ITE TRIP GENERATION AND BEYOND

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November 4th, 2010
Presentation Agenda

I. Traffic Engineering
II. Basics of ITE Trip Generation
III. Presentation #2 - Impact Fee Schedules and ITE Trip Generation Adjustments - Jonathan Young
IV. Berkeley County, SC Impact Fee Ordinance
V. Two Independent Impact Fee Studies
VI. Final Agreement

Questions
I. Traffic Engineering
What Do I Do?

- Traffic Impact Studies
- Level of Service Analysis
- Parking Studies
- Traffic Signal Design
- Signal Systems/Timing Optimization
- Intelligent Transportation Systems (ITS)
- Data Collection
II. Basics of ITE Trip Generation
What is a Trip?

A single or one-direction vehicle movement with either the origin or destination inside a study site.

What is Trip Generation?

The estimated peak hour and daily site traffic volumes for a particular land use.

Source Documents:
ITE Trip Generation, 8th Edition ITE 2008
ITE’s *Trip Generation* Manual

- Purpose is to compile trip generation data submitted to ITE (contained in two volumes)
- 1,000’s of studies conducted in US/Canada since the 1960’s
- Independent Variables (SF, # of Units, Employees, Seats, etc.)
- Contains Plots / Weighted Averages / Regression Equations
- Pass-by and Internal Capture trip data
# Trip Generation Table
Shopping Center
(820)

Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On: 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 |
| 42.94           | 12.50 - 270.80  | 21.38            |

Data Plot and Equation

Fitted Curve Equation: $\ln(T) = 0.65 \ln(X) + 5.83$

$R^2 = 0.78$
# Trip Generation Table
Shopping Center
(820)

Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Leasable Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 412
Average 1000 Sq. Feet GLA: 379
Directional Distribution: 49% entering, 51% exiting

<table>
<thead>
<tr>
<th>Trip Generation per 1000 Sq. Feet Gross Leasable Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Rate</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>3.73</td>
</tr>
</tbody>
</table>

Data Plot and Equation

\[ X = 1000 \text{ Sq. Feet Gross Leasable Area} \]

\[ \text{Fitted Curve Equation: } \ln(T) = 0.67 \ln(X) + 3.37 \]

\[ R^2 = 0.81 \]
Trip Generation Procedure
Figure 3.1 Recommended Procedure for Selecting Between Trip Generation Average Rates and Equations

1. Compatible with ITE Land Use Code?  
   - Yes
   - No

2. Size within Data Extremes?  
   - Yes
   - No

3. Number of Data Points?  
   - 3-5
   - 6+
   - 1 or 2

4. Regression Equation?  
   - Use Regression Equation
   - No

5. Standard Deviation ≤ 110 percent?  
   - Yes
   - No

6. Better Cluster?  
   - Yes
   - No

7. 20 or More Data Points?  
   - Yes
   - No

8A. P^2 ≥ 0.75? And Within Cluster?  
   - Yes
   - No

8B. Std Dev ≤ 110%? And Within Cluster?  
   - Yes
   - No

- If 8A is yes & 8B is yes
- If 8A is yes & 8B is no
- If 8A is no & 8B is yes
- If 8A is no & 8B is no

Collect Local Data
Pass-by Trips

- Trips already on the roadway
- Not new trips
- Trip deductions for retail uses

Example of a Pass-by Trip: Stopping at the dry cleaners on the way home from work.
Figure 5.1 Types of Trips

- PRIMARY TRIPS (via area and adjacent streets)
- DIVERTED LINKED TRIPS (via adjacent streets)
- PASS-BY TRIPS (on adjacent streets)

Legend:
- Trips Prior to Development
- Trips After Development

Internal Capture Trips

- Trips made within mixed-use developments
- Trips are on internal roadways only and do not use adjacent main roadways
- Result in trip reductions for mixed-use developments

*Example of Internal Capture Trip: Driving/Walking from your office to a restaurant within a large mixed-use development, but via internal roadways only.*
Innovation for better mobility

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Internal Capture Trips – Notes

- Existing data based on 1990’s FDOT methodology/research
- New Florida Community Capture Methodology - 2009
- Newly completed research (NCHRP 8-51), results have shown*:
  - ITE Method overestimated traffic
  - NCHRP 8-51 method found to be most accurate, e.g., reduced estimation errors by 1/5th to 1/3rd of other methods
- More data needed

*Source: TTI, 2010 ITE Annual Meeting Presentation
Basics of ITE Trip Generation

Trip Generation Summary
- Use the data carefully
- Understand how the data was collected
- Understand the sites surveyed within each land use
- Pass-by and Internal Capture Trip Deductions
- Weighted Averages vs. Regression Equations
- THESE ARE ESTIMATES!
III. Presentation #2 - Impact Fee Schedules and ITE Trip Generation Adjustments - Jonathan Young
Thank you Jonathan, now back to Eric.

