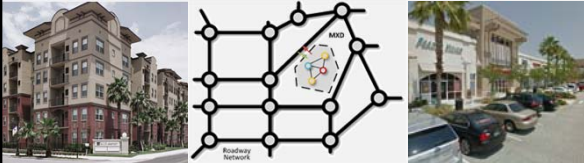




Internal Trip Capture for Mixed-use Developments



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CUTR Webcast
Online Series

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Outline

- Project Background
- Trip Generation and Internal Trip Capture Concepts
- FDOT CUTR Study Sites
- Full Set of Study Sites
- Results and Discussion
- Conclusions and Recommendations

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Introduction

Internal Trip Capture for Mixed-use Developments



Project Background

- MXDs have emerged as a planning initiative to support sustainability efforts by promoting complementary land uses in close proximity.
- Accurate data and methodologies (internal trip capture) are necessary to evaluate trip generation on MXDs.
- Nationwide, there have been efforts to enhance both the data availability and estimation methodologies to estimate internal trip capture rates (NCHRP, EPA).
- FDOT's interest in MXDs in Florida to improve the accuracy of trip internalization estimation in the development review process.

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 5

Mixed-Use Developments (MXD)

A mixed-use development (MXD), according to the Urban Land Institute (ULI), is a single physically and functionally integrated development of **three or more revenue producing uses** developed in conformance with a coherent plan (NCHRP 684)

A multi-use development is a real estate project of separate uses of **differing and complementary, interacting land uses** that do not necessarily share parking and may not be internally interconnected except by public street and/or other public transportation facilities (NCHRP 684)

A multi-use development is typically a single real-state project that consists of **two or more ITE land use** classifications between which trips can be made without using the off-site road system (*ITE Trip Generation Handbook 2nd edition*)

Objective: To accurately estimate the external trips generated by MXDs

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Slide 6

AdJFA1 This slide can be improved

Aldo de Jesus Fabregas Ariza, 6/20/2014

CUTR Trip Generation Methodologies

- ITE trip generation rates are typically used to estimate traffic impact for proposed developments
- Depending on the scope and type of the proposed development there are different methodologies that can be used for trip generation:
 - **ITE Rates:** single use, free-standing sites typically in suburban contexts
 - **Urban Infill Rates:** Single use within the urban core, used to assess trip generation in re-development projects
 - **Internal Trip Capture Rates:** Two or more land uses in close proximity (MXD), typically suburban
 - **Community Capture:** Larger scope, applicable to small towns
 - **Analytical Methods:** e.g. linear regression, used in the travel demand model, include more independent variables and include traveler's socio-economic attributes

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CUTR ITE Trip Generation Rates Pros and Cons

Advantages

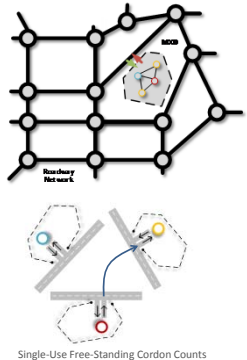
- Single input for trip generation estimation in proportion to land use size
- Reproducible output for the same input
- No requirement of specialized equipment or software to be applied
- Widely accepted

Disadvantages

- Limited explanatory power
- Obsolescence due to prolonged data life cycle

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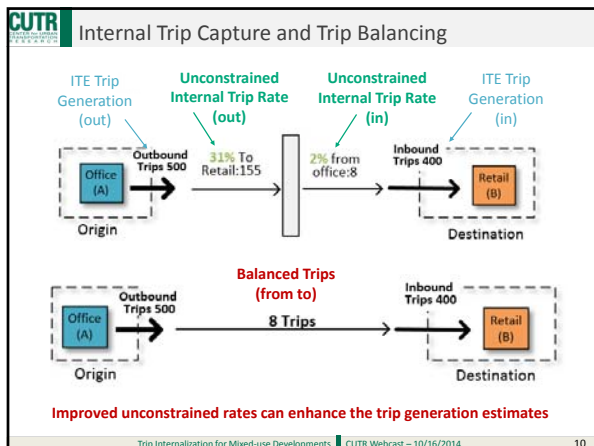
CUTR Trip Generation for MXD Summary

