circles!
- Yield entry vs. stop controlled
- Splitter island w/ arrows
- Significant crash reduction
- Can be high capacity
- Alternative to traffic signals & all-way STOP signs
- Typically more expensive (ROW)
- Concerns with pedestrian crossings because of fewer "gaps"

A multimedia demonstration from the City of Sammamish, WA

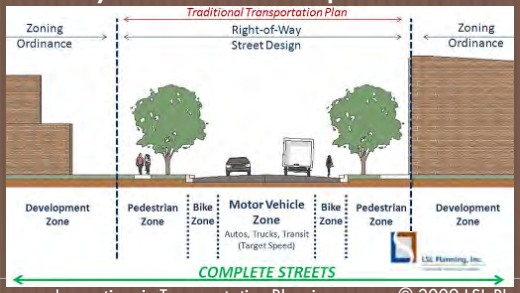
Useful Roundabout Applications

- Safety problems
- Capacity problems
- Closely spaced intersections
- Unusual geometry
- Locations where signal would require bridge widening/lengthening – Interchanges and rail
- Locations where sight triangles are obscured for signals
- Context sensitive applications

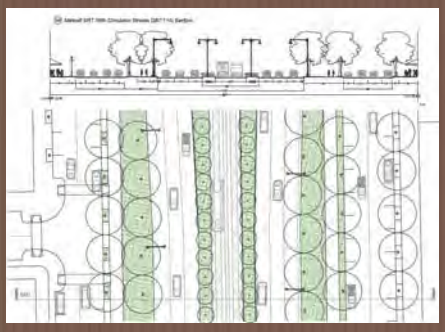
Source: DLZ

Design for all Users: "Complete Streets"

- Context Sensitive Solutions
- Harmonize vehicles and other modes/adjacent land uses
- Consider impacts other than only auto traffic operations



Complete Streets—Examples



Vision Metcalf, Overland Park, KS

Charlotte, NC Street Guidelines

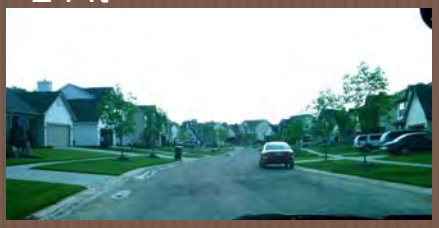
Green Street Design

- Variable cross sections match context
- Stormwater/runoff (rain gardens, bioswales)
- Pervious pavement/parking
- Landscape/Streetscape
- Materials (recycled, solar, LED lights/signals)

Street Design Standards

24 ft

26 ft

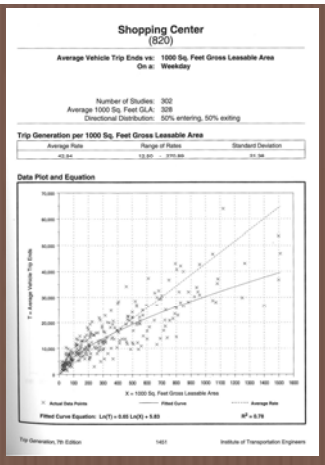


30 ft

32 ft

Traffic Impact Studies

- When to require
  - 100 new peak hour trips
  - Rezonings
  - 15% change in trips
- Trip generation/distribution
- Establish LOS standard
- Identify deficiencies
- Mitigation
  - Improvements
  - Change project
- Funding (proffers, impact fees)


Shopping Center
(820)
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday
Number of Studies: 302
Average 1000 Sq. Feet GLA: 328
Directional Distribution: 50% entering, 50% exiting
Trip Generation per 1000 Sq. Feet Gross Leasable Area
Average Rate | Range of Rates | Standard Deviation
Data Plot and Equation

Page from ITE Trip Generation manual

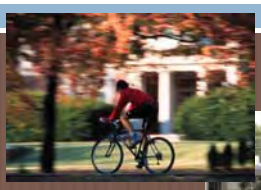
Level of Service

LOS	Description	Delay/Vehicle
A	Operations with very low control delay occurring with favorable progression and short cycle lengths.	≤ 10 sec.
B	Operations with low control delay occurring with good progression and short cycle lengths.	10 – 20 sec.
C	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20 – 35 sec.
D	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35 – 55 sec.
E	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered to be the limit of acceptable delay.	55 – 80 sec.
F	Operation with control delays unacceptable to most drivers occurring due to oversaturation, poor progression, or very long cycle lengths.	80 sec.

