TMC Mobility Study

Steering Committee Meeting
December 9, 2013

Presented by:
Parsons Brinckerhoff, Inc.
Introductions
Agenda

- Introductions

- Overview Study Status
  - TMC Involvement
  - Travel Demand Modeling
  - Mode-Specific Analyses

- Fannin Street Corridor Analysis
  - Existing Conditions
  - LRT Relocation Alternatives
  - Roadway/Signal System Alternatives
  - Recommendations

- Updated Schedule
Overview of Study Status

- Steering Committee composition
  - New TMC representation
- Model development
  - Calibrated model
  - Initiate system alternatives analysis
- Mode-specific analyses
  - Traffic
  - Parking
  - Transit
  - Pedestrian/Bicycle
  - TDM
Fannin Street Corridor Analysis

- Analysis of transit, roadway, and pedestrian improvements along major corridor serving TMC
- Objective to address existing traffic congestion and conflicts in corridor
Major Corridor Issues

- Conflicts between LRT and left turns into local streets and parking garage driveways
- Inadequate signal timing
- Pedestrian channelization/ADA accessibility
- Substandard LRT platform width
Analysis Approach

- Identify and evaluate existing traffic conditions and conflicts
- Assess LRT relocation alternatives
- Assess roadway/signal system alternatives
- Identify preliminary implementation strategy
General Traffic Bottlenecks
**Traffic Conflicts/Crash Experience**

<table>
<thead>
<tr>
<th>Intersection</th>
<th>Number of Crashes</th>
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<tbody>
<tr>
<td>Fannin @ Cambridge</td>
<td>28</td>
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<tr>
<td>Fannin @ University</td>
<td>11</td>
</tr>
<tr>
<td>Fannin @ Ross Sterling</td>
<td>11</td>
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<tr>
<td>Fannin @ John Freeman</td>
<td>30</td>
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<tr>
<td>Fannin @ Dryden</td>
<td>36</td>
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<tr>
<td>Fannin @ Holcombe</td>
<td>27</td>
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<tr>
<td>Fannin @ Pressler</td>
<td>28</td>
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<tr>
<td>Fannin @ Sunset</td>
<td>2</td>
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<tr>
<td>Fannin @ OST</td>
<td>46</td>
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</table>
LRT Relocation Alternatives

- West side of Fannin
- Fannin Transit/Pedestrian Mall
- Main/Fannin one-way pair with LRT on both streets (SB on Main, NB on Fannin)
- Two-way on Main
- Subway on Fannin
- Elevated on Fannin
- At-grade via Cambridge, MacGregor, Braeswood
- At-grade via Cambridge, MacGregor, Holcombe
LRT on West Side of Fannin

- **Advantages**
  - Improve access on east side of Fannin
  - Allow widening of station platforms and provision for separate left turn lanes

- **Disadvantages**
  - Awkward transition north of Holcombe
  - Reduced sidewalk width on west side of Fannin
LRT on West Side of Fannin Looking Southwest
Fannin Transit/Pedestrian Mall

- **Advantages**
  - Ample width for LRT stations and pedestrian circulation
  - Retain and improve emergency vehicle access

- **Disadvantages**
  - Increased travel distances for diverted traffic
  - Less convenient vehicular access to TMC parking and drop off/pickup locations
Fannin Transit/ Pedestrian Mall
LRT on Main/Fannin One-Way Pair

**Advantages**
- Improved traffic flow on Fannin by conversion of vacated LRT lane to left turn lane.
- Ability to widen LRT station platforms

**Disadvantages**
- Access to southbound (Main) LRT stations less convenient for most TMC destinations
- Access to TMC Transit Center inconvenient for southbound (Main) routing
- Increased traffic congestion on Main, although pedestrian activity and traffic turning movements are less along street
- Impact on Hermann Park
- Construction impacts on both Main and Fannin
LRT on Main/Fannin One-Way Pair
Looking Northeast
LRT on Main

• Advantages
  – Greater opportunity to develop more travel lanes and wider sidewalks on Fannin
  – Improved access to parking facilities along Fannin

• Disadvantages
  – Increased walking distances for most LRT passengers
  – Increased traffic congestion on Main, though less pedestrian activity and traffic turning movements
  – Greater impact on Hermann Park for LRT transition
  – Construction impacts on Main
LRT on Main
Looking Northeast
LRT in Subway on Fannin