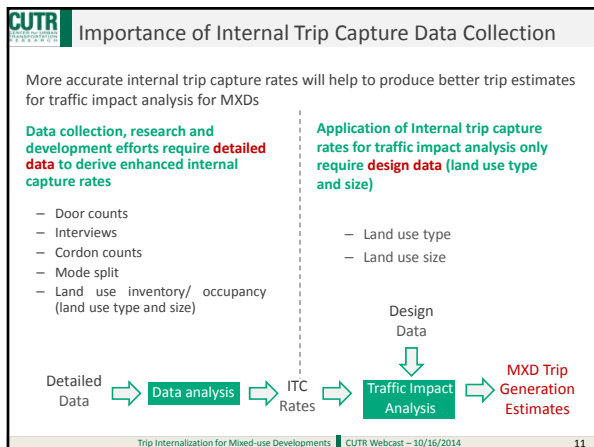


- The objective is to determine the traffic impact on the roadway network
- ITE trip generation rates are used to determine the number of trips per land use in the MXD
- Some of these trips will naturally be between land uses that are already present in the MXD [internal trips]
- Internal trip capture rates reflect the percentage of trips that occur within the MXD by land use and by direction

Single-Use Free-Standing Cordon Counts (Trip Generation Rates)

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Modifications Introduced in NCHRP 684

Expanded internal land uses categories in Tables 7.1 and 7.2 of the ITE Trip Generation Handbook to include the following land uses:

- Office
- Retail
- Restaurant
- Residential
- Cinema
- Hotel

Introduced an adjustment of internal trip capture rates for proximity before the trip balancing process

Outlined data collection/analysis method for internal trip capture studies

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CUTR The Recommended NCHRP Estimation Method

1. Determine whether the methodology is appropriate for the development to be analyzed.
2. Define the pertinent site and development characteristics.
3. Estimate single-use trip generation for each component land use using ITE or other acceptable source; convert to person trips.
4. Use **unconstrained internal capture percentages** to estimate the number of potential internal trips between each pair of land uses. Include an adjustment for proximity.
5. Balance internal trips generated at both ends of each interacting pair (i.e., internal trips coming from the origin end need to be the same as those coming to the destination end); adapt the existing balancing procedure contained in the ITE *Trip Generation Handbook*.
6. Subtract the estimated internal trips from the total trip generation to estimate external trips for the MXD being analyzed; convert to vehicle trips as needed.

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CUTR Data Collection Process and Challenges

```

    graph TD
      A[Obtain Permission] --> B[Initial Site Visit]
      B --> C[Develop Data Collection Plan]
      C --> D[Validation Visit]
      D --> E[Study Preparation]
      E --> F[Perform Study]
  
```

Initial Site Visit

- Land use inventory
- Entry/exit points
- Door locations
- Interviewer locations
- Special considerations

Develop Data Collection Plan

Validation Visit

- Validate data collection plan
- Adjust data collection plan
- Take pictures, videos for training

Study Preparation

- Form preparation
- Supervisor training
- Prepare deployment plan
- Data collection personnel training
- Personnel roles

Perform Study

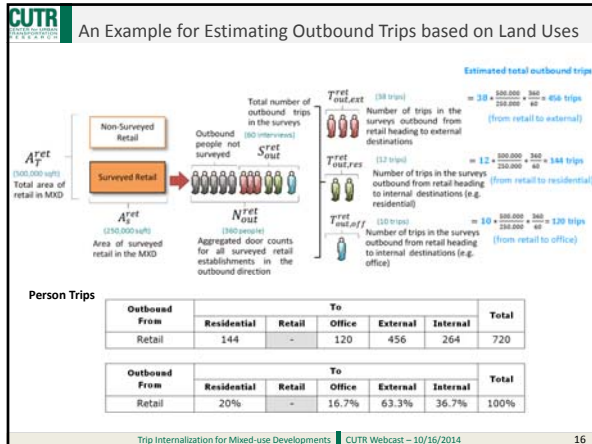
- Supervisors distribute forms in their group
- Supervisors deploy data collection personnel in positions
- Supervisors check data collection personnel
- Study leader supervises the entire data collection process
- Supervisors collect forms and deliver to study leader

