

URS Corporation

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*Samuel Higgins*

URS Corporation  
9400 Amberglenn Boulevard  
Austin TX, 78729  
aecom.com

**Project Name:**  
Barton Springs Road Bridge

**Project Ref:**  
60493733

**Date:**  
1/30/18

**To:** Paulinda Lanham, PMP  
Public Works Department,  
Project Management Division  
City of Austin

# Technical Memorandum

**Subject:** Barton Springs Road Bridge – Traffic Analysis

This technical memorandum summarizes traffic analysis at the intersection of Barton Springs Road and Robert E Lee Road as part of the Barton Springs Road Bridge project.

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## Introduction

On behalf of the City of Austin, URS is conducting a variety of tasks to evaluate the need for rehabilitation or replacement options for the Barton Springs Road Bridge over Barton Creek. The location of the bridge, at the entrance to Zilker Park, is a focal point of key community events and centers such as the Austin City Limits Music Festival, SXSW Conference and Music Festival, Barton Springs, Trail of Lights, and Blues on the Green. Barton Springs Rd and the bridge is also a key commuter corridor and access to Mopac, as well as a key entry/exit to the Zilker and Barton Hills neighborhoods. In addition to the evaluation of the bridge structure, the City is interested in understanding the potential for reducing congestion at this intersection and entrance to Zilker Park. To that end URS has conducted a traffic analysis for the intersection of Barton Springs Road and Robert E Lee Road. The study area is shown in **Figure 1**. The analysis was conducted for the purpose of understanding existing and projected operations at the intersection and to determine if options are available for reducing congestion.

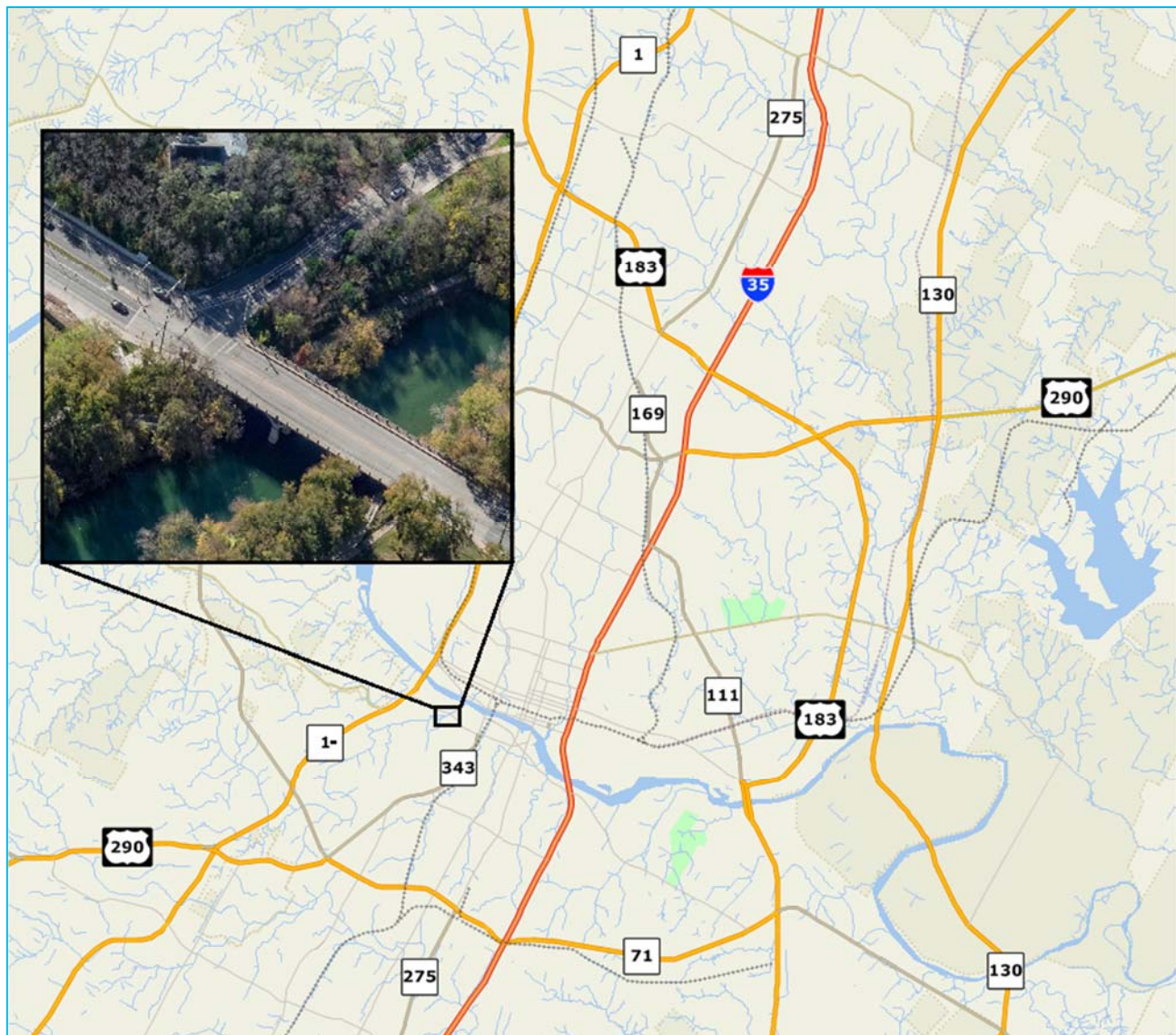


Figure 1: Study Area

# Methodology

## Traffic Analysis Sequence

URS followed the steps below in conducting the traffic analysis for Barton Springs Road Bridge project.

1. Verify existing intersection geometry.
2. Collect traffic counts from the field and signal timing plans from the City of Austin.
3. Analyze existing level of service (LOS).
4. Develop traffic growth rates.
5. Analyze future year No Build conditions.
6. Develop proposed improvements, and analyze future year Build condition.
7. Develop recommendations.

## LOS Description

Signalized intersection LOS is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal timing and traffic volumes. **Table 1** summarizes the LOS criteria for signalized intersections, as described in the Highway Capacity Manual (Transportation Research Board, 2016). For this project, LOS and delay will also be presented for specific approaches, as the AM and PM have specific problem approaches. Synchro 9 was used to analyze the signalized intersection. The existing signal timing plan for the intersection was obtained from the City of Austin and used for existing year analyses. Future year analyses include optimized signal timing to best highlight the impact from geometric changes.

**Table 1: Level of Service for Signalized Intersections**

| Level of Service | Control Delay per Vehicle (sec/veh) |
|------------------|-------------------------------------|
| A                | ≤10                                 |
| B                | >10-20                              |
| C                | >20-35                              |
| D                | >35-55                              |
| E                | >55-80                              |
| F                | >80                                 |

## Traffic Growth Rate

Historical traffic counts from the City of Austin were gathered for Barton Springs Road, and the traffic counts indicate no growth from 2005 to 2015. Thus, a growth rate was determined by comparing the traffic counts collected for this project and the CAMPO Travel Demand Model (TDM) result for 2040 which are presented in **Table 2**. From 2017 to 2040, the estimated growth rate is calculated as 1.80%, and this growth rate will be applied to the existing traffic volumes to develop projected volume estimates for 2020 and 2040 conditions. Projected traffic considered only this intersection and not constraints or impacts from adjacent intersections.

**Table 2: Barton Springs Road ADT**

| Source            | Year | ADT    |
|-------------------|------|--------|
| Traffic Counts    | 2017 | 21,992 |
| CAMPO TDM         | 2040 | 33,134 |
| 2017 to 2040 Rate |      | 1.80%  |

## Existing Geometry

The following are the lane configurations for each approach at the T-intersection of Barton Springs Road and Robert E Lee Road:

- Northbound Robert E Lee Road: one left turn lane and one right turn bay with 40' of storage;
- Eastbound Barton Springs Road: one through lane and one shared through-right turn lane;
- Westbound Barton Springs Road: two through lanes and one left turn bay with 260' of storage;
- Crosswalks: western and southern legs;
- Sidewalks: west side of southern leg, narrow on both sides of bridge on western leg, standard on both sides of eastern leg; and
- Bicycle: lanes on both sides of eastern leg, no bicycle lanes on southern leg and western leg immediately west of intersection.

# Traffic Volumes

Existing turning movement count (TMC) data was collected during the AM and PM peak periods in November 2017. The count reports are in **Appendix A** and also include bicycle and pedestrian counts. On the day of intersection counts, the weather was fair (77°F / no rain), and the typical bicycle and pedestrian traffic did not significantly impact intersection operations. The lane configurations and existing AM and PM traffic counts are shown in **Figure 2** and **Figure 3**. 2020 and 2040 projected traffic counts are presented in **Figure 4** through **Figure 7**.

