Traffic Impact Assessment Review for Appointed and Elected Officials

Presentation to Town Council and Planning Commission of the Town of Vienna

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Transportation Impacts Assessments in Vienna

- As part of MAC rezoning a required submittal
- Other development applications submit as supplemental information
- Projects of regional significance (VDOT)
- Development review performed by:
  - Staff (or outside consultants)
  - Planning Commission
  - Town Council

Purpose:
- To familiarize Town elected and appoint officials with basic concepts and terminology of these studies
Presentation Outline

- Background Info
- Overall study context and framework
- Non-site traffic forecast
- Trip generation
- Mixed Use / Internal Capture
- Trip types
- Traffic distribution and assignment
- Transportation analysis
- Effect of non-motorized transportation and transit service
- Transportation safety
- Other items
Larger picture trends in transportation impact assessment:

- Shift from greenfields to infill/replacement development
- Increased understanding of land use context on traveler behavior
- Increased interest in moving beyond traditional auto LOS
- “Last in” and “free rider” concerns
- Variety of approaches to synchronizing economic development and transportation system expansion, management, and operations
- Reflect both current and emerging technologies
- Promote context-sensitive solutions
- Support strategies for implementing improvements across all modes
Purpose of a TIA

Short- and long-range planning of site access and off-site improvement needs

- Assist developers and property owners in making critical decisions
- Enable public agencies to correctly assess both impacts and needs associated with a proposed development:
  - What’s the right approach for managing growth in our community?
  - How do we define a meaningful impact?
  - What strategies best facilitate private-sector participation in community transportation plan implementation?
Purpose of a TIA

What’s the right approach for managing growth in our community?
• What are our goals for economic growth and transportation system performance?
• How do we measure success in implementing those goals?
• What are the trigger points for encouraging or requiring private sector development to participate?
  • Definition of adequacy
  • Definition of significant effect or impact
  • Legislative authority
  • Rational nexus
Purpose of a TIA

What might be considered a threshold effect or a meaningful impact on adequacy?

- **Thresholds:** shifting from vehicle trips to person trips or trips by mode
- **Adequacy:**
  - Multimodal Q/LOS
  - Consideration of VMT per California’s SB 743
  - Accessibility metrics
  - Connectivity metrics
  - Safety metrics
Purpose of a TIA

What strategies should be used – alone or in tandem – to prompt private sector participation?

• Impact fees or taxes
• Pro-rata share districts
• Multimodal TIAs
• Other approaches
TIA Process
Study Initiation

Project discussed between applicant’s consultant and review agency staff

- Reach understanding on requirements and acceptable assumptions (agency codes/policies)
- Learn study issues (existing congested areas)
- Study area (boundaries, key intersections & roadways)
- Horizon years and peak hours
- Detail level (types of analysis)
- Available data (counts, committed development, roadway improvements, crash data)
- Resource: VDOT Scoping Form
Proposed Development

- Specific land use classifications and intensities
- Initial proposed access and roadway improvements
- On-site circulation and parking layouts
- Phases and build-out year
- If replacing or augmenting an existing use, physical characteristics of existing development
What Is the Study Area?

• All site access points
• Major intersections adjacent to the site
• First signalized intersection in each direction on the adjacent streets (if within a reasonable distance)
• May depend on the number of trips the site is expected to generate
Context and Framework

- Existing conditions
- Horizon year
- Peak traffic hour
- Anticipated off-site changes
Existing Conditions

• Rationale — provides a foundation for assessing the degree and implications of transportation changes

• Field reconnaissance — collect available data, relevant characteristics, observations of peak and off-peak conditions

• Provides the basis for later analyses
Horizon Year

- < 500 peak-hour trips
  - opening year

- 500-1,000 peak hour trips
  - opening year and 5 years later

- > 1,000 peak hour trips
  - opening year, 5 years later, and regional plan horizon year
Peak Traffic Hour

- Site generated versus adjacent street peak hour
- Weekday versus weekend
- Seasonal variation adjustment
Data to Obtain or Collect

- Intersection/roadway geometry and control
- Transit stops, service and usage
- Pedestrian and bicycle facilities
- Vehicle, pedestrian, and bicycle volumes
- Traffic signal timing plans
- Collision data
- Land use and demographics
- Most current version of the jurisdiction’s TIA guidelines
- Other approved developments in the study area
- Programmed transportation system changes in the study area

NOTE: Traffic data should be collected within the immediate prior year.
Non-Site Traffic

Analyze horizon year base conditions — without subject site being developed

- Forecast traffic conditions to the horizon year
- Modify the study network to the horizon year (if necessary)
- Perform the necessary analyses
Non-Site Traffic Components

- Two Components of Horizon Year Traffic:
  - Background Growth: Traffic through the study area (through traffic)
  - Background Development: Traffic generated by all other new development in the study area
Non-Site Traffic Forecast Methods

- Build-up method (used for background development)
- Trends or growth rate method (used for background growth)
- Area transportation model (used for both background growth & background development)
- Combination of Build-up and Trends

Regardless of method used, check for reasonableness of results
Transportation System Changes

Regardless of whether you use the trends method or the build-up method, or both, need to account for ...

