A Roundabout Way of Solving a Traffic Signal Timing Problem

Tom Stiles, EIT

February 2, 2007

Halbert Dr / McLean Rd / W Walnut St
Pearland, Texas

OUTLINE

- Existing Conditions
  - Location
  - Land Use
  - Existing Geometry
  - Accidents
- Traffic Control
- Traffic Volumes
- Proposed Conditions
  - Alternative 1
  - Alternative 2
- LOS Analysis
- Conclusions

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LOCATION

Signalized Intersections within Study Area

OVERVIEW

- Intersections at FM 518 and McLean Rd / Halbert Drive and McLean Rd at Walnut St operate under the same controller

- Study intersection is no longer in coordination with other signals on FM 518

- Heavy traffic volume along FM 518 and to/from Walnut and McLean Rd throughout the day
Houston District

**Introduction**

**Existing Conditions**

**Traffic Control**

**Traffic Volumes**

**Proposed Conditions**

**LOS Analysis**

**Conclusions**

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**LAND USE**

Small Business

Residential

Shopping Center

Gas Station

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**IMPACTS**

- **Other Significant Impacts:**
  - School on FM 518 – West of McLean
  - Large Residential Neighborhoods – North & South of Study Area
  - Fire Station Two Blocks South of Study Area

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**Approach Geometry**

- FM 518: Five-lane arterial with continuous center left-turn lane
- McLean Rd: Two lane road, widens to three lanes total at intersection
- Halbert Dr: Narrow, two-lane residential road with no pavement markings
- Walnut St:
  - Two-lane, two-way road east of study intersection
  - Two-lane, one-way (eastbound) road between FM 518 and McLean Rd

**Existing Phasing**

- FM 518 Left Turns FM 518 Through / EB Walnut WB Walnut
- NB McLean SB Halbert

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FIELD OBSERVATIONS

- EB Walnut St used as a shortcut from FM 518 to SH 35
- Long Queues at NB McLean Rd and WB Walnut St during the AM Peak
- Lack of coordination between study intersections and FM 518 corridor increases delay on FM 518

INTRODUCTION

Existing Conditions

Traffic Control

Traffic Volumes

Proposed Conditions

LOS Analysis

Conclusions

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HOURLY COUNTS

- During AM and PM Peaks, ¼ total vehicles traveled west on Walnut St from FM 518
- FM 518 EB predominantly higher than westbound movement during the AM Peak
- High volumes occurred on NB McLean Rd during AM Peak
- Walnut St and McLean Rd each carried ½ the volume of FM 518 throughout the day

Westbound FM 518 Approach During the PM Peak

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Introduction

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24-HOUR COUNT

24-HOUR COUNT SUMMARY

VEHICLES PER HOUR

FM 518
MCLEAN
WALNUT
HALBERT
TOTAL

0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00

ACCIDENTS

- Reports from Jan. 2003 to Dec. 2005 analyzed
- 22 total accidents
- 13/22 rear-end accidents
ATLTERNATIVE OVERVIEW

- Two lane roundabout
- Five approaches
- Replaces two closely spaced intersections
- Inscribed Diameter – 170 feet
- Design Speed – 20 mph
- Lane Widths – 15 feet
- Design Vehicle – WB 50

ATLTERNATIVE ONE

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PROPOSED CONDITIONS

- MOE to compare existing conditions and roundabout alternatives:
  - Average Travel Time
  - Average Speed

- LOS comparisons were analyzed using the average results of five random simulations for each alternative during each of the peak periods
**SIMULATIONS**

<table>
<thead>
<tr>
<th>No-Build</th>
<th>Proposed</th>
<th>Side by Side</th>
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</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>AM Peak</td>
<td>AM Peak</td>
</tr>
<tr>
<td>Noon Peak</td>
<td>Noon Peak</td>
<td>Noon Peak</td>
</tr>
<tr>
<td>PM Peak</td>
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<td>PM Peak</td>
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</table>

**February 2, 2007**

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**SIMULATION RESULTS**

**AM**

<table>
<thead>
<tr>
<th>Period</th>
<th>Interval</th>
<th>Case</th>
<th>No-Build</th>
<th>Roundabout</th>
<th>Difference</th>
<th>% difference</th>
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</thead>
<tbody>
<tr>
<td>AM Peak</td>
<td>07:00 - 09:00</td>
<td>FM 518 EB</td>
<td>236.2</td>
<td>108.3</td>
<td>-67.9</td>
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<td>FM 518 WB</td>
<td>278.1</td>
<td>249.9</td>
<td>-28.6</td>
<td>-10%</td>
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<td>Halbert McLean NB</td>
<td>2153.2</td>
<td>352.0</td>
<td>-1801.2</td>
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<td>606.2</td>
<td>192.2</td>
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<td>6656.7</td>
<td>432.7</td>
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<td>-94%</td>
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<td>173.3</td>
<td>151.9</td>
<td>-21.4</td>
<td>-12%</td>
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<td></td>
<td>FM 518 WB</td>
<td>229.4</td>
<td>216.7</td>
<td>-12.7</td>
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<td>6620.3</td>
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<td>-6262.7</td>
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Average Travel Time (sec/veh/mile)
**SIMULATION RESULTS**

**Comparison of Average Travel Time (sec/veh/mile)**

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### Simulation Results

#### Average Travel Speed (mph)

<table>
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<tbody>
<tr>
<td></td>
<td>07:00 - 09:00</td>
<td>FM 518 EB</td>
<td>20.7</td>
<td>26.4</td>
<td>5.7</td>
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<td>18.1</td>
<td>1.8</td>
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<td>12.9</td>
<td>133%</td>
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<td>0.9</td>
<td>12.2</td>
<td>11.3</td>
<td>1313%</td>
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<td>12:00 - 14:00</td>
<td>FM 518 EB</td>
<td>27.3</td>
<td>30.0</td>
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<td>10%</td>
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<td>FM 518 WB</td>
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<td>14.2</td>
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</table>
CONCLUSIONS

- Roundabout satisfies original goals:
  - Significant reduction in queue lengths and delays
  - Improve progression on FM 518
  - Maintain Safety