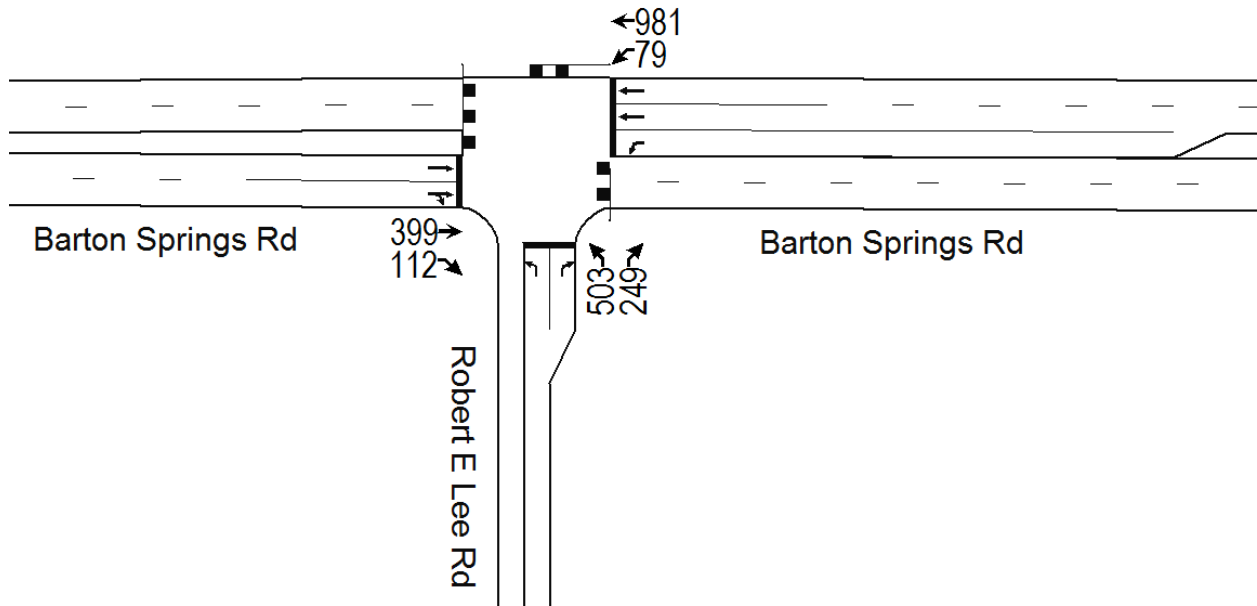


Figure 2: Existing AM Peak Hour Turning Movement Counts

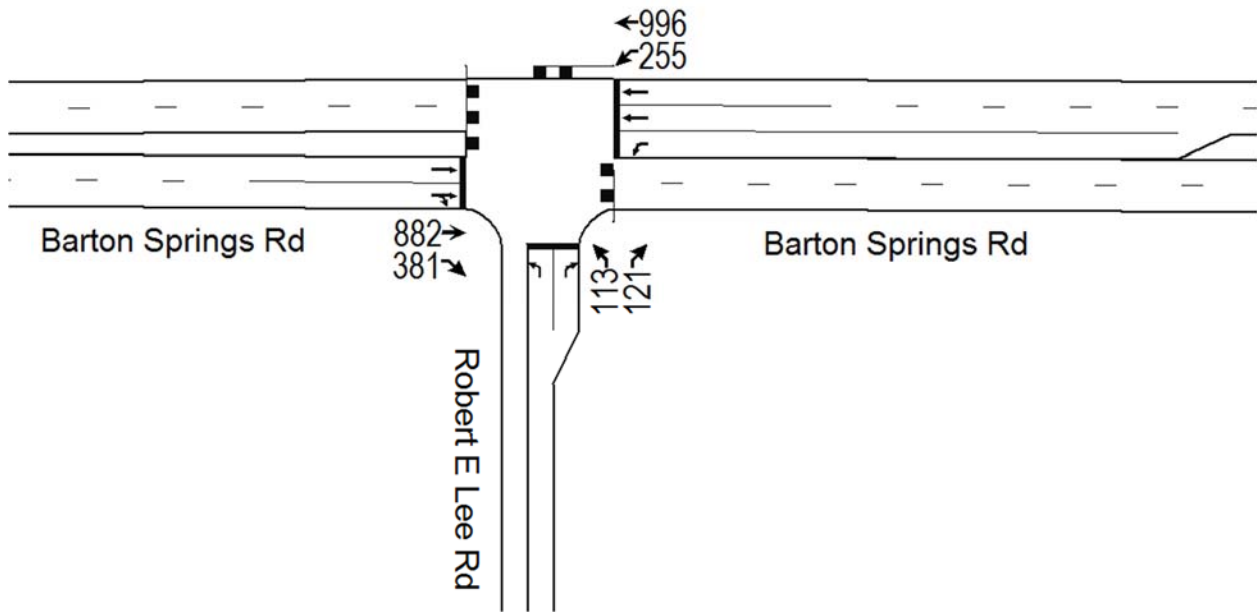


Figure 3: Existing PM Peak Hour Turning Movement Counts

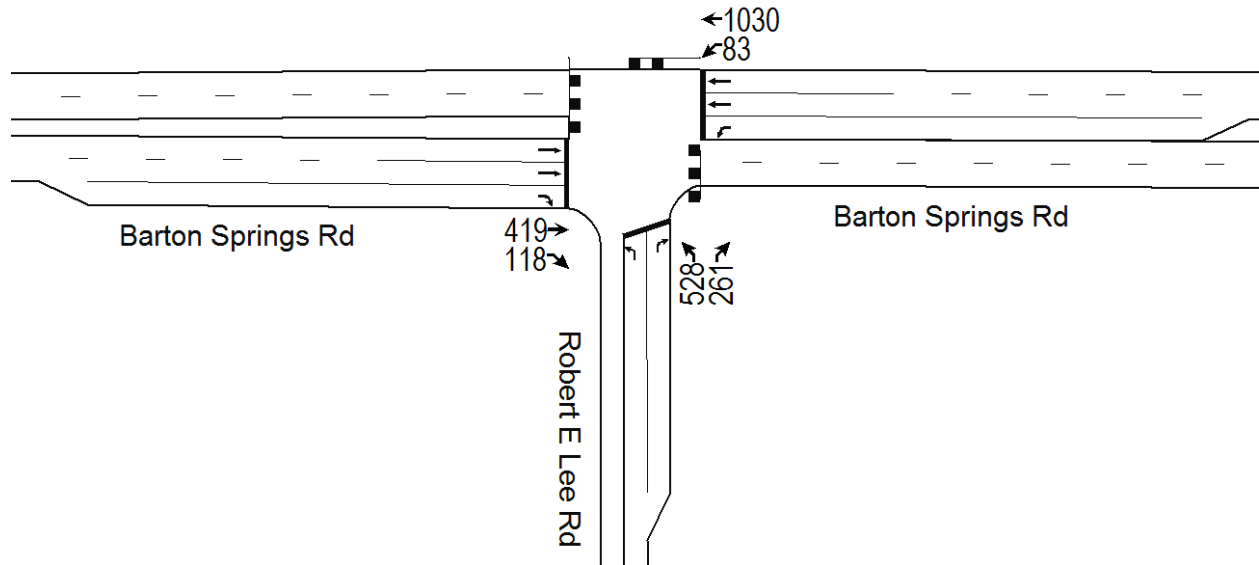


Figure 4: 2020 AM Peak Hour Turning Movement Counts

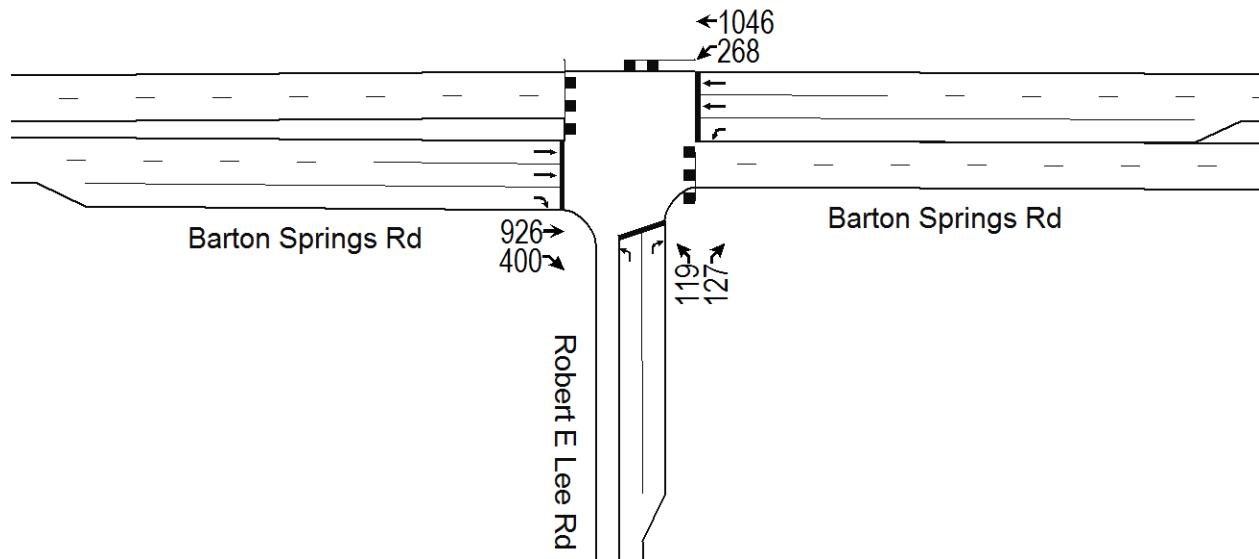


Figure 5: 2020 PM Peak Hour Turning Movement Counts

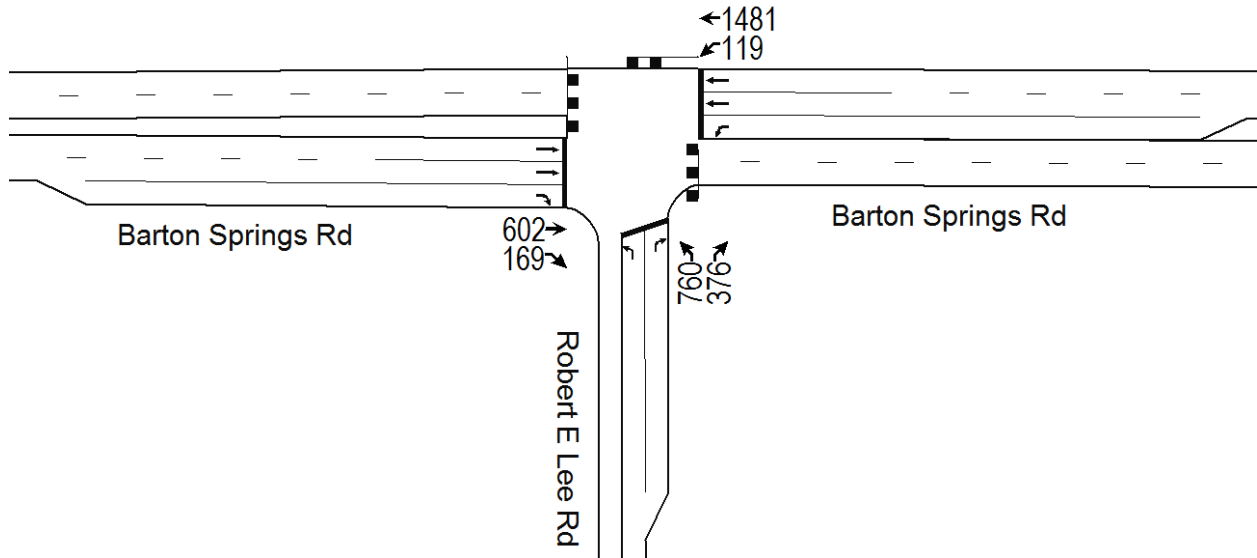


Figure 6: 2040 AM Peak Hour Turning Movement Counts

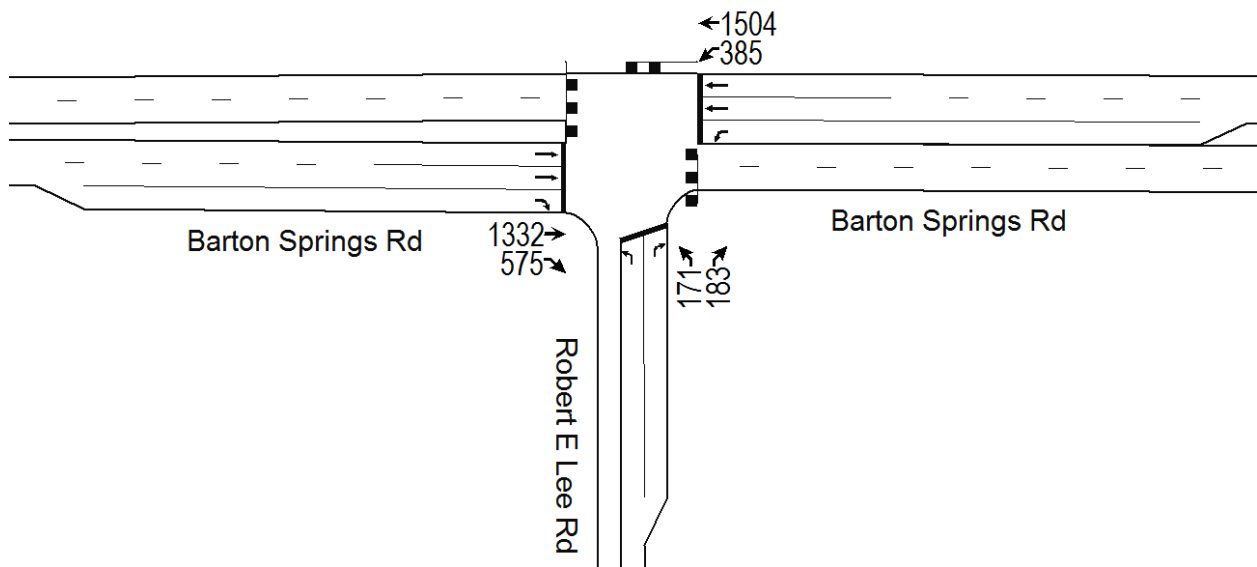


Figure 7: 2040 PM Peak Hour Turning Movement Counts

## Intersection LOS Analysis

Existing conditions and No Build and Build conditions for both 2020 and 2040 were analyzed and the overall intersection LOS and delay results are presented in **Table 3** and approach LOS and delay in **Table 4**. Through the course of the analysis, it was determined that the primary sources of congestion are the northbound left turning traffic in the AM peak hour and the eastbound right turning traffic in the PM peak hour. Therefore, the clear alternative for roadway improvements are the addition of turn bays. The Build condition includes a lengthened northbound right turn bay with 130' of storage and an eastbound right turn bay with 250' of storage. The turn bay lengths are based on physical constraints along the approaches. Although storage length for turn bays is often derived from queue lengths in the LOS analysis, this intersection presents several physical constraints including existing trees, driveways, and parking lots. The lengths used are intended to minimize impacts to these constraints while still providing improved vehicle operations. The Synchro reports are provided in **Appendix B**. The Yearly Reduced Vehicle-Hours column in **Table 4** was calculated assuming 250 days per year with peak hour congestion.

**Table 3: Intersection LOS and Delay**

| Year | Peak | No Build |             | Build |             |
|------|------|----------|-------------|-------|-------------|
|      |      | LOS      | Delay (sec) | LOS   | Delay (sec) |
| 2017 | AM   | C        | 31.1        |       |             |
|      | PM   | C        | 33.5        |       |             |
| 2020 | AM   | C        | 33.5        | C     | 31.1        |
|      | PM   | C        | 22.5        | B     | 17.3        |
| 2040 | AM   | E        | 64.5        | E     | 59.1        |
|      | PM   | E        | 61.6        | C     | 26.5        |

**Table 4: Approach LOS and Delay**

| Approach      | Year | Volume | No Build |             | Build |             | Yearly Reduced Veh-Hrs |
|---------------|------|--------|----------|-------------|-------|-------------|------------------------|
|               |      |        | LOS      | Delay (sec) | LOS   | Delay (sec) |                        |
| AM Northbound | 2017 | 752    | C        | 29.6        |       |             |                        |
| PM Eastbound  |      | 1263   | D        | 49.1        |       |             |                        |
| AM Northbound | 2020 | 790    | C        | 26.1        | C     | 24.3        | 99                     |
| PM Eastbound  |      | 1326   | C        | 28.2        | C     | 20.6        | 700                    |
| AM Northbound | 2040 | 1136   | E        | 61.6        | E     | 61.6        | 0                      |
| PM Eastbound  |      | 1907   | F        | 89.4        | C     | 29.4        | 7,946                  |

As seen in the results, the lengthened turn bay on the northbound approach provides small improvement to AM delay in 2020, and by 2040, the approach is too saturated to realize significant benefit from 130' of storage. However, the construction cost of extending the turn bay may be relatively inexpensive. URS has been scoped to design the replacement of the retaining wall along the east side of the approach for increased slope stability, so the only additional costs may be a small amount of additional pavement. Although the addition of an eastbound right turn bay means further widening of the Barton Springs Road Bridge, the travel time benefits in approach delay reduction are 17% in 2020 and 67% in 2040.