- Diversion of traffic from study area
- Diversion of traffic to study area
- Diversion of traffic within study area
- Changes in mode split
Site Trip Generation

Need to estimate the number of trips expected to travel to and from the site
- Know the site land use(s) and size(s)
- Know the peak hour(s) required for analysis
- For the street traffic analysis – vehicle trips; person trips are used for supplemental analysis

Data Sources:
- Use locally-established rates
- ITE *Trip Generation* data
- Collect data from comparable sites
ITE Trip Generation Data

10th Edition data assembled from more than 6,000 individual studies in United States and Canada since the 1980s

- Includes new urban and person-trip data
- Still retains significant portion of dataset mainly collected at suburban locations
  - With limited transit service
  - Without nearby pedestrian amenities
  - Without travel demand management (TDM) programs
- Data received on voluntary basis
Trip Generation Issues

- Independent variable
- Time period (AM, PM, Mid-day, Saturday, other)
- Daily/seasonal variation (retail, movie theaters, etc.)
- Rate versus equation
  (first consider the rate – see Recommended Practice pg. 35 – 37)
- Transit availability (may allow trip reduction)
- TDM programs (purpose is to reduce trip production during peaks)
- Age of data base
- Mixed-use projects (internal capture)
Trip Generation Issues

Selecting the Correct Independent Variable

- One of the most important decisions
- Select the one with the best predictive accuracy
- Select the one with the strongest logical relationship with the LU’s tripmaking
- The one with the largest sample size
Mixed Use - Internal Capture

For mixed-use sites, not all of the trips will have an origin or destination external to the site. Some trips will come from complementary land uses within the site. Complementary land uses include:

- Residential – Retail
- Office – Retail
- Residential - Office
Trip Types

Primary trips
- Main reason for a trip
- Upon exit, trip travels back in the direction from which it came
- Assigned to all study intersections

Pass-by trips
- Trips made as an intermediate stop
- Upon exit, trips continue to travel in the same direction they were traveling before stopping at the site
- Already on roadway, only added in at site driveways
Alternate Modes

• Most ITE *Trip Generation* data was collected at suburban sites without alternate modes available

• If the site is located in an area where alternate mode use is expected to be significant, vehicle trip generation can be reduced

• Discuss appropriate alternate mode trip reduction with review agency staff
Distribution and Assignment

- **Trip Distribution** - the directions from which traffic will approach and depart the site

- **Traffic Assignment** - the amount of traffic that will use certain routes on the roadway network
Trip Distribution

Three methods:

• **Analogy** - Adapt the trip distribution of a nearby, similar existing development

• **Model** - Use the area transportation planning forecasting model for trip distribution

• **Surrogate Data** – Using a proxy to determine where trips would go, e.g. for residential development what direction and how much employment
Traffic Assignment

• The product of the trip assignment process is project-generated and total trips, by direction and turning movement, on each segment of the study area roadway network.

• Tracks the produced trips through the study network, accounting for every movement.

• NOTE: This is an important checkpoint as transcription errors are possible – still can occur with miscoded data in software tools.
Analysis

• Basic objectives of TIA analysis
  • Identify transportation-related implications of the project, and if appropriate
  • Identify improvements necessary to ensure acceptable operating conditions

Topics

• Traffic Analysis
  • Capacity / LOS
  • Multimodal Considerations
  • Travel Demand Management

• Safety
• Mitigation
Capacity Analysis

- *Highway Capacity Manual (HCM) / derivatives*
- Specific procedures for special conditions—SIDRA, microsimulation
- Locally-prescribed techniques
Capacity Analysis: Other Things to Consider

- Intersections or Segments
- Planning or Ops/Sim
- Thresholds for Adequacy
- Queue Length

- Multimodal considerations
Reporting Level of Service

- Local criteria
- Typically
  - AM (PM)
  - Letter grade
- Tabular and graphic

RP Figure 7-2. SOURCE: Street Smarts, Duluth, GA
Level of Service

• Compare LOS for three conditions:
  • Existing Conditions
  • Existing plus non-site development
  • Future total (including site development)

• Compare and determine:
  • Where LOS is affected
  • Whether LOS reaches level requiring mitigation
What does it mean:
The intersection LOS is computed as a weighted average of the vehicle delay (in sec.).