- **Advantages**
  - Greater opportunity to develop more travel lanes and wider sidewalks on Fannin
  - Reduced travel time for LRT through TMC area
  - Allows separation of station passenger movements from LRT and street traffic
  - Potential direct building access from stations
  - Opportunity for wider station platforms

- **Disadvantages**
  - Utility relocation and flood mitigation required
  - Very high capital cost for underground construction
  - Greater construction impacts
LRT in Subway on Fannin
LRT on Elevated Structure on Fannin

- **Advantages**
  - Greater opportunity to develop more travel lanes and wider sidewalks on Fannin
  - Reduced travel time for LRT through TMC area
  - Allows separation of station passenger movements from LRT and street traffic
  - Potential direct building access from stations
  - Opportunity for wider station platforms

- **Disadvantages**
  - Impact on existing pedestrian overpasses on Fannin
  - Visual obstruction along street
  - Higher cost with grade-separated treatment
  - Greater construction impacts
LRT on Elevated Structure on Fannin
At-Grade LRT on Cambridge, MacGregor, Braeswood

• Advantages
  – Greater opportunity to develop more travel lanes and wider sidewalks on Fannin

• Disadvantages
  – Greater LRT travel time through TMC
  – Less transit passenger accessibility to TMC Main Campus
  – Impact on traffic operations on three streets
  – Potential right-of-way impact to build LRT if general traffic capacity is maintained
  – Impact on Hermann Park with Cambridge widening.
At-Grade LRT on Cambridge, MacGregor, Braeswood
At-Grade LRT on Cambridge, MacGregor, Holcombe

- **Advantages**
  - Greater opportunity to develop more travel lanes and wider sidewalks on Fannin
- **Disadvantages**
  - Greater LRT travel time through TMC
  - Less transit passenger accessibility to TMC Main Campus
  - Impact on traffic operations on three streets
  - Potential right-of-way impact to build LRT if general traffic capacity is maintained
  - Impact on Hermann Park with Cambridge widening.
At-Grade LRT on Cambridge, MacGregor, Holcombe
People Mover Alternative

- Northern and southern ends connect with any of the LRT alternatives
- All-elevated alignment avoids traffic conflicts
- Full automation is practical, allowing high service frequency
- Alignment has physical and visual impacts on existing development and streets
- Convenient access between stations and passenger destinations is difficult
- Capital cost is significant
- Only marginal benefit to LRT on Fannin
Automated People Mover (AGT) Systems

Miami Metromover

IUPUI People Mover (Indianapolis)

Comparison of TSM Accessibility
People Mover vs. Shuttle Bus

**People Mover**
- Exclusive guideway, no traffic interference
- Shorter travel times
- Greater service frequency
- Difficult alignment and station-to-destination access issues
- High capital cost

**Shuttle Bus**
- Broader coverage of parking and TMC destinations
- Facility-specific routings
- Impeded by traffic conflicts
- Labor-intensive operation
LRT Relocation Evaluation Criteria

- LRT train running time
- Traffic operations
- Traffic conflicts
- "Order-of-magnitude" costs
  - Capital
  - Operations/maintenance
- TMC Main Campus access times
  - For current LRT passenger trips to/from stations
  - For current TMC Main Campus employment
- Right-of-way requirements
- Environmental impact
- Constructability
Estimated LRT Running Times and Distances for TMC Alternatives

- Grade Separated
- Existing or Main Street
- Cambridge-Braeswood
- Cambridge-Holcombe
Effects on LRT Access Times in the TMC

Change in TMC Access Time, Current LRT Passengers (weekday hours)

<table>
<thead>
<tr>
<th></th>
<th>Without People Mover</th>
<th>With People Mover</th>
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<tbody>
<tr>
<td>1. Fannin Street At Grade</td>
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<tr>
<td>2 &amp; 3. Fannin St. Grade Separated</td>
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<td>4. Fannin-Main Split</td>
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<td>5. Main Street</td>
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<td>6. Cambridge-Braeswood</td>
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<td>7. Cambridge-Holcombe</td>
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Change in TMC Employee Access Time from LRT (weekday hours)