For a high-level sketch analysis of benefits vs cost, the yearly vehicle-hour reductions can be monetized to demonstrate 40-year benefits (design life will be much longer). Interpolated delay reduction from 2020-2040 and constant from 2040-2060 are assumed. Using the US DOT value of travel time savings of \$13.60, an occupancy of 1.1 persons/vehicle, and a 3% discount rate, the total benefit from delay reduction is \$1.9 million. Sketch level costs of the turn bay bridge width are \$0.8 million (235' length x 10' width x \$350/sq-ft) for construction and \$0.1 million (5% of cost every 10 years, 3% discount rate) for maintenance. This yields a benefit-cost ratio of 2.1 (\$1.9 million / \$0.9 million).



## Recommendations

URS recommends construction of both the northbound and eastbound right turn bays at the intersection of Robert E Lee Road and Barton Springs Road. The turn bay storage lengths used in the analysis were 130' for the northbound approach and 250' for the eastbound approach. The turn bays will improve vehicle operations at the intersection by reducing delay for vehicles on those approaches during peak hour traffic. All proposed design for the project will include safe design for bicycle and pedestrian crossings and transitions.

Additional benefits from the right turn bays include additional roadway space for maintenance of traffic during bridge construction and additional pavement and flexibility for special event traffic control operations for the many special events that occur at Zilker Park such as the Austin City Limits Festival and the Trail of Lights. The special event traffic such as buses, special event vehicles, and pedestrian traffic are in extremely high volumes, and the addition of pavement widths around this critical intersection provide more options for how to arrange the traffic patterns.

## **Appendix A – Traffic Counts**



C. J. Hensch & Associates Inc.  
5215 Sycamore Ave.

Pasadena, Texas, United States 77503  
(281) 487-5417

Count Name: Barton Springs at  
Robert E Lee  
Site Code:  
Start Date: 11/01/2017  
Page No: 1

### Turning Movement Data

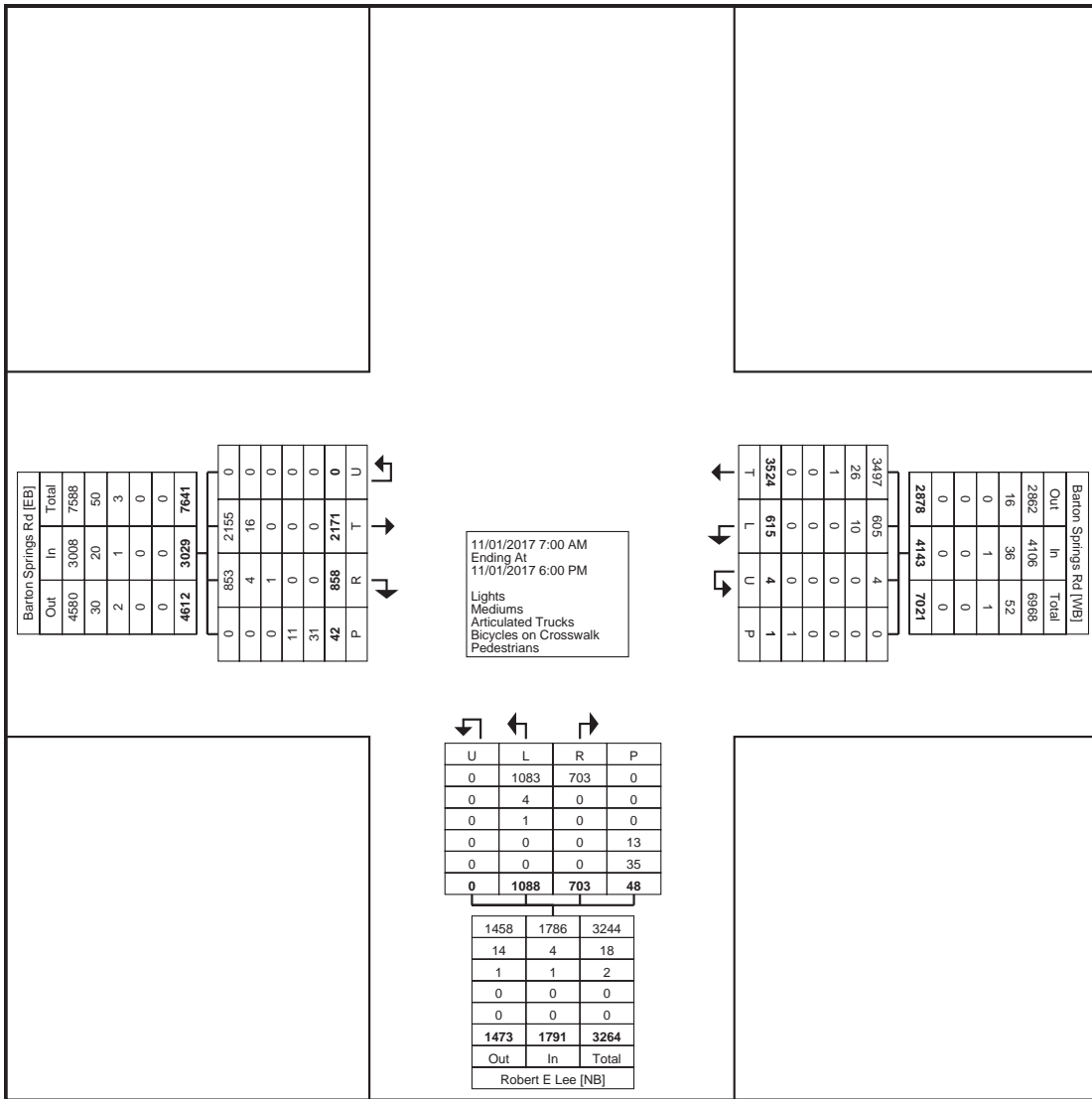
| Start Time              | Barton Springs Rd<br>Westbound |      |        |       |            | Robert E Lee<br>Northbound |       |        |      |            | Barton Springs Rd<br>Eastbound |       |        |      |            | Int. Total |
|-------------------------|--------------------------------|------|--------|-------|------------|----------------------------|-------|--------|------|------------|--------------------------------|-------|--------|------|------------|------------|
|                         | Left                           | Thru | U-Turn | Peds  | App. Total | Left                       | Right | U-Turn | Peds | App. Total | Thru                           | Right | U-Turn | Peds | App. Total |            |
| 7:00 AM                 | 16                             | 61   | 0      | 0     | 77         | 33                         | 27    | 0      | 2    | 60         | 57                             | 8     | 0      | 1    | 65         | 202        |
| 7:15 AM                 | 17                             | 115  | 0      | 0     | 132        | 63                         | 36    | 0      | 4    | 99         | 63                             | 22    | 0      | 1    | 85         | 316        |
| 7:30 AM                 | 23                             | 167  | 0      | 0     | 190        | 91                         | 87    | 0      | 3    | 178        | 69                             | 13    | 0      | 0    | 82         | 450        |
| 7:45 AM                 | 13                             | 224  | 0      | 0     | 237        | 130                        | 73    | 0      | 4    | 203        | 88                             | 19    | 0      | 0    | 107        | 547        |
| Hourly Total            | 69                             | 567  | 0      | 0     | 636        | 317                        | 223   | 0      | 13   | 540        | 277                            | 62    | 0      | 2    | 339        | 1515       |
| 8:00 AM                 | 20                             | 237  | 0      | 0     | 257        | 108                        | 62    | 0      | 0    | 170        | 96                             | 19    | 0      | 1    | 115        | 542        |
| 8:15 AM                 | 22                             | 247  | 1      | 0     | 270        | 158                        | 60    | 0      | 0    | 218        | 90                             | 21    | 0      | 0    | 111        | 599        |
| 8:30 AM                 | 24                             | 254  | 0      | 1     | 278        | 108                        | 61    | 0      | 3    | 169        | 97                             | 37    | 0      | 0    | 134        | 581        |
| 8:45 AM                 | 13                             | 243  | 0      | 0     | 256        | 129                        | 66    | 0      | 4    | 195        | 116                            | 35    | 0      | 1    | 151        | 602        |
| Hourly Total            | 79                             | 981  | 1      | 1     | 1061       | 503                        | 249   | 0      | 7    | 752        | 399                            | 112   | 0      | 2    | 511        | 2324       |
| *** BREAK ***           | -                              | -    | -      | -     | -          | -                          | -     | -      | -    | -          | -                              | -     | -      | -    | -          | -          |
| 4:00 PM                 | 48                             | 189  | 0      | 0     | 237        | 22                         | 21    | 0      | 3    | 43         | 143                            | 57    | 0      | 9    | 200        | 480        |
| 4:15 PM                 | 44                             | 271  | 0      | 0     | 315        | 50                         | 34    | 0      | 4    | 84         | 140                            | 64    | 0      | 2    | 204        | 603        |
| 4:30 PM                 | 51                             | 243  | 0      | 0     | 294        | 49                         | 29    | 0      | 2    | 78         | 143                            | 86    | 0      | 2    | 229        | 601        |
| 4:45 PM                 | 69                             | 277  | 0      | 0     | 346        | 34                         | 26    | 0      | 1    | 60         | 187                            | 96    | 0      | 2    | 283        | 689        |
| Hourly Total            | 212                            | 980  | 0      | 0     | 1192       | 155                        | 110   | 0      | 10   | 265        | 613                            | 303   | 0      | 15   | 916        | 2373       |
| 5:00 PM                 | 56                             | 234  | 0      | 0     | 290        | 31                         | 17    | 0      | 3    | 48         | 209                            | 108   | 0      | 5    | 317        | 655        |
| 5:15 PM                 | 78                             | 253  | 1      | 0     | 332        | 31                         | 28    | 0      | 4    | 59         | 193                            | 80    | 0      | 9    | 273        | 664        |
| 5:30 PM                 | 63                             | 264  | 0      | 0     | 327        | 26                         | 37    | 0      | 3    | 63         | 237                            | 92    | 0      | 4    | 329        | 719        |
| 5:45 PM                 | 58                             | 245  | 2      | 0     | 305        | 25                         | 39    | 0      | 8    | 64         | 243                            | 101   | 0      | 5    | 344        | 713        |
| Hourly Total            | 255                            | 996  | 3      | 0     | 1254       | 113                        | 121   | 0      | 18   | 234        | 882                            | 381   | 0      | 23   | 1263       | 2751       |
| Grand Total             | 615                            | 3524 | 4      | 1     | 4143       | 1088                       | 703   | 0      | 48   | 1791       | 2171                           | 858   | 0      | 42   | 3029       | 8963       |
| Approach %              | 14.8                           | 85.1 | 0.1    | -     | -          | 60.7                       | 39.3  | 0.0    | -    | -          | 71.7                           | 28.3  | 0.0    | -    | -          | -          |
| Total %                 | 6.9                            | 39.3 | 0.0    | -     | 46.2       | 12.1                       | 7.8   | 0.0    | -    | 20.0       | 24.2                           | 9.6   | 0.0    | -    | 33.8       | -          |
| Lights                  | 605                            | 3497 | 4      | -     | 4106       | 1083                       | 703   | 0      | -    | 1786       | 2155                           | 853   | 0      | -    | 3008       | 8900       |
| % Lights                | 98.4                           | 99.2 | 100.0  | -     | 99.1       | 99.5                       | 100.0 | -      | -    | 99.7       | 99.3                           | 99.4  | -      | -    | 99.3       | 99.3       |
| Mediums                 | 10                             | 26   | 0      | -     | 36         | 4                          | 0     | 0      | -    | 4          | 16                             | 4     | 0      | -    | 20         | 60         |
| % Mediums               | 1.6                            | 0.7  | 0.0    | -     | 0.9        | 0.4                        | 0.0   | -      | -    | 0.2        | 0.7                            | 0.5   | -      | -    | 0.7        | 0.7        |
| Articulated Trucks      | 0                              | 1    | 0      | -     | 1          | 1                          | 0     | 0      | -    | 1          | 0                              | 1     | 0      | -    | 1          | 3          |
| % Articulated Trucks    | 0.0                            | 0.0  | 0.0    | -     | 0.0        | 0.1                        | 0.0   | -      | -    | 0.1        | 0.0                            | 0.1   | -      | -    | 0.0        | 0.0        |
| Bicycles on Crosswalk   | -                              | -    | -      | 0     | -          | -                          | -     | -      | 13   | -          | -                              | -     | -      | 11   | -          | -          |
| % Bicycles on Crosswalk | -                              | -    | -      | 0.0   | -          | -                          | -     | -      | 27.1 | -          | -                              | -     | -      | 26.2 | -          | -          |
| Pedestrians             | -                              | -    | -      | 1     | -          | -                          | -     | -      | 35   | -          | -                              | -     | -      | 31   | -          | -          |
| % Pedestrians           | -                              | -    | -      | 100.0 | -          | -                          | -     | -      | 72.9 | -          | -                              | -     | -      | 73.8 | -          | -          |



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5215 Sycamore Ave.