An intersection may thus have an acceptable overall LOS and have individual movements with unacceptable LOS. (e.g. left turn movements)

When recommendations are formulated, they should include modifications to reduce delay and increase capacity on critical movements (also to reduce queue length).

The modifications may include adding lanes, reducing friction (such as removing curb parking), changing signal phasing or timing, or re-directing critical movements.
Multimodal Analysis

- Trip generation
- Trip distribution
- Trip assignment

- For pedestrians
- For bicyclists
- For transit patrons

Table 5
Graduated and Maximum Trip Credits Related to Congestion Standards

<table>
<thead>
<tr>
<th>Non-Automobile Transportation Facility</th>
<th>Trip Credit vs Congestion Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1350-1500</td>
</tr>
<tr>
<td>100 linear feet of five-foot wide sidewalk</td>
<td>0.5</td>
</tr>
<tr>
<td>100 linear feet of eight-foot wide bike path</td>
<td>0.5</td>
</tr>
<tr>
<td>Other non-automobile facilities</td>
<td></td>
</tr>
<tr>
<td>Maximum trip credits</td>
<td>60</td>
</tr>
</tbody>
</table>

SOURCE: Montgomery County Planning Department
Multimodal Analysis

- Level of service (LOS) / quality of service (QOS)
- Need to address both
## Quality of Service

<table>
<thead>
<tr>
<th>Mode</th>
<th>Potential Quality of Service Considerations</th>
</tr>
</thead>
</table>
| Pedestrian | Presence, connectivity and width of sidewalks  
|            | Lateral separation from traffic                                                                         |
|            | Barriers and buffers from traffic                                                                         |
|            | Crossing opportunities on arterial and collector roadways                                               |
|            | Delays at intersections                                                                                  |
|            | Driveway frequency and volumes                                                                          |
|            | Visitor experience (national/state/local parks, or at other types of recreational or entertainment venues) |
| Bicycle    | Presence of a dedicated facility                                                                         |
|            | Network connectivity                                                                                    |
|            | Number and width of travel lanes adjacent to the route                                                 |
|            | Volume and speed of traffic                                                                             |
|            | Percentage of trucks and buses encountered                                                               |
|            | Pavement condition                                                                                      |
| Transit    | Frequency and hours of service                                                                           |
|            | Reliability of service                                                                                  |
|            | Passenger loads                                                                                        |
|            | Travel times                                                                                            |
| Automobile | Corridor travel times                                                                                   |
|            | Intersection delay                                                                                      |
|            | Queue length                                                                                            |
Transportation Demand Management

<table>
<thead>
<tr>
<th>Technique</th>
<th>Types of Trips Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Office</td>
</tr>
<tr>
<td><strong>Physical Actions</strong></td>
<td></td>
</tr>
<tr>
<td>Parking availability reduced below normal demand level or substantial increase in parking costs</td>
<td>T, P</td>
</tr>
<tr>
<td>Quality pedestrian environment on site (mixed-use developments only)</td>
<td>T, P, M</td>
</tr>
<tr>
<td>Building amenities (bicycle lockers, showers, automated teller machines, parking garage dimensions to accommodate vanpools, wiring for ease of telework)</td>
<td>T, P, M</td>
</tr>
<tr>
<td><strong>Non-Physical Actions</strong></td>
<td></td>
</tr>
<tr>
<td>Transit service to areas of trip origins</td>
<td>T, P</td>
</tr>
<tr>
<td>Carpool, vanpool programs (ridematching, preferential parking, subsidies, promotion)</td>
<td>T, P</td>
</tr>
<tr>
<td>Modified work schedules (4/40, staggered, flex)</td>
<td>P</td>
</tr>
<tr>
<td>Telecommute options</td>
<td>T, P</td>
</tr>
<tr>
<td>Internal shuttle transportation to/within development site</td>
<td>T, M</td>
</tr>
<tr>
<td>Transit subsidy</td>
<td>T, P</td>
</tr>
<tr>
<td>On-site transportation coordinator or information center</td>
<td>T, P</td>
</tr>
</tbody>
</table>

RP Table 7-11. SOURCE: Donald R. Samdahl
Transportation Safety

Motorists:

- Compile recent (past 3 years) collision data
- Identify high collision locations
- Consider measures to alleviate collision hazards
Transportation Safety