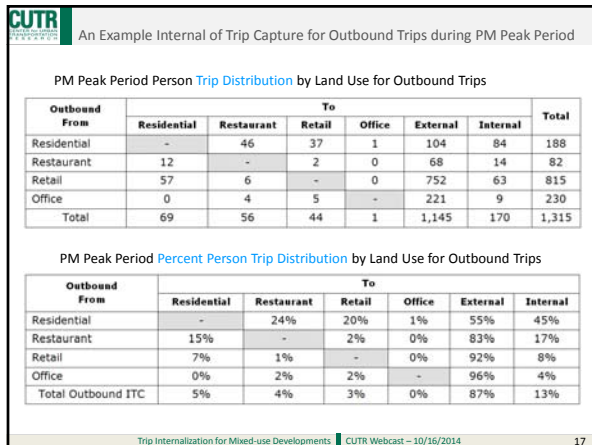
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CUTR Exit Interview Contents

The diagram illustrates the flow of information during an exit interview. It shows an 'Internal Origin' (Retail, Office, Residential) and an 'External Origin' (External) leading to an 'Establishment of land use L (e.g. Retail)'. From there, it branches into 'Internal Destination' (Retail, Office, Residential) and 'External Destination' (External). Below this, 'Number In' and 'Number Out' are represented by stick figures. The 'Exit Interview Information' section includes questions: 'Where were you before?', 'What mode did you use to get here?', 'Where are you heading now?', and 'What mode are going to use to get there?'. The process is labeled as 'Inbound Trip to Land Use L' and 'Outbound Trip from Land Use L'.

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Study Sites

Internal Trip Capture for Mixed-use Developments

CUTR **Creekwood (Bradenton)**

Creekwood DRI

West East

Study site

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CUTR **Creekwood (continued)**

Single-family detached homes (992 dwelling units)

Restaurant

Retail

Residential

Land Use Type	Size	Units
Residential	592	du
Restaurants	35,405	sq. ft.
Retail	361,792	sq. ft.

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CUTR **Selected Results (Creekwood)**

PM Peak Period Person Trip Distribution by Land Use for **Outbound Trips**

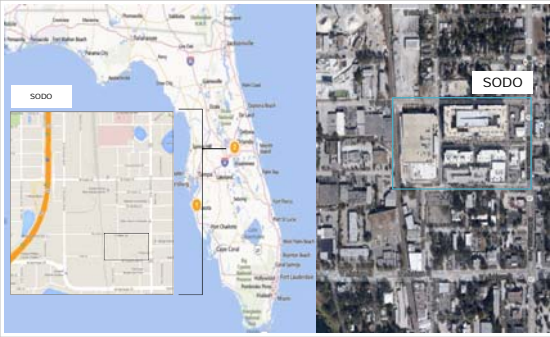
Outbound From	To				
	Residential	Restaurant	Retail	External	Internal
Residential	///	3%	30%	67%	33%
Restaurant	3%	///	9%	88%	12%
Retail	7%	4%	///	89%	11%
Total Outbound ITC	5%	4%	6%	85%	15%

PM Peak Period Person Trip Distribution by Land Use for **Inbound Trips**

Inbound To	From				
	Residential	Restaurant	Retail	External	Internal
Residential	///	2%	18%	80%	20%
Restaurant	3%	///	19%	78%	22%
Retail	7%	2%	-	91%	9%
Total Inbound ITC	5%	2%	7%	87%	13%

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CUTR SODO (Orlando)



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CUTR SODO (continued)

Residential



Restaurant



Retail



Mid-rise residential
Sit-down restaurant
Apparel store

Fast food restaurant w/drive-through, Bank, Wireless retailer

Major Retailer

Medical offices (second level), Massage salon, Nail salon, Sit-down restaurant

Fitness center, Hair salon
High education/training facility
Sit-down restaurant

Land Use Type	Size	Units
Residential	300	du
Commercial	345,000	sq. ft.
Office	100,000	sq. ft.