Pasadena, Texas, United States 77503  
(281) 487-5417

Count Name: Barton Springs at  
Robert E Lee  
Site Code:  
Start Date: 11/01/2017  
Page No: 2



Turning Movement Data Plot



C. J. Hensch & Associates Inc.  
5215 Sycamore Ave.

Pasadena, Texas, United States 77503  
(281) 487-5417

Count Name: Barton Springs at  
Robert E Lee  
Site Code:  
Start Date: 11/01/2017  
Page No: 3

### Turning Movement Peak Hour Data (8:00 AM)

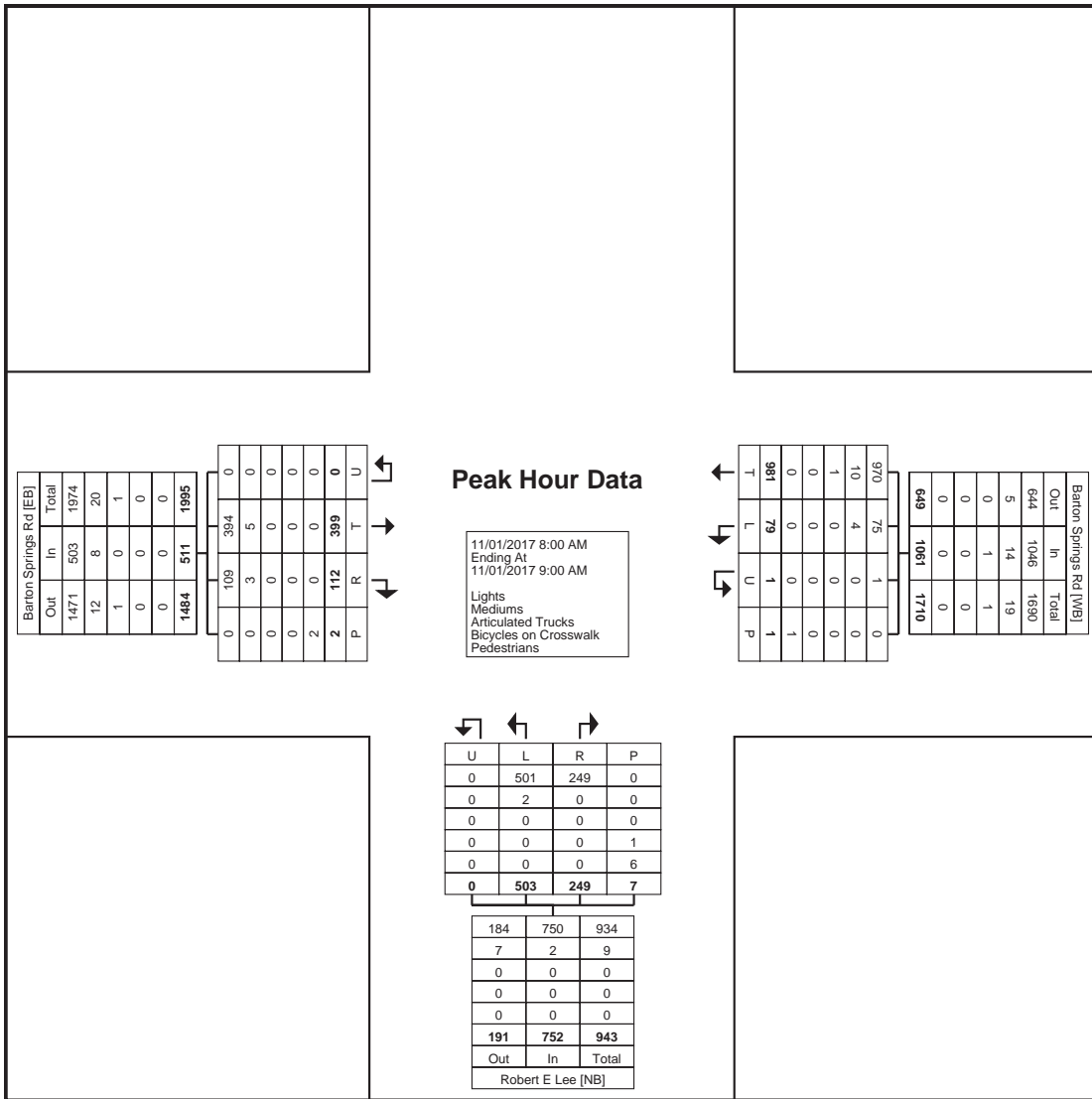
| Start Time              | Barton Springs Rd<br>Westbound |       |        |       |            | Robert E Lee<br>Northbound |       |        |      |            | Barton Springs Rd<br>Eastbound |       |        |       |            | Int. Total |
|-------------------------|--------------------------------|-------|--------|-------|------------|----------------------------|-------|--------|------|------------|--------------------------------|-------|--------|-------|------------|------------|
|                         | Left                           | Thru  | U-Turn | Peds  | App. Total | Left                       | Right | U-Turn | Peds | App. Total | Thru                           | Right | U-Turn | Peds  | App. Total |            |
| 8:00 AM                 | 20                             | 237   | 0      | 0     | 257        | 108                        | 62    | 0      | 0    | 170        | 96                             | 19    | 0      | 1     | 115        | 542        |
| 8:15 AM                 | 22                             | 247   | 1      | 0     | 270        | 158                        | 60    | 0      | 0    | 218        | 90                             | 21    | 0      | 0     | 111        | 599        |
| 8:30 AM                 | 24                             | 254   | 0      | 1     | 278        | 108                        | 61    | 0      | 3    | 169        | 97                             | 37    | 0      | 0     | 134        | 581        |
| 8:45 AM                 | 13                             | 243   | 0      | 0     | 256        | 129                        | 66    | 0      | 4    | 195        | 116                            | 35    | 0      | 1     | 151        | 602        |
| Total                   | 79                             | 981   | 1      | 1     | 1061       | 503                        | 249   | 0      | 7    | 752        | 399                            | 112   | 0      | 2     | 511        | 2324       |
| Approach %              | 7.4                            | 92.5  | 0.1    | -     | -          | 66.9                       | 33.1  | 0.0    | -    | -          | 78.1                           | 21.9  | 0.0    | -     | -          | -          |
| Total %                 | 3.4                            | 42.2  | 0.0    | -     | 45.7       | 21.6                       | 10.7  | 0.0    | -    | 32.4       | 17.2                           | 4.8   | 0.0    | -     | 22.0       | -          |
| PHF                     | 0.823                          | 0.966 | 0.250  | -     | 0.954      | 0.796                      | 0.943 | 0.000  | -    | 0.862      | 0.860                          | 0.757 | 0.000  | -     | 0.846      | 0.965      |
| Lights                  | 75                             | 970   | 1      | -     | 1046       | 501                        | 249   | 0      | -    | 750        | 394                            | 109   | 0      | -     | 503        | 2299       |
| % Lights                | 94.9                           | 98.9  | 100.0  | -     | 98.6       | 99.6                       | 100.0 | -      | -    | 99.7       | 98.7                           | 97.3  | -      | -     | 98.4       | 98.9       |
| Mediums                 | 4                              | 10    | 0      | -     | 14         | 2                          | 0     | 0      | -    | 2          | 5                              | 3     | 0      | -     | 8          | 24         |
| % Mediums               | 5.1                            | 1.0   | 0.0    | -     | 1.3        | 0.4                        | 0.0   | -      | -    | 0.3        | 1.3                            | 2.7   | -      | -     | 1.6        | 1.0        |
| Articulated Trucks      | 0                              | 1     | 0      | -     | 1          | 0                          | 0     | 0      | -    | 0          | 0                              | 0     | 0      | -     | 0          | 1          |
| % Articulated Trucks    | 0.0                            | 0.1   | 0.0    | -     | 0.1        | 0.0                        | 0.0   | -      | -    | 0.0        | 0.0                            | 0.0   | -      | -     | 0.0        | 0.0        |
| Bicycles on Crosswalk   | -                              | -     | -      | 0     | -          | -                          | -     | -      | 1    | -          | -                              | -     | -      | 0     | -          | -          |
| % Bicycles on Crosswalk | -                              | -     | -      | 0.0   | -          | -                          | -     | -      | 14.3 | -          | -                              | -     | -      | 0.0   | -          | -          |
| Pedestrians             | -                              | -     | -      | 1     | -          | -                          | -     | -      | 6    | -          | -                              | -     | -      | 2     | -          | -          |
| % Pedestrians           | -                              | -     | -      | 100.0 | -          | -                          | -     | -      | 85.7 | -          | -                              | -     | -      | 100.0 | -          | -          |



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Count Name: Barton Springs at  
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Page No: 4



Turning Movement Peak Hour Data Plot (8:00 AM)



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Pasadena, Texas, United States 77503  
(281) 487-5417

Count Name: Barton Springs at  
Robert E Lee  
Site Code:  
Start Date: 11/01/2017  
Page No: 5