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<tr>
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<td>7. Cambridge-Holcombe</td>
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Order of Magnitude Capital Cost Estimate

Capital Cost ($ Millions, 2013 prices)

- Existing LRT
- Re-Configured LRT on Fannin
- Fannin Street Transit-Pedestrian Mall
- LRT Split, on Fannin and Main
- LRT Relocated to Main Street
- Fannin, LRT in Subway
- Fannin, LRT on Aerial Structure
- Cambridge-Braeswood
- Cambridge-Holcombe
- People Mover from Cambridge, 7 stations
- People Mover from Cambridge, 6 stations
- People Mover from Fannin, 7 stations
- People Mover from Main, 8 stations
- People Mover from Main, 7 stations
### Past Crash Experience Along Alternate Alignments

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Number of Crashes (2007 – 2011)</th>
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<tr>
<td>Westside of Fannin</td>
<td>171</td>
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<tr>
<td>Main/Fannin one-way pair with LRT on both streets</td>
<td>250</td>
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<tr>
<td>Two-way on Main</td>
<td>79</td>
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<tr>
<td>Subway on Fannin</td>
<td>171</td>
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<tr>
<td>Elevated on Fannin</td>
<td>171</td>
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<tr>
<td>At-grade via Cambridge, MacGregor, Braeswood</td>
<td>64</td>
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<tr>
<td>At-grade via Cambridge, MacGregor, Holcombe</td>
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Weekday User Travel
Time Saved or Lost

Approximate Weekday User Timed Saved or Lost

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<thead>
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<th>Hours Lost</th>
<th>Hours Saved</th>
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- Existing LRT
- Surface LRT re-built on Fannin
- Fannin Street Transit-Pedestrian Mall
- LRT split, on Fannin and Main
- Surface LRT on Main Street
- Subway LRT on Fannin
- Aerial LRT on Fannin
- LRT on Cambridge-Braeswood
- LRT on Cambridge-Holcombe
- Existing LRT with People Mover
- Surface LRT re-built on Fannin with People Mover
- Fannin St. Transit-Pedestrian Mall with People Mover
- LRT split, on Fannin and Main with People Mover
- Surface LRT on Main Street with People Mover
- Subway LRT on Fannin with People Mover
- Aerial LRT on Fannin with People Mover
- LRT on Cambridge-Braeswood with People Mover
- LRT on Cambridge-Holcombe with People Mover

- Transit Passenger Time to TMC Destination
- Motor Vehicle Time within TCM Area
## Annualized Cost and Travel Time Benefits

### Costs and Transportation User Time-Savings Benefits of the Guideway Transit Alternatives (millions, 2013 prices)

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<th>Alternative</th>
<th>$(10)</th>
<th>$-</th>
<th>$10</th>
<th>$20</th>
<th>$30</th>
<th>$40</th>
<th>$50</th>
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<td>Surface LRT re-built on Fannin</td>
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<td>Fannin Street Transit-Pedestrian Mall</td>
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<td>LRT split, on Fannin and Main</td>
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<td>Subway LRT on Fannin</td>
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<td>Aerial LRT on Fannin</td>
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<td>LRT on Cambridge-Braeswood</td>
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<td>LRT on Cambridge-Holcombe</td>
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<td>Existing LRT with People Mover</td>
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<td>Surface LRT re-built on Fannin with People Mover</td>
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<td>LRT split, on Fannin and Main with People Mover</td>
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<td>Surface LRT on Main Street with People Mover</td>
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<td>Aerial LRT on Fannin with People Mover</td>
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<td>LRT on Cambridge-Braeswood with People Mover</td>
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- **Annual Net Cost (Capital and Operating)**
- **Annual User Benefits (Travel Time)**
Benefit/ Cost Ratio

Benefit estimates are for travel times only and do not include value of effects such as possible reductions in crashes, benefits due to induced travel or future growth in travel, and indirect benefits such as economic impact of construction.
Overall LRT Alternatives Comparison