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CUTR Selected Results (SODO)

PM Peak Period Person Trip Distribution by Land Use for Outbound Trips

Outbound From	To					
	Residential	Restaurant	Office	Retail	External	Internal
Residential	—	24%	20%	1%	55%	45%
Restaurant	15%	—	2%	0%	83%	17%
Retail	7%	1%	—	—	92%	8%
Office	0%	2%	2%	—	96%	4%
Total Outbound ITC	5%	4%	3%	0%	87%	13%

PM Peak Period Person Trip Distribution by Land Use for Inbound Trips

Inbound To	From					
	Residential	Restaurant	Retail	Office	External	Internal
Residential	—	9%	42%	0%	49%	51%
Restaurant	33%	—	4%	3%	60%	40%
Retail	4%	0%	—	1%	95%	5%
Office	3%	0%	0%	—	97%	3%
Total Inbound ITC	7%	1%	5%	1%	86%	14%

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CUTR Lakeside Village (Lakeland)

Map of Florida showing the location of Lakeside Village in Lakeland. An inset map shows the study site's location within the Lakeland area. An aerial view of the study site is also provided.

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CUTR Lakeside (continued)

Aerial map of the study site with various land use types labeled: Multi-family Residential, Hotel, Movie Theater, Retail + Restaurant, Residential, and Retail + Cinema. Accompanying photos show examples of these land uses.

Land Use Type	Size	Units
Hotel	900	rooms
Movie	76,902	sq. ft.
Residential	312	du
Restaurant	79,160	sq. ft.
Retail	387,316	sq. ft.

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CUTR Selected Results (Lakeside Village)

PM Peak Period Person Trip Distribution by Land Use for **Outbound Trips**

Outbound From	To						
	Residential	Restaurant	Retail	Hotel	Cinema	External	Internal
Residential	0%	0%	3%	0%	3%	95%	5%
Restaurant	5%	21%	0%	5%	68%	32%	
Retail	7%	1%	0%	0%	92%	8%	
Hotel	0%	38%	14%	14%	33%	67%	
Cinema	0%	4%	11%	4%	81%	19%	
Total Outbound ITC	6%	1%	7%	0%	2%	84%	16%

PM Peak Period Person Trip Distribution by Land Use for **Inbound Trips**

Inbound To	From						
	Residential	Restaurant	Retail	Hotel	Cinema	External	Internal
Residential	16%	39%	0%	0%	0%	46%	54%
Restaurant	0%	3%	1%	1%	95%	5%	
Retail	0%	10%	0%	1%	89%	11%	
Hotel	0%	0%	0%	15%	85%	15%	
Cinema	2%	36%	0%	2%	60%	40%	
Total Inbound ITC	0%	9%	5%	0%	1%	85%	15%

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CUTR Uptown Altamonte (Altamonte)

Uptown Altamonte

Study Site

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CUTR Uptown Altamonte (Continued)

Land Use Type	Size	Units
Residential	880	du
Restaurant	11,453	sq. ft.
Retail	451,632	sq. ft.
Office	117,175	sq. ft.
Hotel	277	rooms
Cinema*	92,535	sq. ft.

Multifamily residential

Hotel

Mid-rise residential

Office

Movie Theater

Retail + Restaurants

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CUTR Uptown Altamonte (Continued)

Residential

Office

Hotel

Retail

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Outbound		To						
From	Residential	Restaurant	Retail	Office	Hotel	External	Internal	
Residential		5%	43%	0%	4%	48%	52%	
Restaurant	3%		7%	1%	0%	89%	11%	
Retail	4%	6%		0%	1%	89%	11%	
Office	24%	3%	1%		3%	69%	31%	
Hotel	2%	1%	6%	0%		91%	9%	
Total Outbound ITC	4%	4%	5%	0%	1%	85%	15%	

Inbound		From						
To	Residential	Restaurant	Retail	Office	Hotel	External	Internal	
Residential		4%	13%	6%	1%	77%	23%	
Restaurant	1%		12%	0%	0%	86%	14%	
Retail	5%	3%		0%	1%	91%	9%	
Office	0%	11%	0%		0%	89%	11%	
Hotel	3%	0%	5%	1%		91%	9%	
Total Inbound ITC	3%	2%	6%	1%	1%	88%	12%	