### Turning Movement Peak Hour Data (5:00 PM)

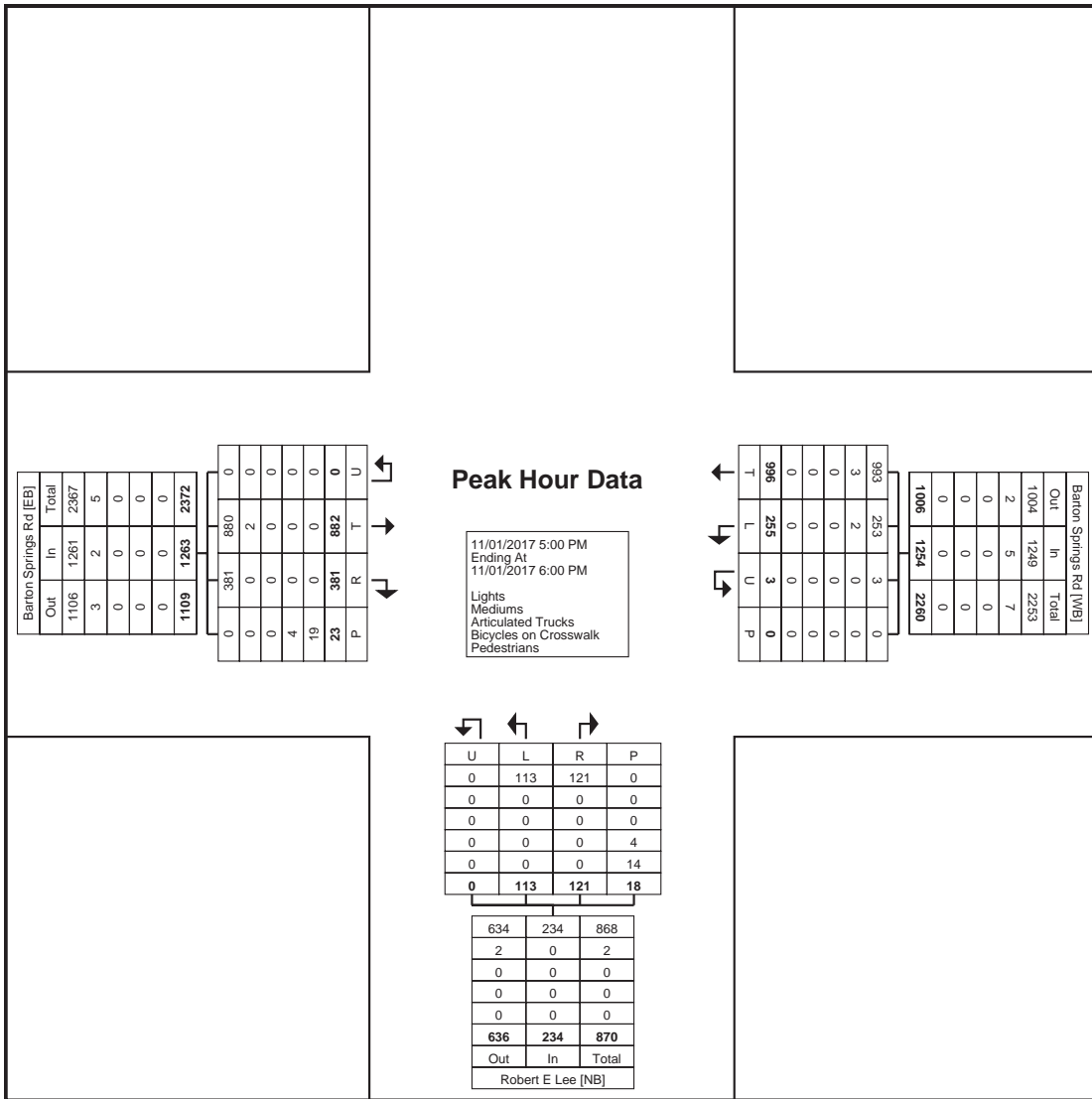
| Start Time              | Barton Springs Rd<br>Westbound |       |        |      |            | Robert E Lee<br>Northbound |       |        |      |            | Barton Springs Rd<br>Eastbound |       |        |      |            | Int. Total |
|-------------------------|--------------------------------|-------|--------|------|------------|----------------------------|-------|--------|------|------------|--------------------------------|-------|--------|------|------------|------------|
|                         | Left                           | Thru  | U-Turn | Peds | App. Total | Left                       | Right | U-Turn | Peds | App. Total | Thru                           | Right | U-Turn | Peds | App. Total |            |
| 5:00 PM                 | 56                             | 234   | 0      | 0    | 290        | 31                         | 17    | 0      | 3    | 48         | 209                            | 108   | 0      | 5    | 317        | 655        |
| 5:15 PM                 | 78                             | 253   | 1      | 0    | 332        | 31                         | 28    | 0      | 4    | 59         | 193                            | 80    | 0      | 9    | 273        | 664        |
| 5:30 PM                 | 63                             | 264   | 0      | 0    | 327        | 26                         | 37    | 0      | 3    | 63         | 237                            | 92    | 0      | 4    | 329        | 719        |
| 5:45 PM                 | 58                             | 245   | 2      | 0    | 305        | 25                         | 39    | 0      | 8    | 64         | 243                            | 101   | 0      | 5    | 344        | 713        |
| Total                   | 255                            | 996   | 3      | 0    | 1254       | 113                        | 121   | 0      | 18   | 234        | 882                            | 381   | 0      | 23   | 1263       | 2751       |
| Approach %              | 20.3                           | 79.4  | 0.2    | -    | -          | 48.3                       | 51.7  | 0.0    | -    | -          | 69.8                           | 30.2  | 0.0    | -    | -          | -          |
| Total %                 | 9.3                            | 36.2  | 0.1    | -    | 45.6       | 4.1                        | 4.4   | 0.0    | -    | 8.5        | 32.1                           | 13.8  | 0.0    | -    | 45.9       | -          |
| PHF                     | 0.817                          | 0.943 | 0.375  | -    | 0.944      | 0.911                      | 0.776 | 0.000  | -    | 0.914      | 0.907                          | 0.882 | 0.000  | -    | 0.918      | 0.957      |
| Lights                  | 253                            | 993   | 3      | -    | 1249       | 113                        | 121   | 0      | -    | 234        | 880                            | 381   | 0      | -    | 1261       | 2744       |
| % Lights                | 99.2                           | 99.7  | 100.0  | -    | 99.6       | 100.0                      | 100.0 | -      | -    | 100.0      | 99.8                           | 100.0 | -      | -    | 99.8       | 99.7       |
| Mediums                 | 2                              | 3     | 0      | -    | 5          | 0                          | 0     | 0      | -    | 0          | 2                              | 0     | 0      | -    | 2          | 7          |
| % Mediums               | 0.8                            | 0.3   | 0.0    | -    | 0.4        | 0.0                        | 0.0   | -      | -    | 0.0        | 0.2                            | 0.0   | -      | -    | 0.2        | 0.3        |
| Articulated Trucks      | 0                              | 0     | 0      | -    | 0          | 0                          | 0     | 0      | -    | 0          | 0                              | 0     | 0      | -    | 0          | 0          |
| % Articulated Trucks    | 0.0                            | 0.0   | 0.0    | -    | 0.0        | 0.0                        | 0.0   | -      | -    | 0.0        | 0.0                            | 0.0   | -      | -    | 0.0        | 0.0        |
| Bicycles on Crosswalk   | -                              | -     | -      | 0    | -          | -                          | -     | -      | 4    | -          | -                              | -     | -      | 4    | -          | -          |
| % Bicycles on Crosswalk | -                              | -     | -      | -    | -          | -                          | -     | -      | 22.2 | -          | -                              | -     | -      | 17.4 | -          | -          |
| Pedestrians             | -                              | -     | -      | 0    | -          | -                          | -     | -      | 14   | -          | -                              | -     | -      | 19   | -          | -          |
| % Pedestrians           | -                              | -     | -      | -    | -          | -                          | -     | -      | 77.8 | -          | -                              | -     | -      | 82.6 | -          | -          |



C. J. Hensch & Associates Inc.  
5215 Sycamore Ave.

Pasadena, Texas, United States 77503  
(281) 487-5417

Count Name: Barton Springs at  
Robert E Lee  
Site Code:  
Start Date: 11/01/2017  
Page No: 6



Turning Movement Peak Hour Data Plot (5:00 PM)



## **Appendix B – Synchro Reports**

Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

Existing AM  
12/12/2017



| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↙     | ↑↑    | ↙     | ↗     |
| Traffic Volume (vph)    | 399   | 112  | 79    | 981   | 503   | 249   |
| Future Volume (vph)     | 399   | 112  | 79    | 981   | 503   | 249   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.99  |      | 1.00  |       | 1.00  | 0.98  |
| Frt                     | 0.964 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3391  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.269 |       | 0.950 |       |
| Satd. Flow (perm)       | 3391  | 0    | 501   | 3539  | 1763  | 1559  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 34    |      |       |       |       | 64    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 2    | 1     |       | 6     | 6     |
| Confl. Bikes (#/hr)     |       |      |       |       |       | 1     |
| Peak Hour Factor        | 0.86  | 0.76 | 0.82  | 0.97  | 0.80  | 0.94  |
| Adj. Flow (vph)         | 464   | 147  | 96    | 1011  | 629   | 265   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 611   | 0    | 96    | 1011  | 629   | 265   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 10.0  | 20.0  | 20.0  | 10.0  |
| Total Split (s)         | 52.0  |      | 15.0  | 67.0  | 68.0  | 15.0  |
| Total Split (%)         | 38.5% |      | 11.1% | 49.6% | 50.4% | 11.1% |
| Maximum Green (s)       | 46.0  |      | 10.0  | 61.0  | 63.0  | 10.0  |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lag   |      | Lead  |       |       | Lead  |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effect Green (s)    | 46.0  |      | 62.0  | 61.0  | 63.0  | 73.0  |
| Actuated g/C Ratio      | 0.34  |      | 0.46  | 0.45  | 0.47  | 0.54  |
| v/c Ratio               | 0.52  |      | 0.30  | 0.63  | 0.76  | 0.30  |
| Control Delay           | 35.4  |      | 23.5  | 30.6  | 37.2  | 11.8  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 35.4  |      | 23.5  | 30.6  | 37.2  | 11.8  |
| LOS                     | D     |      | C     | C     | D     | B     |
| Approach Delay          | 35.4  |      |       | 30.0  | 29.6  |       |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

Existing AM  
 12/12/2017

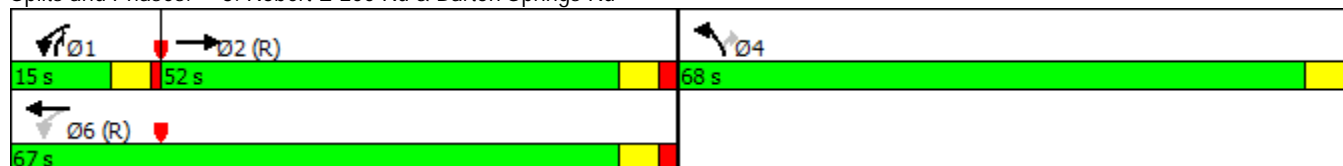


| Lane Group              | EBT  | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|-----|------|------|------|------|
| Approach LOS            | D    |     |      | C    | C    |      |
| Queue Length 50th (ft)  | 212  |     | 47   | 351  | 447  | 82   |
| Queue Length 95th (ft)  | 256  |     | 75   | 425  | 499  | 134  |
| Internal Link Dist (ft) | 848  |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1177 |     | 324  | 1599 | 826  | 874  |
| Starvation Cap Reductn  | 0    |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.52 |     | 0.30 | 0.63 | 0.76 | 0.30 |

Intersection Summary

|                                   |  |
|-----------------------------------|--|
| Area Type:                        | Other  |
| Cycle Length:                     | 135  |
| Actuated Cycle Length:            | 135  |
| Offset:                           | 62 (46%), Referenced to phase 2:EBT and 6:WBTL, Start of Green |
| Natural Cycle:                    | 90   |
| Control Type:                     | Pretimed   |
| Maximum v/c Ratio:                | 0.76   |
| Intersection Signal Delay:        | 31.1   |
| Intersection LOS:                 | C  |
| Intersection Capacity Utilization | 64.7%  |
| ICU Level of Service              | C  |
| Analysis Period (min)             | 15   |

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

Existing PM  
12/12/2017



| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↘     | ↑↑    | ↘     | ↗     |
| Traffic Volume (vph)    | 882   | 381  | 255   | 996   | 113   | 121   |
| Future Volume (vph)     | 882   | 381  | 255   | 996   | 113   | 121   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.98  |      |       |       | 0.98  | 0.98  |
| Frt                     | 0.954 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3295  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.062 |       | 0.950 |       |
| Satd. Flow (perm)       | 3295  | 0    | 115   | 3539  | 1736  | 1547  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 67    |      |       |       |       | 50    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 19   | 1     |       | 14    | 14    |
| Confl. Bikes (#/hr)     |       | 4    |       |       |       | 4     |
| Peak Hour Factor        | 0.91  | 0.88 | 0.82  | 0.94  | 0.91  | 0.78  |
| Adj. Flow (vph)         | 969   | 433  | 311   | 1060  | 124   | 155   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 1402  | 0    | 311   | 1060  | 124   | 155   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 25.0  | 60.0  | 20.0  | 25.0  |
| Total Split (s)         | 65.0  |      | 35.0  | 100.0 | 35.0  | 35.0  |
| Total Split (%)         | 48.1% |      | 25.9% | 74.1% | 25.9% | 25.9% |
| Maximum Green (s)       | 59.0  |      | 30.0  | 94.0  | 30.0  | 30.0  |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lead  |      | Lag   |       |       | Lag   |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effect Green (s)    | 59.0  |      | 95.0  | 94.0  | 30.0  | 60.0  |
| Actuated g/C Ratio      | 0.44  |      | 0.70  | 0.70  | 0.22  | 0.44  |
| v/c Ratio               | 0.95  |      | 0.69  | 0.43  | 0.32  | 0.21  |
| Control Delay           | 49.1  |      | 49.6  | 9.5   | 46.6  | 14.2  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 49.1  |      | 49.6  | 9.5   | 46.6  | 14.2  |
| LOS                     | D     |      | D     | A     | D     | B     |
| Approach Delay          | 49.1  |      |       | 18.6  | 28.6  |       |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

Existing PM  
 12/12/2017

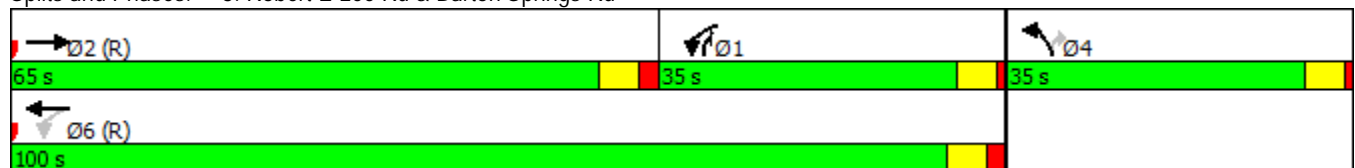


| Lane Group              | EBT  | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|-----|------|------|------|------|
| Approach LOS            | D    |     | B    |      | C    |      |
| Queue Length 50th (ft)  | 592  |     | 196  | 193  | 92   | 50   |
| Queue Length 95th (ft)  | #757 |     | 265  | 233  | 152  | 76   |
| Internal Link Dist (ft) | 848  |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1477 |     | 448  | 2464 | 393  | 723  |
| Starvation Cap Reductn  | 0    |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.95 |     | 0.69 | 0.43 | 0.32 | 0.21 |