IV. Berkeley County, SC Impact Fee Ordinance
Berkeley County, SC has an Impact Fee Ordinance

Two existing businesses wished to build new facilities in Berkeley County, SC

Each owner was assessed an Impact Fee they were not happy about…

…so we were called to assess the situation.
Berkeley County Ordinance – Impact Fee Calcs

Impact Fee = (NNWT) x (TED) x (COST) x (CDR)

Where:
NNWT = Net New Weekday Trips (includes pass-by and capture trip reductions)
TED = Trip end discount of 50%
COST = Cost per trip for Service Zone 1, $402.25
CDR = Per County Council Policy – 70% of maximum allowable impact fee will be charged (85% for Independent Studies).
Berkeley County, SC Impact Fee Ordinance
V. Two Independent Impact Fee Studies
What kind of land use is this?

- Sells motorcycles, watercrafts, ATV’s, utility vehicles
- Sells parts
- Provides on-site service
- Typically low number of employees (<20)
- Building space dedicated to showroom, service area, and storage
SITE #1

- **Existing Site Characteristics**
  - Building – 5,000 sf, with additional 1,250 sf of storage outside the building
  - 7 employees
  - Open 10AM-6PM, Mon-Sat

- **Future Site Characteristics**
  - 17,000 sf
  - 7 Employees
  - Open 10AM-6PM, Mon-Sat
SITE #2

- Existing Site Characteristics
  - Building – 9,950 sf, with additional 15,820 sf of storage outside the building
  - 15 employees
  - Open 9AM-6PM, Mon-Sat

- Future Site Characteristics
  - 43,559 sf
  - 15 Employees
  - Open 9AM-6PM, Mon-Sat
Two Independent Impact Fee Studies

- **Site #1**
  - Assessed $41,700 in impact fees based on existing Berkeley County Ordinance methodologies

- **Site #2**
  - Assessed $126,000 in impact fees
Impact Fee Calcs for Site #1 (per County Ordinance):

17,000 Square Feet of Future Building Area

Apportioned:
11,000sf = Warehouse (11 x 4.96 = 55 Trips)
5,000sf = Retail (5 x 86.56 = 433 Daily Trips x .52 Pass-by = 225 Trips)
1,000sf = Office (1 x 15.65 = 16 Trips)

NNWT = Net New Weekday Trips (296 Trips)

Impact Fee = (NNWT) x (TED) x (COST) x (CDR)
= (296) x (0.50) x (402.25) x (0.70) = $41,673

Total Fee = $41,673
### Two Independent Impact Fee Studies

<table>
<thead>
<tr>
<th>Type of Land Use²</th>
<th>ITE Code</th>
<th>Daily Trip Generation Rate³</th>
<th>Pass-by Percentage⁴</th>
<th>Discounted Impact Fee⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General Office (per 1,000 sf)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 50,000 sf</td>
<td>710</td>
<td>15.65</td>
<td>0%</td>
<td>$2,204</td>
</tr>
<tr>
<td>50,000 – 100,000 sf</td>
<td>710</td>
<td>14.25</td>
<td>0%</td>
<td>$2,006</td>
</tr>
<tr>
<td>100,001 – 200,000 sf</td>
<td>710</td>
<td>12.15</td>
<td>0%</td>
<td>$1,711</td>
</tr>
<tr>
<td>&gt; 200,000 sf</td>
<td>710</td>
<td>11.37</td>
<td>0%</td>
<td>$1,601</td>
</tr>
</tbody>
</table>

| **General Retail (per 1,000 sf)** |          |                            |                     |                        |
| < 50,000 sf      | 820      | 86.56                      | 48%                 | $6,337                 |
| 50,000 – 100,000 sf | 820    | 75.10                      | 42%                 | $6,090                 |
| 100,001 – 200,000 sf | 820  | 58.92                      | 35%                 | $5,417                 |
| > 200,000 sf     | 820      | 53.28                      | 32%                 | $5,101                 |

| **Industrial** |          |                            |                     |                        |
| General Light Industrial (per 1,000 sf)⁷ | 110      | 6.97                        | 0%                  | $ 981                  |
| General Heavy Industrial (per 1,000 sf)⁷ | 120      | 1.5                         | 0%                  | $ 211                  |
| Industrial Park (per 1,000 sf)⁷ | 130      | 6.96                        | 0%                  | $ 980                  |
| Warehousing (per 1,000 sf)⁷ | 150      | 4.96                        | 0%                  | $ 699                  |
| Mini-Warehouse (per 1,000 sf)⁷ | 151      | 2.5                         | 0%                  | $ 352                  |
Data Collection for Independent Study (per Berkeley County Ordinance)

