Demand Estimation Model for Park-and-Ride Service: Fort Bend County to Central Houston
Investigation of past and present methods/thoughts

LITERATURE/SOURCE REVIEW

RELATIVE DEMAND ESTIMATION
General Notions About Shape of Market-Shed for Park-and-Rides

- Limited by distance to facility vs. destination
- Facilities close together may reduce each other’s market generation effectiveness
- Riders’ willingness to backtrack limited
- Parabola is most common shape
- 50% of riders typically live within 2.5 mile radius circle around facility
Figure 23: Catchment area determination


Cox (1982) → Central Business District

Christiansen et al. (1981), Spillar (1997), and Abdul Hamid et al. (2007)
A close look at nine park-and-ride facilities

CASE STUDY ANALYSIS OF HOUSTON AREA PARK-AND-RIDES
Location of Case Study Facilities

Nine Metro Facilities:
4, Spring
7, Kingwood
8, Townsen
18, Bay Area
49, Grand Parkway
51, Kingsland
55, Cypress
56, Northwest Station

Current FBC Facilities:
42, AMC Movie Theater
43, University of Houston
Observations

- 2.5 mi radius circle covers approximately 37% of riders based on 2008 or 2009 data for 8 case study facilities
- Parabola can describe general distribution
- Findings concur with research
  - 2.5 mile radius circle to measure/estimate demand may safely represent 37% of riders
Summary of Case Study

- Average distance to CBD: 24.3 miles
- Average peak weekday CBD bound riders: 726
- Average # of inbound bus trips: 25
- Average boardings per bus trip at P&R: 27.9
Use the Census’ online tool to obtain paired geography analysis of worker flows by income bracket.

**OBTAIN LEHD DATA FOR ANALYSIS**
LEHD OnTheMap Data, US Census Bureau

- Available annually from 2002-2010
- Longitudinal Employer-Household Dynamics (LEHD)
- Links home to work Census Blocks
- Work data, not exactly travel data
- OnTheMap is online tool for analysis
Paired Analysis to Get Worker Flows

- Selecting 2.5 mile radius around P&R
- Selecting 1.0 mile radius to encompass CBD
- Tabulating worker flow by income brackets
  - $1,250 per month or less
  - $1,251 to $3,333 per month
  - More than $3,333 per month
Step 1. Select areas for analysis

2.5 mile radius circle around facility used to identify home Census Blocks

1 mile radius circle around CBD used to identify work Census Block
Step 2. Select analysis settings
Step 3. Run analysis, record findings
Use of existing, local, and LEHD data to estimate demand for P&R service

MODEL FOR P&R DEMAND ESTIMATION USING LEHD DATA
Demand Estimation Model

Simplified Steps

- Obtain initial LEHD and P&R data
- Clean, arrange P&R data for use
- Create case study rates by combining P&R and LEHD data
- Obtain LEHD data for study sites
- Estimate demand for P&R services by applying rates from case study to LEHD data for new P&R sites
Current FBC Facilities:
42, AMC Movie Theater
43, University of Houston

Workgroup selected site for service/cost scenario analysis:
43, University of Houston
43, University of Houston
Based on Eight Case Study Sites: Model Inputs

- Average distance to CBD: 24.3 miles
- Average peak weekday CBD bound riders: 767
- Average # of inbound bus trips: 28
- Average boardings per bus trip at P&R: 27.9
- Average LEHD worker flow to CBD: 1,579
- Case study P&R worker-flow capture ratio for AM riders traveling to Central Houston from the 2.5 mile circle around P&R facility:
  - Low estimate 10.72%
  - Medium or average estimate 17.76%
  - High estimate 28.18%
Things to Note

- Estimated ridership is to Central Houston in peak hours, does not include other riders.
- Estimated ridership is for transit services equivalent to the high-quality service at the 8 case study P&Rs.
- The five options for P&R service in FBC each affect estimated demand differently.
Ridership Estimation: Avg/Low/High