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Mixed-Use Development Site	AM Peak Period			PM Peak Period		
	Inb	Outb	Total	Inb	Outb	Total
Creekwood (Bradenton) - a suburban development with single-family detached residential units on the back end with front-end commercial.	15%	12%	14%	13%	15%	14%
SODO (Orlando) - a compact development with mid-rise residential, medical offices, a big-box retail grocery store, and a variety of ground-floor retail and restaurants.	12%	12%	12%	14%	13%	14%
Lakeside Village (Lakeland) - a lifestyle center (open shopping mall) with a movie theater, hotels, and a direct connection to an apartment complex.	7%	11%	9%	15%	16%	16%
Uptown Altamonte (Altamonte Springs) - combines existing residential, hotel, and shopping centers with new residential and a retail-themed town center.	17%	9%	12%	12%	15%	13%

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Other Study Sites	
FDOT-Tindale & Oliver (1993)	<ul style="list-style-type: none">• Boca Del Mar• Country Isles• Village Commons
NCHRP 684 (2011)	<ul style="list-style-type: none">• Atlantic Station• Mockingbird Station• Legacy Towncenter
FDOT District 2 (2010)	<ul style="list-style-type: none">• Haile plantation• Magnolia Parke• Palencia Site• Tioga Site

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Results & Discussion

Internal Trip Capture for Mixed-use Developments



Unconstrained Internal Trip Capture Percentages for Outbound Trips for PM Peak Period

Origin Land Use	MXD Site	Destination Land Use					
		To Office	To Retail	To Restaurant	To Residential	To Cinema	To Hotel
From Office	Creekwood	---	---	---	---	---	---
	SODO	---	2	2	0	---	---
	Lakeside Village	---	---	---	---	---	---
	Uptown Atlanta	---	1	3	24	---	3
	Atlantic Station	---	6	3	0	0	0
	Legacy Town	---	0	1	2	0	0
	Mockingbird	---	9	4	2	0	---
	Boca Del Mar	---	0	---	0	---	---
	Country Isles	---	20	---	0	---	---
	Village Commons	---	5	---	1	---	---
From Retail	Creekwood	---	---	4	7	---	---
	SODO	---	0	1	7	---	---
	Lakeside Village	---	---	1	7	0	0
	Uptown Atlanta	---	0	6	4	---	1
	Atlantic Station	---	2	19	13	4	1
	Legacy Town	---	1	29	26	0	5
	Mockingbird	---	1	20	7	4	---
	Boca Del Mar	---	0	---	3	---	---
	Country Isles	---	1	---	5	---	---
	Village Commons	---	0	---	7	---	---
From Restaurant	Creekwood	---	---	9	3	---	---
	SODO	---	0	2	15	---	---
	Lakeside Village	---	---	23	5	5	0
	Uptown Atlanta	---	1	2	3	---	---
	Atlantic Station	---	1	41	3	8	7
	Legacy Town	---	2	10	18	6	3
	Mockingbird	---	3	38	3	2	---
	Boca Del Mar	---	---	---	---	---	---
	Country Isles	---	---	---	---	---	---
	Village Commons	---	---	---	---	---	---

Note: Highest percentages for each land use pair are indicated in bold.

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Unconstrained Internal Trip Capture Percentages for Outbound Trips for the PM Peak Period (cont.)