- Each criterion scored 1-5
- Nine criteria used

<table>
<thead>
<tr>
<th>IMPORTANCE WEIGHTING (Assumed by Study Team)</th>
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<tbody>
<tr>
<td>LRT Through Passenger Travel Time</td>
<td>2%</td>
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<tr>
<td>LRT TMC Ridership Access</td>
<td>10%</td>
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<tr>
<td>Traffic Operations</td>
<td>13%</td>
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<tr>
<td>Safety</td>
<td>20%</td>
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<tr>
<td>Right-of-Way Required</td>
<td>5%</td>
</tr>
<tr>
<td>Environmental Effects</td>
<td>5%</td>
</tr>
<tr>
<td>Constructability</td>
<td>10%</td>
</tr>
<tr>
<td>Capital Cost</td>
<td>30%</td>
</tr>
<tr>
<td>O&amp;M Cost</td>
<td>5%</td>
</tr>
<tr>
<td>WEIGHTED SCORE (highest is best)</td>
<td>100%</td>
</tr>
</tbody>
</table>
Overall LRT Alternatives Comparison

- O&M Cost
- Capital Cost
- Constructability
- Environmental Effects
- Right-of-Way Required
- Safety
- Traffic Operations
- LRT TMC Ridership Access
- LRT Through Passenger Travel Time
Questions?
Roadway/Signal System Alternatives

- University/Dryden One-Way Pair
- Signal removal at Ross Sterling and Bellows
- Alternatives 1 and 2 combined
University/Dryden One-Way Pair

• **Dryden - EB one-way**
  – NB approach - NB Left movement eliminated
  – SB approach - No modification
    WB approach - Only left and right turns are allowed
  – Thru movement eliminated
  – EB approach - 4 lane approach

• **University - WB one-way**
  – WB, NB and SB approaches no modifications
  – EB approach converted to WB lanes
Signal Removal at Ross Sterling and Bellows

- Median closure both intersections
- Right in-Right out only movements allowed
- Bellows
  - SB left turning vehicles have to make U-turn at Holcombe
  - NB left turning vehicles have to use Main Street to access
- Ross Sterling
  - SB left turning vehicles have to make left turn at John Freeman
  - NB left turning vehicles have to turn left at Cambridge to access the parking garage from Main Street
Combination of Alternatives 1 and 2

- University/Dryden One-Way Pair
- Signal Removal at Ross Sterling and Bellows
Traffic Operations Analysis Methodology

- Using VISSIM software
- Study limits – Cambridge Drive to Pressler
- Traffic redistribution
- Signal operation modifications
- Simulation runs
- Measures of Effectiveness comparison
Roadway/Signal System Alternative Evaluation Criteria

- Corridor Impacts
  - Change in general traffic travel time
- System impacts (within study area)
  - Change in average delay per vehicle
  - Change in average general traffic speed
  - Change in general traffic travel time
Corridor Impacts

Travel Time Comparison

GT = General Traffic
LRT = Light Rail Transit
System Impacts

**Average Delay/Vehicle Comparison**

![Average Delay/Vehicle Graph]

- No Build
- Scenario 1
- Scenario 2
- Scenario 3

**Average Speed Comparison**

![Average Speed Graph]

- No Build
- Scenario 1
- Scenario 2
- Scenario 3

**Total Travel Time Comparison**

![Total Travel Time Graph]

- No Build
- Scenario 1
- Scenario 2
- Scenario 3
VISSIM Video Screen Capture
University/Dryden One-Way Pair
Existing Weekday AM Peak
VISSIM Video Screen Capture
University/Dryden One-Way Pair + Signal Removal
Existing Weekday AM Peak
Conclusions

• Fannin St. provides best accessibility to TMC Main Campus
• LRT relocation alternatives are all expensive
• Lower cost roadway and signal system options effective
  – Consider conversion of University/Dryden to one-way pair
  – Signal removal at Ross Sterling and Bellows
  – ADA accessibility improvements at intersections
Updated Schedule

- Regional Modeling Results – December
- Tech Memo – Modal Analysis – January 2014
- Tech Memo – System Alternatives Analysis – February 2014
- Next Steering Committee Meeting – February 2014
- Second Stakeholders Meeting – February 2014
- Second Public Meeting – March 2014
- Final Report - April 2014
Committee Involvement

- Facilitate Data Collection - Complete
- Identify Issues and Needs - Complete
- Review of Goals and Objectives and Evaluation Framework – Complete
- Review Preliminary List of Projects - Complete
- Identify and Evaluate System Alternatives - Ongoing
- Review Draft Mobility Plan
Questions?