Intersection Summary

Area Type: Other  
 Cycle Length: 135  
 Actuated Cycle Length: 135  
 Offset: 32 (24%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Pretimed  
 Maximum v/c Ratio: 0.95  
 Intersection Signal Delay: 33.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 72.9%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

2020 No Build AM  
12/12/2017



| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↘     | ↑↑    | ↘     | ↗     |
| Traffic Volume (vph)    | 399   | 112  | 79    | 981   | 503   | 249   |
| Future Volume (vph)     | 399   | 112  | 79    | 981   | 503   | 249   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.99  |      | 1.00  |       | 1.00  | 0.98  |
| Frt                     | 0.964 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3391  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.230 |       | 0.950 |       |
| Satd. Flow (perm)       | 3391  | 0    | 428   | 3539  | 1763  | 1559  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 33    |      |       |       |       | 68    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 2    | 1     |       | 6     | 6     |
| Confl. Bikes (#/hr)     |       |      |       |       |       | 1     |
| Peak Hour Factor        | 0.86  | 0.76 | 0.82  | 0.97  | 0.80  | 0.94  |
| Growth Factor           | 105%  | 105% | 105%  | 105%  | 105%  | 105%  |
| Adj. Flow (vph)         | 487   | 155  | 101   | 1062  | 660   | 278   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 642   | 0    | 101   | 1062  | 660   | 278   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 10.0  | 20.0  | 20.0  | 10.0  |
| Total Split (s)         | 48.0  |      | 14.0  | 62.0  | 73.0  | 14.0  |
| Total Split (%)         | 35.6% |      | 10.4% | 45.9% | 54.1% | 10.4% |
| Maximum Green (s)       | 42.0  |      | 9.0   | 56.0  | 68.0  | 9.0   |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lag   |      | Lead  |       |       | Lead  |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effct Green (s)     | 42.0  |      | 57.0  | 56.0  | 68.0  | 77.0  |
| Actuated g/C Ratio      | 0.31  |      | 0.42  | 0.41  | 0.50  | 0.57  |
| v/c Ratio               | 0.60  |      | 0.37  | 0.72  | 0.74  | 0.30  |
| Control Delay           | 39.9  |      | 28.1  | 36.5  | 32.8  | 10.3  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 39.9  |      | 28.1  | 36.5  | 32.8  | 10.3  |
| LOS                     | D     |      | C     | D     | C     | B     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

2020 No Build AM  
 12/12/2017

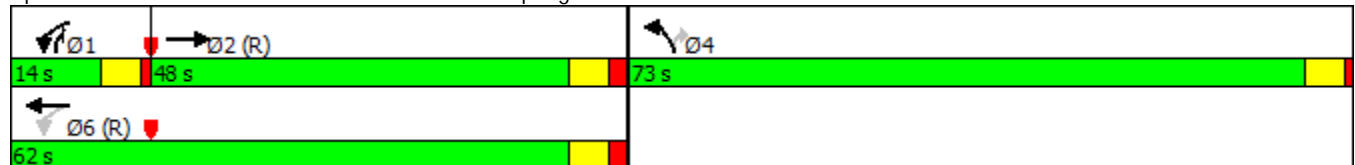


| Lane Group              | EBT  | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|-----|------|------|------|------|
| Approach Delay          | 39.9 |     |      | 35.8 | 26.1 |      |
| Approach LOS            | D    |     |      | D    | C    |      |
| Queue Length 50th (ft)  | 237  |     | 54   | 405  | 446  | 80   |
| Queue Length 95th (ft)  | 285  |     | 84   | 487  | 493  | 129  |
| Internal Link Dist (ft) | 848  |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1077 |     | 270  | 1468 | 891  | 920  |
| Starvation Cap Reductn  | 0    |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.60 |     | 0.37 | 0.72 | 0.74 | 0.30 |

Intersection Summary

|                                   |  |
|-----------------------------------|--|
| Area Type:                        | Other  |
| Cycle Length:                     | 135  |
| Actuated Cycle Length:            | 135  |
| Offset:                           | 62 (46%), Referenced to phase 2:EBT and 6:WBTL, Start of Green |
| Natural Cycle:                    | 90   |
| Control Type:                     | Pretimed   |
| Maximum v/c Ratio:                | 0.74   |
| Intersection Signal Delay:        | 33.5   |
| Intersection LOS:                 | C  |
| Intersection Capacity Utilization | 66.9%  |
| ICU Level of Service              | C  |
| Analysis Period (min)             | 15   |

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

2020 No Build PM  
12/12/2017



| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↘     | ↑↑    | ↘     | ↗     |
| Traffic Volume (vph)    | 882   | 381  | 255   | 996   | 113   | 121   |
| Future Volume (vph)     | 882   | 381  | 255   | 996   | 113   | 121   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.98  |      |       |       | 0.97  | 0.97  |
| Frt                     | 0.954 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3296  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.086 |       | 0.950 |       |
| Satd. Flow (perm)       | 3296  | 0    | 160   | 3539  | 1711  | 1541  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 83    |      |       |       |       | 81    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 19   | 1     |       | 14    | 14    |
| Confl. Bikes (#/hr)     |       | 4    |       |       |       | 4     |
| Peak Hour Factor        | 0.91  | 0.88 | 0.82  | 0.94  | 0.91  | 0.78  |
| Growth Factor           | 105%  | 105% | 105%  | 105%  | 105%  | 105%  |
| Adj. Flow (vph)         | 1018  | 455  | 327   | 1113  | 130   | 163   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 1473  | 0    | 327   | 1113  | 130   | 163   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 25.0  | 60.0  | 20.0  | 25.0  |
| Total Split (s)         | 79.0  |      | 34.0  | 113.0 | 22.0  | 34.0  |
| Total Split (%)         | 58.5% |      | 25.2% | 83.7% | 16.3% | 25.2% |
| Maximum Green (s)       | 73.0  |      | 29.0  | 107.0 | 17.0  | 29.0  |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lead  |      | Lag   |       |       | Lag   |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effect Green (s)    | 73.0  |      | 108.0 | 107.0 | 17.0  | 46.0  |
| Actuated g/C Ratio      | 0.54  |      | 0.80  | 0.79  | 0.13  | 0.34  |
| v/c Ratio               | 0.81  |      | 0.69  | 0.40  | 0.59  | 0.28  |
| Control Delay           | 28.2  |      | 42.9  | 4.7   | 67.2  | 15.6  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 28.2  |      | 42.9  | 4.7   | 67.2  | 15.6  |
| LOS                     | C     |      | D     | A     | E     | B     |



Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd



| Lane Group              | EBT  | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|-----|------|------|------|------|
| Approach Delay          | 28.2 |     |      | 13.4 | 38.5 |      |
| Approach LOS            | C    |     |      | B    | D    |      |
| Queue Length 50th (ft)  | 511  |     | 171  | 131  | 109  | 47   |
| Queue Length 95th (ft)  | 614  |     | 239  | 156  | 179  | 77   |
| Internal Link Dist (ft) | 848  |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1820 |     | 473  | 2804 | 222  | 587  |
| Starvation Cap Reductn  | 0    |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.81 |     | 0.69 | 0.40 | 0.59 | 0.28 |

Intersection Summary

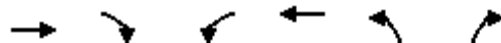
|                                   |  |
|-----------------------------------|--|
| Area Type:                        | Other  |
| Cycle Length:                     | 135  |
| Actuated Cycle Length:            | 135  |
| Offset:                           | 32 (24%), Referenced to phase 2:EBT and 6:WBTL, Start of Green |
| Natural Cycle:                    | 90   |
| Control Type:                     | Pretimed   |
| Maximum v/c Ratio:                | 0.81   |
| Intersection Signal Delay:        | 22.5   |
| Intersection LOS:                 | C  |
| Intersection Capacity Utilization | 75.5%  |
| ICU Level of Service              | D  |
| Analysis Period (min)             | 15   |

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group                | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
|---------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations       | ↑↑    | ↑     | ↓     | ↑↑    | ↓     | ↑     |
| Traffic Volume (vph)      | 399   | 112   | 79    | 981   | 503   | 249   |
| Future Volume (vph)       | 399   | 112   | 79    | 981   | 503   | 249   |
| Ideal Flow (vphp)         | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)       |       | 250   | 260   |       | 0     | 130   |
| Storage Lanes             |       | 1     | 1     |       | 1     | 1     |
| Taper Length (ft)         |       |       | 25    |       | 25    |       |
| Lane Util. Factor         | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor           |       | 0.97  | 1.00  |       | 1.00  | 0.98  |
| Fr <sub>t</sub>           |       | 0.850 |       |       |       | 0.850 |
| Fl <sub>t</sub> Protected |       |       | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)         | 3539  | 1583  | 1770  | 3539  | 1770  | 1583  |
| Fl <sub>t</sub> Permitted |       |       | 0.329 |       | 0.950 |       |
| Satd. Flow (perm)         | 3539  | 1543  | 612   | 3539  | 1763  | 1559  |
| Right Turn on Red         |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)         |       | 155   |       |       |       | 136   |
| Link Speed (mph)          | 35    |       |       | 35    | 30    |       |
| Link Distance (ft)        | 928   |       |       | 736   | 1481  |       |
| Travel Time (s)           | 18.1  |       |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)       |       | 2     | 1     |       | 6     | 6     |
| Confl. Bikes (#/hr)       |       |       |       |       |       | 1     |
| Peak Hour Factor          | 0.86  | 0.76  | 0.82  | 0.97  | 0.80  | 0.94  |
| Growth Factor             | 105%  | 105%  | 105%  | 105%  | 105%  | 105%  |
| Adj. Flow (vph)           | 487   | 155   | 101   | 1062  | 660   | 278   |
| Shared Lane Traffic (%)   |       |       |       |       |       |       |
| Lane Group Flow (vph)     | 487   | 155   | 101   | 1062  | 660   | 278   |
| Turn Type                 | NA    | Perm  | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases          | 2     |       | 1     | 6     | 4     | 1     |
| Permitted Phases          |       | 2     | 6     |       |       | 4     |
| Minimum Split (s)         | 45.0  | 45.0  | 10.0  | 20.0  | 20.0  | 10.0  |
| Total Split (s)           | 48.0  | 48.0  | 13.0  | 61.0  | 74.0  | 13.0  |
| Total Split (%)           | 35.6% | 35.6% | 9.6%  | 45.2% | 54.8% | 9.6%  |
| Maximum Green (s)         | 42.0  | 42.0  | 8.0   | 55.0  | 69.0  | 8.0   |
| Yellow Time (s)           | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)          | 2.0   | 2.0   | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)      | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)       | 6.0   | 6.0   | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                  | Lag   | Lag   | Lead  |       |       | Lead  |
| Lead-Lag Optimize?        | Yes   | Yes   | Yes   |       |       | Yes   |
| Walk Time (s)             | 7.0   | 7.0   |       |       |       |       |
| Flash Dont Walk (s)       | 16.0  | 16.0  |       |       |       |       |
| Pedestrian Calls (#/hr)   | 0     | 0     |       |       |       |       |
| Act Effct Green (s)       | 42.0  | 42.0  | 56.0  | 55.0  | 69.0  | 77.0  |
| Actuated g/C Ratio        | 0.31  | 0.31  | 0.41  | 0.41  | 0.51  | 0.57  |
| v/c Ratio                 | 0.44  | 0.26  | 0.31  | 0.74  | 0.73  | 0.29  |
| Control Delay             | 38.7  | 6.1   | 27.4  | 37.7  | 31.7  | 6.9   |
| Queue Delay               | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay               | 38.7  | 6.1   | 27.4  | 37.7  | 31.7  | 6.9   |
| LOS                       | D     | A     | C     | D     | C     | A     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

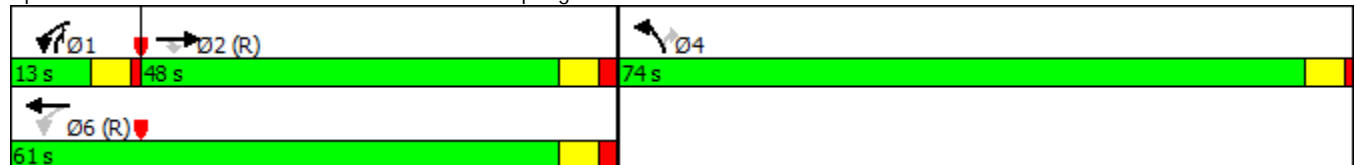


| Lane Group              | EBT  | EBR  | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|------|------|------|------|------|
| Approach Delay          | 30.8 |      |      | 36.8 | 24.3 |      |
| Approach LOS            | C    |      |      | D    | C    |      |
| Queue Length 50th (ft)  | 179  | 0    | 54   | 410  | 439  | 51   |
| Queue Length 95th (ft)  | 220  | 27   | 85   | 494  | 485  | 96   |
| Internal Link Dist (ft) | 848  |      |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      | 250  | 260  |      |      | 130  |
| Base Capacity (vph)     | 1101 | 586  | 322  | 1441 | 904  | 949  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.44 | 0.26 | 0.31 | 0.74 | 0.73 | 0.29 |