Origin Land Use	MXD Site	Destination Land Use					
		To Office	To Retail	To Restaurant	To Residential	To Cinema	To Hotel
From Residential	Creekwood	---	---	---	---	---	---
	SODO	---	1	20	24	---	---
	Lakeside Village	---	---	3	8	3	0
	Uptown Atlanta	---	0	43	9	---	4
	Atlantic Station	---	0	9	3	0	1
	Legacy Town Center	---	4	6	21	0	3
	Mockingbird Station	---	1	31	11	7	0
	Boca Del Mar	---	0	42	---	---	---
	Country Isles	---	0	25	---	---	---
	Village Commons	---	0	25	---	---	---
From Cinema	Creekwood	---	---	---	---	---	---
	SODO	---	---	---	---	---	---
	Lakeside Village	---	---	11	4	0	4
	Uptown Atlanta	---	---	---	---	---	---
	Atlantic Station	---	2	23	11	8	0
	Legacy Town Center	---	0	8	31	7	2
	Mockingbird Station	---	0	17	23	8	---
	Boca Del Mar	---	---	---	---	---	---
	Country Isles	---	---	---	---	---	---
	Village Commons	---	---	---	---	---	---
From Hotel	Creekwood	---	---	---	---	---	---
	SODO	---	---	---	---	---	---
	Lakeside Village	---	---	14	38	0	14
	Uptown Atlanta	---	0	6	2	2	0
	Atlantic Station	---	0	16	48	2	0
	Legacy Town Center	---	0	5	33	0	0
	Mockingbird Station	---	---	---	---	---	---
	Boca Del Mar	---	---	---	---	---	---
	Country Isles	---	---	---	---	---	---
	Village Commons	---	---	---	---	---	---

Note: Highest percentages for each land use pair are indicated in bold.

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CUTR **Unconstrained Internal Trip Capture Percentages for Inbound Trips for PM Peak Period**

Unconstrained Internal Trip Capture Percentages for Inbound Trips for PM Peak Period

Destination Land Use	MKD Site	Origin Land Use					
		From Office	From Retail	From Restaurant	From Residential	From Cinema	From Hotel
To Office	Crestwood	--	--	--	--	--	--
	SODO	0	0	3	--	--	--
	Lakeside Village	--	--	--	--	--	--
	Uptown Atlanta	0	11	0	--	--	0
	Atlantic Station	31	0	0	--	--	0
	Legacy Town Center	5	30	37	0	0	0
	Hockley Station	5	19	2	0	--	--
	Rosa Del Mar	0	--	0	--	--	--
	Country Lakes	2	--	0	--	--	--
	Village Commons	0	--	0	--	--	--
To Retail	Crestwood	--	2	0	--	--	--
	SODO	1	0	4	--	--	--
	Lakeside Village	--	10	0	1	--	--
	Uptown Atlanta	0	3	5	--	--	5
	Atlantic Station	3	23	7	4	1	1
	Legacy Town Center	0	17	10	1	2	2
	Hockley Station	5	50	9	3	--	--
	Rosa Del Mar	0	--	2	--	--	--
	Country Lakes	8	--	3	--	--	--
	Village Commons	3	--	3	--	--	--
To Restaurant	Crestwood	--	19	3	--	--	--
	SODO	3	4	33	--	--	--
	Lakeside Village	--	3	0	1	1	1
	Uptown Atlanta	0	12	1	2	0	0
	Atlantic Station	2	29	1	2	9	0
	Legacy Town Center	0	12	14	2	9	0
	Hockley Station	1	16	2	9	--	--
	Rosa Del Mar	--	--	--	--	--	--
	Country Lakes	--	--	--	--	--	--
	Village Commons	--	--	--	--	--	--

Notes: Highest percentages for each land use pair are indicated in bold.

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CUTR **Unconstrained Internal Trip Capture Percentages for Inbound Trips for PM Peak Period (cont. 3)**

Unconstrained Internal Trip Capture Percentages for Inbound Trips for PM Peak Period (cont. 3)