Highway Capacity Manual 2000 for Signalized Intersections

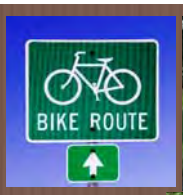
~~Traffic~~ Transportation Impact Studies

- Evaluate all modes (autos, biking, walking, transit)
- Set minimum LOS standards for each (e.g. LOS C for pedestrians, LOS E for vehicles)
- Adjust development to mitigate impacts & improve performance
- Incentives for other modes



Non-motorized Planning

- Types :
  - Bike route
  - Bike lane
  - Sidewalk
  - Multi-modal pathway
  - Trail
- Conditions:
  - Pathway width and condition
  - Continuity of pathways
  - Separation from vehicular traffic
  - Crosswalks
  - Street connectivity






Pedestrian Level of Service

LOS	Space (ft^2/ped)	Flow rate (ped/min/ft)	Speed (ft/s)	V/C Ratio
A	>60	<5	>4.25	0.21
B	40-60	5-7	4.17-4.25	0.21-0.31
C	24-40	7-10	4.00-4.17	0.31-0.44
D	15-24	10-15	3.75-4.00	0.44-0.65
E	8-15	15-23	2.50-3.75	0.65-1.00
F	<8	variable	<2.5	Variable

Highway Capacity Manual 2000

Note: Above considers pedestrian density and delay. Several agencies (eg Florida DOT) are moving toward a more qualitative ranking using factors like those listed in "conditions" on the previous slide.


Non-Motorized Crossings

- Intersection design
- Mid-block crossings
- "PELICAN" signals
  - Design varies; generally stops traffic when activated
  - High-volume crossings away from other signals
  - Schools, universities, hospitals, other institutions, at main transit stops

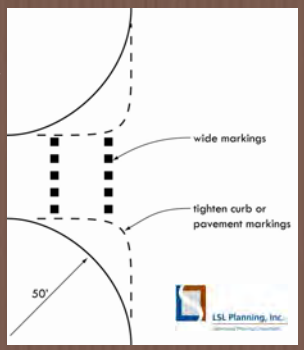
3-D Simulation of PELICAN Crossing, Ann Arbor Trans Plan (LSL)

Mobility for Seniors and Special Needs

- Note ped hit at 40mph, 85% fatality, 20 mph 5%
- AARP survey, 56% support "complete streets"
- Bigger fonts, brighter signs
- Wide, visible pavement markings
- Timing of ped signals (3.5 ft. per second instead of 4)
- Audible countdown signals
- Tighter intersection curb radii to slow speeds

Source: Reid Ewing Study, NCHRP Report

Curb Radii	10'	25'	50'
Street Width	32'	40'	55'
Avg. turning speed	9 mph	17 mph	23 mph
Time to cross @ 3.5 ft/sec	9 sec	11.6 sec	15.8 sec



Traffic Calming

- Residential areas: problem possible if 85th percentile is 5 MPH+ over the desired speed
- Solutions

1. Document the problem and patterns/causes
2. Targeted enforcement
3. Physical traffic calming devices

Traffic Calming Devices

- Chicanes
- Sinusoidal Speed Humps
- Speed Tables Chokers
- Medians
- Flares
- Raised / Textured Crosswalks

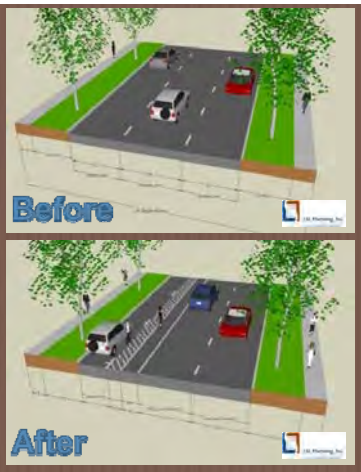
Traffic Calming

- Results
  - Can drop speeds 3-5 MPH
  - Costs can vary based on design, materials
  - Usually positive reactions

See ITE's *Traffic Calming: State of the Practice* by Reid Ewing

Road Diets

- Reducing # of traffic lanes to provide left turn, transit, or bike lane
- Consider:
  - Function & environment
  - Traffic volumes (consider for 8,500 – 24,000 vpd)
  - Peak hour volumes & LOS
  - Crash types, pedestrian, bike, & transit activity
  - Impact on parallel roads



Washtenaw County, MI Access Management Plan: One-Way 3-to-2 Road Diet Concept

Parking Management

- Modernize number of spaces required
- Shared Parking (see ULI)
  - Parking demand by land use by peak period
  - Reduce where other modes promoted
- Downtown Parking
  - Variable pricing by location
  - Attractive structures integrated with uses

Land Use	Parking 85th %
Low/mid rise apartment	1.46 v/du
Office	3.44 v/1000 sq ft
Medical office	4.30 v/1000 sq ft
Shopping center	
Non-December	3.56 v/1000 sq ft
December	5.92 v/1000 sq ft
Supermarket	6.72 v/1000 sq ft
Pharmacy	2.59 v/1000 sq ft