Intersection Summary

|                                   |  |
|-----------------------------------|--|
| Area Type:                        | Other  |
| Cycle Length:                     | 135  |
| Actuated Cycle Length:            | 135  |
| Offset:                           | 62 (46%), Referenced to phase 2:EBT and 6:WBTL, Start of Green |
| Natural Cycle:                    | 90   |
| Control Type:                     | Pretimed   |
| Maximum v/c Ratio:                | 0.74   |
| Intersection Signal Delay:        | 31.1   |
| Intersection LOS:                 | C  |
| Intersection Capacity Utilization | 66.9%  |
| ICU Level of Service              | C  |
| Analysis Period (min)             | 15   |

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group              | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    | ↑     | ↓     | ↑↑    | ↓     | ↑     |
| Traffic Volume (vph)    | 882   | 381   | 255   | 996   | 113   | 121   |
| Future Volume (vph)     | 882   | 381   | 255   | 996   | 113   | 121   |
| Ideal Flow (vphp)       | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 250   | 260   |       | 0     | 130   |
| Storage Lanes           |       | 1     | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |       | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         |       | 0.92  |       |       | 0.97  | 0.98  |
| Frt                     |       | 0.850 |       |       |       | 0.850 |
| Flt Protected           |       |       | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3539  | 1583  | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |       | 0.185 |       | 0.950 |       |
| Satd. Flow (perm)       | 3539  | 1460  | 345   | 3539  | 1724  | 1545  |
| Right Turn on Red       |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)       |       | 455   |       |       |       | 55    |
| Link Speed (mph)        | 35    |       |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |       |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |       |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 19    | 1     |       | 14    | 14    |
| Confl. Bikes (#/hr)     |       | 4     |       |       |       | 4     |
| Peak Hour Factor        | 0.91  | 0.88  | 0.82  | 0.94  | 0.91  | 0.78  |
| Growth Factor           | 105%  | 105%  | 105%  | 105%  | 105%  | 105%  |
| Adj. Flow (vph)         | 1018  | 455   | 327   | 1113  | 130   | 163   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 1018  | 455   | 327   | 1113  | 130   | 163   |
| Turn Type               | NA    | Perm  | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |       | 1     | 6     | 4     | 1     |
| Permitted Phases        |       | 2     | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  | 45.0  | 25.0  | 60.0  | 20.0  | 25.0  |
| Total Split (s)         | 70.0  | 70.0  | 38.0  | 108.0 | 27.0  | 38.0  |
| Total Split (%)         | 51.9% | 51.9% | 28.1% | 80.0% | 20.0% | 28.1% |
| Maximum Green (s)       | 64.0  | 64.0  | 33.0  | 102.0 | 22.0  | 33.0  |
| Yellow Time (s)         | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   | 2.0   | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lead  | Lead  | Lag   |       |       | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   | 7.0   |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  | 16.0  |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     | 0     |       |       |       |       |
| Act Effct Green (s)     | 64.0  | 64.0  | 103.0 | 102.0 | 22.0  | 55.0  |
| Actuated g/C Ratio      | 0.47  | 0.47  | 0.76  | 0.76  | 0.16  | 0.41  |
| v/c Ratio               | 0.61  | 0.49  | 0.54  | 0.42  | 0.45  | 0.24  |
| Control Delay           | 28.1  | 3.7   | 24.1  | 6.4   | 56.8  | 16.1  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 28.1  | 3.7   | 24.1  | 6.4   | 56.8  | 16.1  |
| LOS                     | C     | A     | C     | A     | E     | B     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

2020 Build PM  
 12/12/2017

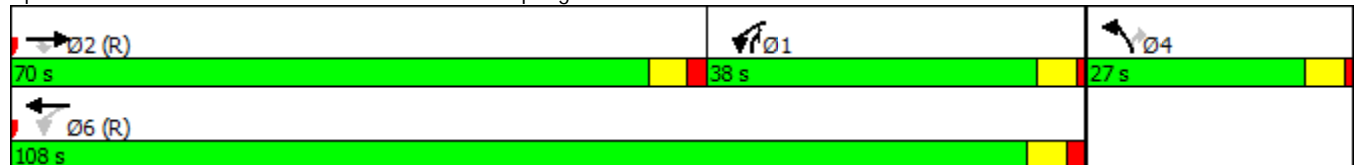


| Lane Group              | EBT  | EBR  | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|------|------|------|------|------|
| Approach Delay          | 20.6 |      |      | 10.5 | 34.2 |      |
| Approach LOS            | C    |      |      | B    | C    |      |
| Queue Length 50th (ft)  | 339  | 0    | 73   | 160  | 104  | 56   |
| Queue Length 95th (ft)  | 410  | 51   | 122  | 192  | 171  | 84   |
| Internal Link Dist (ft) | 848  |      |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      | 250  | 260  |      |      | 130  |
| Base Capacity (vph)     | 1677 | 931  | 611  | 2673 | 288  | 671  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.61 | 0.49 | 0.54 | 0.42 | 0.45 | 0.24 |

Intersection Summary

|                                    |  |
|------------------------------------|--|
| Area Type:                         | Other  |
| Cycle Length:                      | 135  |
| Actuated Cycle Length:             | 135  |
| Offset:                            | 32 (24%), Referenced to phase 2:EBT and 6:WBTL, Start of Green |
| Natural Cycle:                     | 90   |
| Control Type:                      | Pretimed   |
| Maximum v/c Ratio:                 | 0.61   |
| Intersection Signal Delay:         | 17.3   |
| Intersection LOS:                  | B  |
| Intersection Capacity Utilization: | 62.1%  |
| ICU Level of Service:              | B  |
| Analysis Period (min):             | 15   |

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↙     | ↑↑    | ↙     | ↗     |
| Traffic Volume (vph)    | 399   | 112  | 79    | 981   | 503   | 249   |
| Future Volume (vph)     | 399   | 112  | 79    | 981   | 503   | 249   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.99  |      |       |       | 1.00  | 0.98  |
| Frt                     | 0.964 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3391  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.089 |       | 0.950 |       |
| Satd. Flow (perm)       | 3391  | 0    | 166   | 3539  | 1763  | 1559  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 32    |      |       |       |       | 44    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 2    | 1     |       | 6     | 6     |
| Confl. Bikes (#/hr)     |       |      |       |       |       | 1     |
| Peak Hour Factor        | 0.86  | 0.76 | 0.82  | 0.97  | 0.80  | 0.94  |
| Growth Factor           | 151%  | 151% | 151%  | 151%  | 151%  | 151%  |
| Adj. Flow (vph)         | 701   | 223  | 145   | 1527  | 949   | 400   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 924   | 0    | 145   | 1527  | 949   | 400   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 10.0  | 20.0  | 20.0  | 10.0  |
| Total Split (s)         | 46.0  |      | 16.0  | 62.0  | 73.0  | 16.0  |
| Total Split (%)         | 34.1% |      | 11.9% | 45.9% | 54.1% | 11.9% |
| Maximum Green (s)       | 40.0  |      | 11.0  | 56.0  | 68.0  | 11.0  |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lag   |      | Lead  |       |       | Lead  |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effect Green (s)    | 40.0  |      | 57.0  | 56.0  | 68.0  | 79.0  |
| Actuated g/C Ratio      | 0.30  |      | 0.42  | 0.41  | 0.50  | 0.59  |
| v/c Ratio               | 0.90  |      | 0.72  | 1.04  | 1.07  | 0.43  |
| Control Delay           | 56.6  |      | 48.7  | 73.3  | 82.0  | 13.0  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 56.6  |      | 48.7  | 73.3  | 82.0  | 13.0  |
| LOS                     | E     |      | D     | E     | F     | B     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

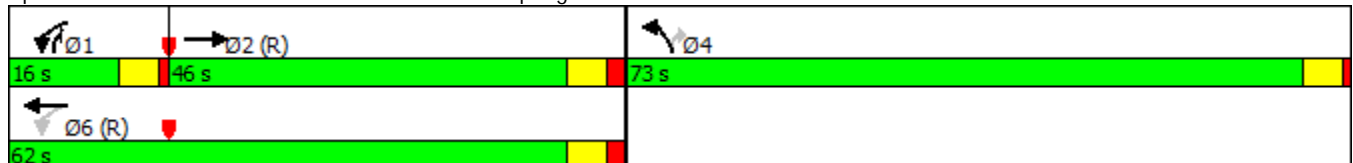


| Lane Group              | EBT  | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|-----|------|------|------|------|
| Approach Delay          | 56.6 |     |      | 71.2 | 61.6 |      |
| Approach LOS            | E    |     |      | E    | E    |      |
| Queue Length 50th (ft)  | 397  |     | 79   | ~759 | -916 | 146  |
| Queue Length 95th (ft)  | 456  |     | #130 | #899 | #952 | 214  |
| Internal Link Dist (ft) | 848  |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1027 |     | 200  | 1468 | 891  | 932  |
| Starvation Cap Reductn  | 0    |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.90 |     | 0.72 | 1.04 | 1.07 | 0.43 |

Intersection Summary

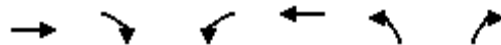
Area Type: Other  
 Cycle Length: 135  
 Actuated Cycle Length: 135  
 Offset: 62 (46%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 110  
 Control Type: Pretimed  
 Maximum v/c Ratio: 1.07  
 Intersection Signal Delay: 64.5  
 Intersection LOS: E  
 Intersection Capacity Utilization 92.2%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group              | EBT   | EBR  | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    |      | ↙     | ↑↑    | ↙     | ↗     |
| Traffic Volume (vph)    | 882   | 381  | 255   | 996   | 113   | 121   |
| Future Volume (vph)     | 882   | 381  | 255   | 996   | 113   | 121   |
| Ideal Flow (vphp)       | 1900  | 1900 | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 0    | 260   |       | 0     | 40    |
| Storage Lanes           |       | 0    | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |      | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 0.95 | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         | 0.98  |      |       |       | 0.96  | 0.97  |
| Frt                     | 0.954 |      |       |       |       | 0.850 |
| Flt Protected           |       |      | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3296  | 0    | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |      | 0.049 |       | 0.950 |       |
| Satd. Flow (perm)       | 3296  | 0    | 91    | 3539  | 1703  | 1540  |
| Right Turn on Red       |       | Yes  |       |       |       | Yes   |
| Satd. Flow (RTOR)       | 87    |      |       |       |       | 29    |
| Link Speed (mph)        | 35    |      |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |      |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |      |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 19   | 1     |       | 14    | 14    |
| Confl. Bikes (#/hr)     |       | 4    |       |       |       | 4     |
| Peak Hour Factor        | 0.91  | 0.88 | 0.82  | 0.94  | 0.91  | 0.78  |
| Growth Factor           | 151%  | 151% | 151%  | 151%  | 151%  | 151%  |
| Adj. Flow (vph)         | 1464  | 654  | 470   | 1600  | 188   | 234   |
| Shared Lane Traffic (%) |       |      |       |       |       |       |
| Lane Group Flow (vph)   | 2118  | 0    | 470   | 1600  | 188   | 234   |
| Turn Type               | NA    |      | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |      | 1     | 6     | 4     | 1     |
| Permitted Phases        |       |      | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  |      | 25.0  | 60.0  | 20.0  | 25.0  |
| Total Split (s)         | 82.0  |      | 33.0  | 115.0 | 20.0  | 33.0  |
| Total Split (%)         | 60.7% |      | 24.4% | 85.2% | 14.8% | 24.4% |
| Maximum Green (s)       | 76.0  |      | 28.0  | 109.0 | 15.0  | 28.0  |
| Yellow Time (s)         | 4.0   |      | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   |      | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   |      | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lead  |      | Lag   |       |       | Lag   |
| Lead-Lag Optimize?      | Yes   |      | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   |      |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  |      |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     |      |       |       |       |       |
| Act Effct Green (s)     | 76.0  |      | 110.0 | 109.0 | 15.0  | 43.0  |
| Actuated g/C Ratio      | 0.56  |      | 0.81  | 0.81  | 0.11  | 0.32  |
| v/c Ratio               | 1.12  |      | 1.11  | 0.56  | 0.96  | 0.45  |
| Control Delay           | 89.4  |      | 121.1 | 5.5   | 113.7 | 31.8  |
| Queue Delay             | 0.0   |      | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 89.4  |      | 121.1 | 5.5   | 113.7 | 31.8  |
| LOS                     | F     |      | F     | A     | F     | C     |



Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd



| Lane Group              | EBT   | EBR | WBL  | WBT  | NBL  | NBR  |
|-------------------------|-------|-----|------|------|------|------|
| Approach Delay          | 89.4  |     |      | 31.7 | 68.3 |      |
| Approach LOS            | F     |     |      | C    | E    |      |
| Queue Length 50th (ft)  | ~1106 |     | ~421 | 213  | 167  | 134  |
| Queue Length 95th (ft)  | #1242 |     | #543 | 252  | #320 | 173  |
| Internal Link Dist (ft) | 848   |     |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |       |     | 260  |      |      | 40   |
| Base Capacity (vph)     | 1893  |     | 422  | 2857 | 196  | 519  |
| Starvation Cap Reductn  | 0     |     | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0     |     | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0     |     | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 1.12  |     | 1.11 | 0.56 | 0.96 | 0.45 |

Intersection Summary

Area Type: Other  
 Cycle Length: 135  
 Actuated Cycle Length: 135  
 Offset: 32 (24%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 150  
 Control Type: Pretimed  
 Maximum v/c Ratio: 1.12  
 Intersection Signal Delay: 61.6  
 Intersection LOS: E  
 Intersection Capacity Utilization 99.9%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group              | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    | ↑     | ↓     | ↑↑    | ↓     | ↑     |
| Traffic Volume (vph)    | 399   | 112   | 79    | 981   | 503   | 249   |
| Future Volume (vph)     | 399   | 112   | 79    | 981   | 503   | 249   |
| Ideal Flow (vphp)       | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 250   | 260   |       | 0     | 130   |
| Storage Lanes           |       | 1     | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |       | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         |       | 0.97  |       |       | 1.00  | 0.98  |
| Frt                     |       | 0.850 |       |       |       | 0.850 |
| Flt Protected           |       |       | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3539  | 1583  | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |       | 0.184 |       | 0.950 |       |
| Satd. Flow (perm)       | 3539  | 1543  | 343   | 3539  | 1763  | 1559  |
| Right Turn on Red       |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)       |       | 223   |       |       |       | 44    |
| Link Speed (mph)        | 35    |       |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |       |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |       |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 2     | 1     |       | 6     | 6     |
| Confl. Bikes (#/hr)     |       |       |       |       |       | 1     |
| Peak Hour Factor        | 0.86  | 0.76  | 0.82  | 0.97  | 0.80  | 0.94  |
| Growth Factor           | 151%  | 151%  | 151%  | 151%  | 151%  | 151%  |
| Adj. Flow (vph)         | 701   | 223   | 145   | 1527  | 949   | 400   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 701   | 223   | 145   | 1527  | 949   | 400   |
| Turn Type               | NA    | Perm  | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |       | 1     | 6     | 4     | 1     |
| Permitted Phases        |       | 2     | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  | 45.0  | 10.0  | 20.0  | 20.0  | 10.0  |
| Total Split (s)         | 46.0  | 46.0  | 16.0  | 62.0  | 73.0  | 16.0  |
| Total Split (%)         | 34.1% | 34.1% | 11.9% | 45.9% | 54.1% | 11.9% |
| Maximum Green (s)       | 40.0  | 40.0  | 11.0  | 56.0  | 68.0  | 11.0  |
| Yellow Time (s)         | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   | 2.0   | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lag   | Lag   | Lead  |       |       | Lead  |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   | 7.0   |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  | 16.0  |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     | 0     |       |       |       |       |
| Act Effect Green (s)    | 40.0  | 40.0  | 57.0  | 56.0  | 68.0  | 79.0  |
| Actuated g/C Ratio      | 0.30  | 0.30  | 0.42  | 0.41  | 0.50  | 0.59  |
| v/c Ratio               | 0.67  | 0.36  | 0.56  | 1.04  | 1.07  | 0.43  |
| Control Delay           | 45.4  | 6.1   | 33.2  | 73.3  | 82.0  | 13.0  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 45.4  | 6.1   | 33.2  | 73.3  | 82.0  | 13.0  |
| LOS                     | D     | A     | C     | E     | F     | B     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd

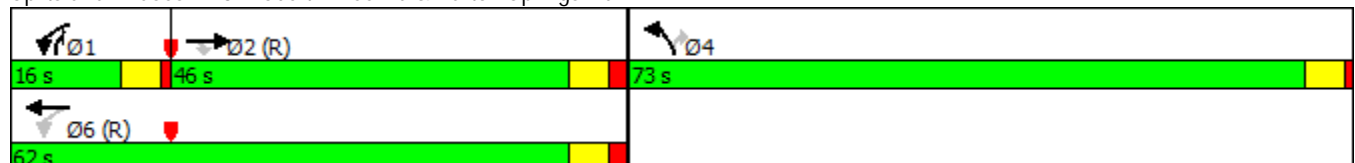


| Lane Group              | EBT  | EBR  | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|------|------|------|------|------|
| Approach Delay          | 35.9 |      |      | 69.8 | 61.6 |      |
| Approach LOS            | D    |      |      | E    | E    |      |
| Queue Length 50th (ft)  | 284  | 0    | 79   | ~759 | -916 | 146  |
| Queue Length 95th (ft)  | 334  | 27   | 115  | #899 | #952 | 214  |
| Internal Link Dist (ft) | 848  |      |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      | 250  | 260  |      |      | 130  |
| Base Capacity (vph)     | 1048 | 614  | 261  | 1468 | 891  | 932  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.67 | 0.36 | 0.56 | 1.04 | 1.07 | 0.43 |

Intersection Summary

Area Type: Other  
 Cycle Length: 135  
 Actuated Cycle Length: 135  
 Offset: 62 (46%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 110  
 Control Type: Pretimed  
 Maximum v/c Ratio: 1.07  
 Intersection Signal Delay: 59.1  
 Intersection LOS: E  
 Intersection Capacity Utilization 92.2%  
 ICU Level of Service F  
 Analysis Period (min) 15  
 ~ Volume exceeds capacity, queue is theoretically infinite.  
 Queue shown is maximum after two cycles.  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd



Lanes, Volumes, Timings  
3: Robert E Lee Rd & Barton Springs Rd

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| Lane Group              | EBT   | EBR   | WBL   | WBT   | NBL   | NBR   |
|-------------------------|-------|-------|-------|-------|-------|-------|
| Lane Configurations     | ↑↑    | ↑     | ↓     | ↑↑    | ↓     | ↑     |
| Traffic Volume (vph)    | 882   | 381   | 255   | 996   | 113   | 121   |
| Future Volume (vph)     | 882   | 381   | 255   | 996   | 113   | 121   |
| Ideal Flow (vphp)       | 1900  | 1900  | 1900  | 1900  | 1900  | 1900  |
| Storage Length (ft)     |       | 250   | 260   |       | 0     | 130   |
| Storage Lanes           |       | 1     | 1     |       | 1     | 1     |
| Taper Length (ft)       |       |       | 25    |       | 25    |       |
| Lane Util. Factor       | 0.95  | 1.00  | 1.00  | 0.95  | 1.00  | 1.00  |
| Ped Bike Factor         |       | 0.92  |       |       | 0.97  | 0.98  |
| Frt                     |       | 0.850 |       |       |       | 0.850 |
| Flt Protected           |       |       | 0.950 |       | 0.950 |       |
| Satd. Flow (prot)       | 3539  | 1583  | 1770  | 3539  | 1770  | 1583  |
| Flt Permitted           |       |       | 0.062 |       | 0.950 |       |
| Satd. Flow (perm)       | 3539  | 1461  | 115   | 3539  | 1714  | 1545  |
| Right Turn on Red       |       | Yes   |       |       |       | Yes   |
| Satd. Flow (RTOR)       |       | 462   |       |       |       | 15    |
| Link Speed (mph)        | 35    |       |       | 35    | 30    |       |
| Link Distance (ft)      | 928   |       |       | 736   | 1481  |       |
| Travel Time (s)         | 18.1  |       |       | 14.3  | 33.7  |       |
| Confl. Peds. (#/hr)     |       | 19    | 1     |       | 14    | 14    |
| Confl. Bikes (#/hr)     |       | 4     |       |       |       | 4     |
| Peak Hour Factor        | 0.91  | 0.88  | 0.82  | 0.94  | 0.91  | 0.78  |
| Growth Factor           | 151%  | 151%  | 151%  | 151%  | 151%  | 151%  |
| Adj. Flow (vph)         | 1464  | 654   | 470   | 1600  | 188   | 234   |
| Shared Lane Traffic (%) |       |       |       |       |       |       |
| Lane Group Flow (vph)   | 1464  | 654   | 470   | 1600  | 188   | 234   |
| Turn Type               | NA    | Perm  | pm+pt | NA    | Prot  | pm+ov |
| Protected Phases        | 2     |       | 1     | 6     | 4     | 1     |
| Permitted Phases        |       | 2     | 6     |       |       | 4     |
| Minimum Split (s)       | 45.0  | 45.0  | 25.0  | 60.0  | 20.0  | 25.0  |
| Total Split (s)         | 71.0  | 71.0  | 41.0  | 112.0 | 23.0  | 41.0  |
| Total Split (%)         | 52.6% | 52.6% | 30.4% | 83.0% | 17.0% | 30.4% |
| Maximum Green (s)       | 65.0  | 65.0  | 36.0  | 106.0 | 18.0  | 36.0  |
| Yellow Time (s)         | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |
| All-Red Time (s)        | 2.0   | 2.0   | 1.0   | 2.0   | 1.0   | 1.0   |
| Lost Time Adjust (s)    | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Lost Time (s)     | 6.0   | 6.0   | 5.0   | 6.0   | 5.0   | 5.0   |
| Lead/Lag                | Lead  | Lead  | Lag   |       |       | Lag   |
| Lead-Lag Optimize?      | Yes   | Yes   | Yes   |       |       | Yes   |
| Walk Time (s)           | 7.0   | 7.0   |       |       |       |       |
| Flash Dont Walk (s)     | 16.0  | 16.0  |       |       |       |       |
| Pedestrian Calls (#/hr) | 0     | 0     |       |       |       |       |
| Act Effect Green (s)    | 65.0  | 65.0  | 107.0 | 106.0 | 18.0  | 54.0  |
| Actuated g/C Ratio      | 0.48  | 0.48  | 0.79  | 0.79  | 0.13  | 0.40  |
| v/c Ratio               | 0.86  | 0.69  | 0.88  | 0.58  | 0.80  | 0.37  |
| Control Delay           | 37.4  | 11.5  | 60.1  | 6.7   | 80.8  | 25.4  |
| Queue Delay             | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   | 0.0   |
| Total Delay             | 37.4  | 11.5  | 60.1  | 6.7   | 80.8  | 25.4  |
| LOS                     | D     | B     | E     | A     | F     | C     |

Lanes, Volumes, Timings  
 3: Robert E Lee Rd & Barton Springs Rd



| Lane Group              | EBT  | EBR  | WBL  | WBT  | NBL  | NBR  |
|-------------------------|------|------|------|------|------|------|
| Approach Delay          | 29.4 |      |      | 18.8 | 50.1 |      |
| Approach LOS            | C    |      |      | B    | D    |      |
| Queue Length 50th (ft)  | 584  | 120  | 336  | 245  | 162  | 124  |
| Queue Length 95th (ft)  | 691  | 244  | #420 | 290  | #284 | 159  |
| Internal Link Dist (ft) | 848  |      |      | 656  | 1401 |      |
| Turn Bay Length (ft)    |      | 250  | 260  |      |      | 130  |
| Base Capacity (vph)     | 1703 | 943  | 532  | 2778 | 236  | 637  |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.86 | 0.69 | 0.88 | 0.58 | 0.80 | 0.37 |

Intersection Summary

Area Type: Other  
 Cycle Length: 135  
 Actuated Cycle Length: 135  
 Offset: 32 (24%), Referenced to phase 2:EBT and 6:WBTL, Start of Green  
 Natural Cycle: 90  
 Control Type: Pretimed  
 Maximum v/c Ratio: 0.88  
 Intersection Signal Delay: 26.5  
 Intersection LOS: C  
 Intersection Capacity Utilization 80.9%  
 ICU Level of Service D  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.

Splits and Phases: 3: Robert E Lee Rd & Barton Springs Rd