- Surveyed Ins/Outs of existing sites during business hours
- Study conducted on an average weekday (Tuesday-Thursday) for two different weeks
- Classified number of Motorcycles versus Cars/Trucks trips
Two Independent Impact Fee Studies

Conclusions of Site #1 Independent Study

<table>
<thead>
<tr>
<th>DATE</th>
<th>VEHICLE TYPE</th>
<th>IN</th>
<th>OUT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, Sept. 18, 2008</td>
<td>Car/Truck</td>
<td>29</td>
<td>29</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Motorcycle</td>
<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>Thursday, Sept. 25, 2008</td>
<td>Car/Truck</td>
<td>34</td>
<td>34</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Motorcycle</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>35</td>
<td>35</td>
<td>70</td>
</tr>
</tbody>
</table>

Average Daily Trips: 38

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Conclusions of Site #1 Independent Study

- 76 average daily trips
- Conservative assumption that 25% of the trips are pass-by in nature
- NNWT value of 76 x 0.75 = 57 was used (vs. 296)
- The Impact Fee becomes:

  \[ \text{Impact Fee} = (57) \times (0.50) \times (402.25) \times (0.85) = 9,744.51 \]

A $33,000 Savings…
BUT WAIT….THE NEW BUILDING IS BIGGER!!!

Doesn’t this mean there will be more trips?

Not necessarily…

- Number of Employees to remain the same
- Much of the increased space being used for storage and workshop
- No new services offered
- Hours of operation remain the same
BUT WAIT AGAIN….YOU DIDN’T THINK IT WOULD BE THAT EASY DID YA?
VI. Final Agreement
County Comments/Recommendations for Site #1 Study:

- 25% Pass-by assumption ok
- Insisted the site would generate additional trips with larger building
- Compromise: assume existing building square footage is 50% bigger
- Thus NNWT value increases to 117.97
- The Impact Fee becomes:

\[
\text{Impact Fee} = (117.97) \times (0.50) \times ($402.25) \times (0.85) = $20,167.71
\]

Still a $21,410 Savings
SITE #2

- **Existing Site Characteristics**
  - Building – 9,950 sf, with additional 15,820 sf of storage outside the building
  - 15 employees
  - Open 9AM-6PM, Mon-Sat

- **Future Site Characteristics**
  - 43,559 sf
  - 15 Employees
  - Open 9AM-6PM, Mon-Sat
## Conclusions of Site #2 Independent Study

<table>
<thead>
<tr>
<th>DATE</th>
<th>VEHICLE TYPE</th>
<th>IN</th>
<th>OUT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday, Feb. 19, 2009</td>
<td>Car/Truck</td>
<td>109</td>
<td>111</td>
<td>220</td>
</tr>
<tr>
<td></td>
<td>Motorcycle</td>
<td>20</td>
<td>19</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>129</td>
<td>130</td>
<td>259</td>
</tr>
<tr>
<td>Tuesday, Feb. 24, 2009</td>
<td>Car/Truck</td>
<td>129</td>
<td>129</td>
<td>258</td>
</tr>
<tr>
<td></td>
<td>Motorcycle</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>135</td>
<td>135</td>
<td>270</td>
</tr>
</tbody>
</table>

**Daily Trips (Average February)**

<table>
<thead>
<tr>
<th></th>
<th>IN</th>
<th>OUT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>132</td>
<td>133</td>
<td>265</td>
<td></td>
</tr>
</tbody>
</table>

**Daily Trips (Average Month)**

<table>
<thead>
<tr>
<th></th>
<th>IN</th>
<th>OUT</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>161</td>
<td>162</td>
<td>323</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions of Site #2 Independent Study

- 323 average daily trips
- Conservative assumption that 25% of the trips are pass-by in nature
- Assumed existing square footage was 50% higher (per prior study County recommendation)
- NNWT value of 323 x 0.75 = 242 was used
- The Impact Fee becomes:
  \[ \text{Impact Fee} = (316) \times (0.50) \times ($402.25) \times (0.85) = $54,022.18 \]

A $72,000 Savings
County Comments/Recommendations on Site #2 Study:

- 25% Pass-by assumption ok
- Compromise: assume existing building square footage is 20% bigger
- Thus NNWT value increases to 380
- The Impact Fee becomes:

  \[
  \text{Impact Fee} = (380) \times (0.50) \times ($402.25) \times (0.85) = $64,963.38
  \]

Still a $61,000 Savings
Moral of Story:

*ITE Trip Generation used to calculate Impact Fees needs to be carefully reviewed – especially for small unique developments.*
Thank You

Questions are Welcome!