ITE Parking Generation

Transit Planning

- Commuter rail
- Light rail
- Streetcar
- Bus rapid transit
- Frequent bus
- Demand responsive

Bus Rapid Transit (BRT)

Light Rail

Streetcar

Transit Oriented Development (TOD)

GOAL: Increased transit ridership and private sector return on transit investment

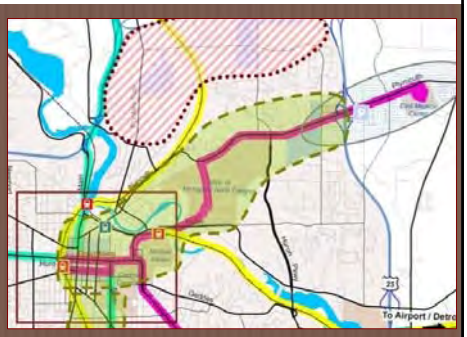
- Usually higher density, taller buildings
- A mix of uses
- 5 minute walk zones designed for pedestrians
- Buildings oriented to sidewalk
- Reduced parking
- Park and Ride at certain locations
- Norfolk, VA
  - Core zones within 1/8 – 1/4 mile
  - Transition zones 1/4 - 1/2 mile

Vision Metcalf, Overland Park, KS

TOD *[1/4 – 1/2 mile zones]*

- Intermediate Bus
  - 7 DU/acre
- Frequent Bus/Transit
  - 15 DU/acre
  - 75 employees/acre
- Light Rail
  - 9 DU/acre
  - 23 employees/acre

Source: Transportation Research Board



Case Study: TOD Catalytic Transportation Projects

- City of Dallas used transit as economic stimuli
- Shifting planned density to transit corridors
- Both transit and economic tools were reviewed where TOD overlays were used
- Public-Private Partnerships were sought in an innovative fashion

Source: Parsons-Brinckerhoff

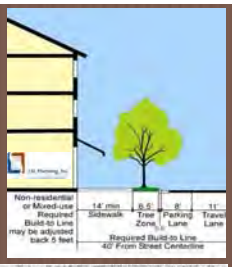
Using Transportation as an Economic Catalyst

- Convert one-way to two-way
- Add on-street parking
- Road diet/redesign
- Add a median
- Add transit (BRT/ streetcar/light rail)

City of Birmingham, MI
Triangle Plan and Form-Based Code

Form-Based Codes (FBC)

- Regulates physical form, with a lesser focus on use
- Defines the streetscape
- Street related to building form
- Regulates private *and* public realm

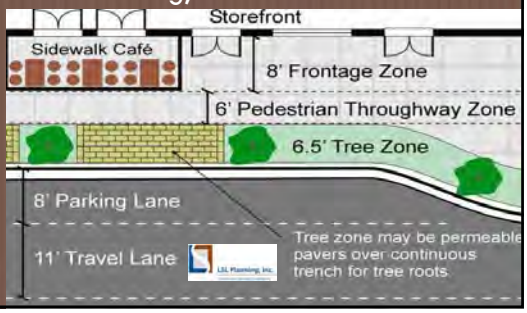


Leesburg, Virginia
Form-Based Code

Form-Based Code Example

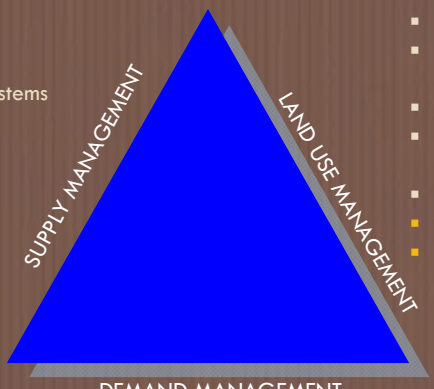
- Mixed-use/compact Buildings closer to street
- Multi-modal streets
- "Green" incentives
- Parking in rear yard
- Incentivize parking structures
- Reduced parking requirements

Leesburg, VA



Revisiting the Triangle

- Roadway Improvements
- Transportation System Management
- Intelligent Transportation Systems
- Transit
- Non-motorized
- Access Management
- Green Streets
- Road Diet
- Traffic Calming



- Planning
- Zoning (audit regs)
- Mixed Use
- Compact Development
- Site Plan Review
- TOD
- Form-based Code

- Complete Streets
- Alternative Work Schedules
- Alternative Modes
- Employer Support Programs
- Roundabouts
- Congestion Management

The world of transportation is changing . . .

- Key organizing themes of U.S. Transportation Policy
  - Economic recovery
  - Safety
  - Alternatives to driving
  - Mobility for increasing senior population
  - livable and sustainable communities

U.S. Transportation Secretary LaHood, address to Senate Committee, April 28, 2009

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