Destination Land Use	MKD Site	Origin Land Use					
		From Office	From Retail	From Restaurant	From Residential	From Cinema	From Hotel
To Residential	Crestwood	--	18	0	--	--	--
	SODO	0	42	9	--	--	--
	Lakeside Village	--	20	16	--	0	0
	Uptown Atlanta	0	13	4	--	--	1
	Atlantic Station	1	66	5	--	4	0
	Legacy Town Center	1	15	16	0	0	0
	Hockley Station	3	19	10	0	--	--
	Rosa Del Mar	0	32	--	--	--	--
	Country Lakes	0	13	--	--	--	--
	Village Commons	4	30	--	--	--	--
To Cinema	Crestwood	--	--	--	--	--	--
	SODO	1	26	23	0	0	0
	Lakeside Village	0	0	36	2	2	2
	Uptown Atlanta	--	--	--	--	--	--
	Atlantic Station	1	26	23	0	0	0
	Legacy Town Center	0	0	32	0	0	0
	Hockley Station	1	14	7	0	--	--
	Rosa Del Mar	--	--	--	--	2	--
	Country Lakes	--	--	--	--	--	--
	Village Commons	--	--	--	--	--	--
To Hotel	Crestwood	--	--	--	--	--	--
	SODO	--	0	0	--	--	15
	Lakeside Village	--	0	0	3	--	--
	Uptown Atlanta	1	5	0	3	--	--
	Atlantic Station	0	17	21	5	0	0
	Legacy Town Center	0	13	10	13	1	1
	Hockley Station	--	--	--	--	--	--
	Rosa Del Mar	--	--	--	--	--	--
	Country Lakes	--	--	--	--	--	--
	Village Commons	--	--	--	--	--	--

Notes: Highest percentages for each land use pair are indicated in bold.

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CUTR **Proposed Unconstrained Internal Trip Capture Rates - Outbound PM**

This table can be used in place of Table 7.1 in the previous ITE *Trip Generation Handbook* for outbound trips in the PM period

Unconstrained ITC Rates - Outbound PM

Origin Land Use From	Destination Land Use To					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office	2%	20%	4%	24%	0%	3%
Retail	2%	41%	29%	26%	4%	5%
Restaurant	3%	41%	68%	18%	8%	7%
Residential	4%	43%	24%	8%	3%	4%
Cinema	2%	21%	31%	8%	14%	4%
Hotel	0%	16%	68%	2%	14%	4%

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 | 39

CUTR Proposed Unconstrained Internal Trip Capture Rates - Inbound PM

This table can be used in place of Table 7.2 in the previous ITE *Trip Generation Handbook* for outbound trips in the PM period

Unconstrained ITC Rates - Inbound PM

Destination Land Use To	Origin Land Use From					
	Office	Retail	Restaurant	Residential	Cinema	Hotel
Office		31%	30%	57%	6%	0%
Retail	8%		50%	10%	4%	2%
Restaurant	3%	29%		33%	3%	5%
Residential	6%	46%	16%		4%	1%
Cinema	1%	26%	36%	2%		2%
Hotel	1%	17%	71%	12%	15%	

Trip Internalization for Mixed-use Developments | CUTR Webcast - 10/16/2014 | 40

CUTR Proximity Adjustment

NCHRP Report 684 indicated that as distance increases, the level of interaction (i.e., the internal capture) declines

To quantify this effect, a set of proximity factors was developed between land use pairs in NCHRP 684

To	From	Unconstrained Internal Capture Rate		Proximity Adjustment Factor	
		AM Peak	PM Peak	AM Peak	PM Peak
Restaurant	From Office	23%	2%	1.000	0.100
	From Retail	50%	29%	1.000	1.000
	From Restaurant	0%	0%	1.000	1.000
	From Cinema/Entertainment	0%	3%	1.000	1.000
	From Residential	20%	14%	1.000	0.847
	From Hotel	6%	5%	1.000	1.000
Proximity Adjustment		20%	14%*0.847 = 11.9%		

A large MXD has a better prediction of its observed bidirectional cordon counts by using proximity factors

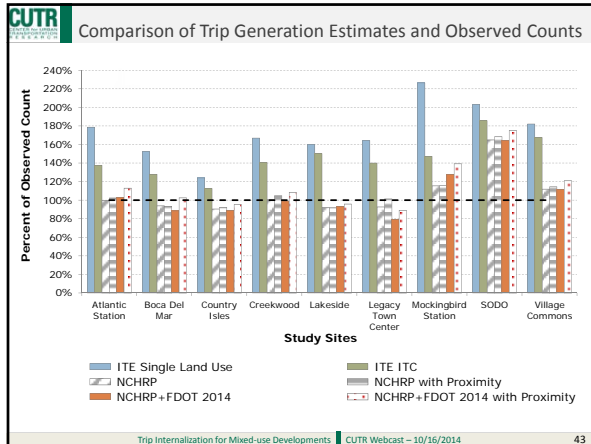
Trip Internalization for Mixed-use Developments | CUTR Webcast - 10/16/2014 | 41

CUTR Evaluation of the Proposed Method to Estimate Internal Trip Capture

Will these proposed tables perform well in predicting trip generation for MXDs?