Pedestrians/Bicyclists

- Address both:
  - Internal circulation system
  - External access points

- Minimize potential conflicts with vehicles.
Mitigation

• If deficiencies are identified, improvements in access, geometry, or operations must be investigated

• Low-cost improvements
• Simple, practical solutions
• Right-of-way limitations
• Topography
• TDM strategies
• Character and quality of life that community is fostering
• Consistency with local policies and programs
Site Access / Off-Site Elements

Access Design Objectives:

- Preserve street functionality
- Minimize speed difference (through vs. turning traffic)
- Eliminate encroachment of turning vehicles on adjacent lanes
- Accommodate design vehicle
- Provide adequate sight distance
- Provide adequate storage distance
- Minimize conflict points
- Design for peak hour volumes
Potential Intersection Improvements

- Localized improvements
  - Modify
  - Expand
  - New facility

- Add a turn lane
- Lengthen storage lanes
- Add sidewalk/crosswalk
- Add bike lanes
- Realign approaches
- Improve sight distance
- Add traffic signal
- Change signal phasing
- Change signal timing
- Improve signal progression
- Convert to roundabout
- Add accel/decel lane
- Channelize
Background Improvement

Improvements programmed or needed to accommodate background traffic

RP Figure 8-2 SOURCE: Street Smarts, Duluth, GA
Improvements programmed or needed to accommodate project-generated traffic
Improvement Implementation Issues

- Could require combination of private and public actions
  - Committed public improvements
  - Anticipated improvements by other private interests
  - Limitations under revised Virginia proffer law.
If it still doesn’t fit....

- Reduce development size
- Modify land use mix
- Modify site plan
- More effective TDM measures
- Change development site location
On-Site Planning / Vehicle Queues

• Do not interfere with adjacent streets’ movements, with free circulation within site, or with egress from the site

• Assure adequate storage for turn lanes into site, exiting drives, etc.

• Allow vehicles to enter and circulate within site

• Allow exiting vehicles to align perpendicular to street
Internal Vehicle Circulation

- Between entry/exit points and
  - Parking areas
  - Pick-up/drop-off areas
  - Service areas
- Clearly understandable to driver
- Comply with MUTCD (signs, striping)
Traffic Calming and Speed Control

- Reduced roadway width
- Curb extensions
- Median islands
- Textured/colored pavement
- Circles or roundabouts
- On-street parking
Service, Delivery & Emergency Vehicles

- Roadway geometry
  - Turning paths
  - Entry/exit conflicts
- Pavement requirements
- Loading docks
On-Site Parking Issues

Resources:

• *Parking Handbook for Small Communities* (ITE, National Trust for Historic Preservation)
• *Parking Generation* (ITE)
• *Dimensions of Parking* (ULI, NPA)
• *Shared Parking* (ULI)
Study Report

- **Document:**
  - Purpose
  - Procedures
  - Assumptions
  - Findings
  - Conclusions
  - Recommendations

SOURCE: Montgomery County Planning Department
Study Review

• It’s important for the technical staff to have a punch list to ensure completeness and acceptability of technical materials.

• There’s a bridge between technical info and policy judgment which covers qualitative review, mostly:
  • Do the conditions described tell an internally consistent story?
  • Do the conditions describe tell a story that’s consistent with previous studies (whether TIAs or other plans/studies)?
  • If not, why not?
    (Often there are good reasons such as definition of background traffic assumptions).
Sources

- *Transportation Impact Assessment for Site Development Recommended Practice* (2010) In update. Institute of Transportation Engineers


Supplemental Slides*

- Pro Rata Share District Concepts
  - What is a Pro Rata Share District?
  - Advantages

* The next two slides were not discussed during the course of the presentation.
3. PRO-RATA SHARE DISTRICT CONCEPTS

WHAT IS A PRO-RATA SHARE DISTRICT?

- Compact geographic area
- Payment replaces traditional TIS based on allocation of areawide improvements
- Examples
  - Delaware DOT Transportation Improvement Districts (TID)
  - Florida Multimodal Transportation Districts (MMTD)
  - Special districts in Baltimore and Montgomery County, MD; Portland OR
3. PRO-RATA SHARE DISTRICT CONCEPTS

ADVANTAGES

- Focuses attention and resources on implementing master plans rather than ad-hoc remedies
- Addresses “last-in” / “free rider” concerns
- Measures success through public and private phasing of comprehensive plan development
- Improves predictability

Pro-rata share districts do require additional care and feeding and are not suitable everywhere....