### LOW SCENARIO: RIDERSHIP GENERATION SIMILAR TO THREE LOWEST CASE STUDY PARK-AND-RIDE FACILITIES

**Grand Parkway, Kingwood, and Spring**

<table>
<thead>
<tr>
<th>Analysis P&amp;R Site</th>
<th>Current Lot Spaces</th>
<th>Future Lot Capacity</th>
<th>Workers Living Within 2.5 miles of P&amp;R with Jobs in Houston CBD</th>
<th>Model Worker Flow P&amp;R Capture Ratio (LOW)</th>
<th>Earn $1,250 month or less</th>
<th>Earn $1,251 to $3,333</th>
<th>More than $3,333 per month</th>
<th>Distance to next Metro competing park-and-ride facility in corridor:</th>
<th>Estimated Demand for Peak Hour P&amp;R Service to Central Houston</th>
</tr>
</thead>
<tbody>
<tr>
<td>On or near UH Campus in Sugar Land (workgrp agreed assumption)</td>
<td>576</td>
<td>??</td>
<td>1,137</td>
<td>10.72%</td>
<td>4.0%</td>
<td>7.3%</td>
<td>88.7%</td>
<td>9</td>
<td>333</td>
</tr>
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### AVERAGE SCENARIO: RIDERSHIP GENERATION SIMILAR TO ALL CASE STUDY PARK-AND-RIDE FACILITIES

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### HIGH SCENARIO: RIDERSHIP GENERATION SIMILAR TO THREE HIGHEST CASE STUDY PARK-AND-RIDE FACILITIES

**Townsen, Cypress, and Northwest Station**

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<th>Future Lot Capacity</th>
<th>Workers Living Within 2.5 miles of P&amp;R with Jobs in Houston CBD</th>
<th>Model Worker Flow P&amp;R Capture Ratio (HIGH)</th>
<th>Earn $1,250 month or less</th>
<th>Earn $1,251 to $3,333</th>
<th>More than $3,333 per month</th>
<th>Distance to next Metro competing park-and-ride facility in corridor:</th>
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<td>9</td>
<td>876</td>
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</table>
# Ridership Estimation by Option

<table>
<thead>
<tr>
<th>Options</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>Fort Bend Shuttle</td>
<td>Extension METRO 262</td>
<td>New Fort Bend Route</td>
<td>New METRO Route</td>
</tr>
<tr>
<td><strong>Example from Case Studies</strong></td>
<td>Loudoun County Mesquite to DART</td>
<td>Baytown P&amp;R</td>
<td>Cobb County Loudoun County The Woodlands Express</td>
<td>GRTA Express Planned Brazoria P&amp;R</td>
</tr>
<tr>
<td><strong>Operator</strong></td>
<td>Fort Bend County (Contractor)</td>
<td>METRO</td>
<td>Fort Bend County (Contractor)</td>
<td>METRO</td>
</tr>
<tr>
<td><strong>Type of Service</strong></td>
<td>Shuttle from FBC to West Bellfort Park &amp; Ride[1]</td>
<td>Commuter Express with stops at Westwood P&amp;R</td>
<td>Park &amp; Ride</td>
<td>Park &amp; Ride</td>
</tr>
<tr>
<td><strong>Type of Vehicle</strong></td>
<td>Small transit bus 32 seats</td>
<td>Current METRO vehicle assigned</td>
<td>Small transit bus 32 seats</td>
<td>Assume current METRO Park &amp; Ride vehicle</td>
</tr>
<tr>
<td><strong>Service Assumptions</strong></td>
<td>Buses operate from P&amp;R in FBC on a schedule to meet METRO Route 265 West Bellfort P&amp;R</td>
<td>Selected bus trips on the METRO Route 262 start/end at P&amp;R in FBC</td>
<td>Buses operate from P&amp;R in FBC directly to downtown Houston</td>
<td>Buses operate from P&amp;R in FBC directly to downtown Houston</td>
</tr>
<tr>
<td><strong>Cost Model</strong></td>
<td>Current FBC contract with First Transit</td>
<td>METRO cost model for Baytown P&amp;R</td>
<td>Current FBC contract with First Transit</td>
<td>METRO cost model for Planned Brazoria P&amp;R</td>
</tr>
<tr>
<td><strong>Fare Assumptions</strong></td>
<td>See Option 1</td>
<td>$5.00 each way from Sugar Land</td>
<td>$5.00 each way</td>
<td>$5.00 each way</td>
</tr>
</tbody>
</table>

**ESTIMATED AM PEAK RIDERSHIP - Fort Bend County to Central Houston**

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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td>35% of Low Non-stop P&amp;R</td>
<td>50% of Low Non-stop P&amp;R</td>
<td>75% of Low Non-stop P&amp;R</td>
<td>100% of Low Non-stop P&amp;R</td>
</tr>
<tr>
<td>On or near UH</td>
<td>83</td>
<td>167</td>
<td>250</td>
<td>333</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Options 4 and 5 Non-Stop P&amp;R to Downtown</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>333</td>
<td>532</td>
<td>876</td>
<td></td>
</tr>
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