- A series of tests were necessary to assess the effectiveness of the estimation method using the updated rates and the maximum interaction selection criteria for inbound and outbound trip rates.
- The analyses focused on the PM peak period since it was used for design purposes.
- Several combinations of datasets were used to test the following six methodologies:
 1. ITE Single Land Use
 2. ITE Internal Trip Capture (ITC)
 3. NCHRP Report 684 (NCHRP (684))
 4. NCHRP with Proximity
 5. NCHRP+FDOT 2014
 6. NCHRP+FDOT 2014 with Proximity
- Comparison of trip generation estimates and observed counts.

Trip Internalization for Mixed-use Developments | CUTR Webcast - 10/16/2014 | 42



Summary of Estimation Tests

The combined data (NCHRP+FDOT 2014) improved the prediction in **five out of eight test cases**, with **one test case tied**

Development	NCHRP 684	NCHRP+FDOT 2014	Size (acres)	Best Estimate
Atlantic Station	100%	103%	117	NCHRP
Boca Del Mar	94%	103%	296	NCHRP+FDOT 2014 with Proximity
Country Isles	92%	96%	71	NCHRP+FDOT 2014 with Proximity
Creekwood	101%	99%	43	NCHRP or NCHRP + FDOT 2014 (tie)
Lakeside Village	92%	96%	74	NCHRP+FDOT 2014 with Proximity
Legacy Town Center	101%	89%	77	NCHRP with Proximity
Mockingbird Station	116%	128%	11	NCHRP
SODO	165%	164%	18	NCHRP+FDOT 2014
Village Commons	112%	111%	101	NCHRP+FDOT 2014

The estimator without proximity performed better when the area of an MXD is within 43 acres. For an MXD with at least 71 acres, estimators with proximity were the best predictors (7 out of 9 or 78%)

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 | 44

Conclusions & Recommendations Internal Trip Capture for Mixed-use Developments

CUTR Selected Conclusions

- The minimum data elements needed to perform an internal trip capture study are door counts and interviews for origin and destination locations.
- The observed ITC rates of four study MXD sites in Florida for the PM peak period ranged from 13–16 percent and from 9–14 percent for the AM peak period.
- This study verified that the NCHRP enhanced the ITC method to produce more accurate estimates than the previous ITC method.
- The combined data approach (NCHRP+FDOT 2014) improved the prediction capability of the existing data-method combination in five out of eight test cases, with one test case tied.
- This research project produced revised unconstrained ITC rates for further improving the trip generation estimated for MXDs.

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 46

CUTR Selected Conclusions (Continued)

- This research contributed to the collective knowledge of internal trip capture by incorporating unconstrained internal trip capture rates for the AM peak period
- The estimator without proximity performed better when the area of an MXD is within 43 acres. For an MXD with at least 71 acres, estimators with proximity were the best predictors (7 out of 9 or 78%)
- If adopted, the updated unconstrained trip rates for PM inbound trips will be comprised of 70 percent NCHRP data and 30 percent FDOT 2014 data. For PM outbound trips the composition will be 67 percent NCHRP data, 30 percent FDOT 2014 data, and 3 percent FDOT 1993 data

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 47

CUTR Selected Recommendations

- Perform additional internal trip capture studies, keeping track of detailed land uses and distances between them. In this way, more land use categories can be added to an internal trip capture database
- It is recommended that the proximity factors be considered when the area of an MXD is greater than 55 acres
- Further understanding on proximity of land uses within an MXD and proximity of competitive land uses outside the MXD could potentially shed some light for further improvement on internal trip capture estimation methodologies

Trip Internalization for Mixed-use Developments | CUTR Webcast – 10/16/2014 48