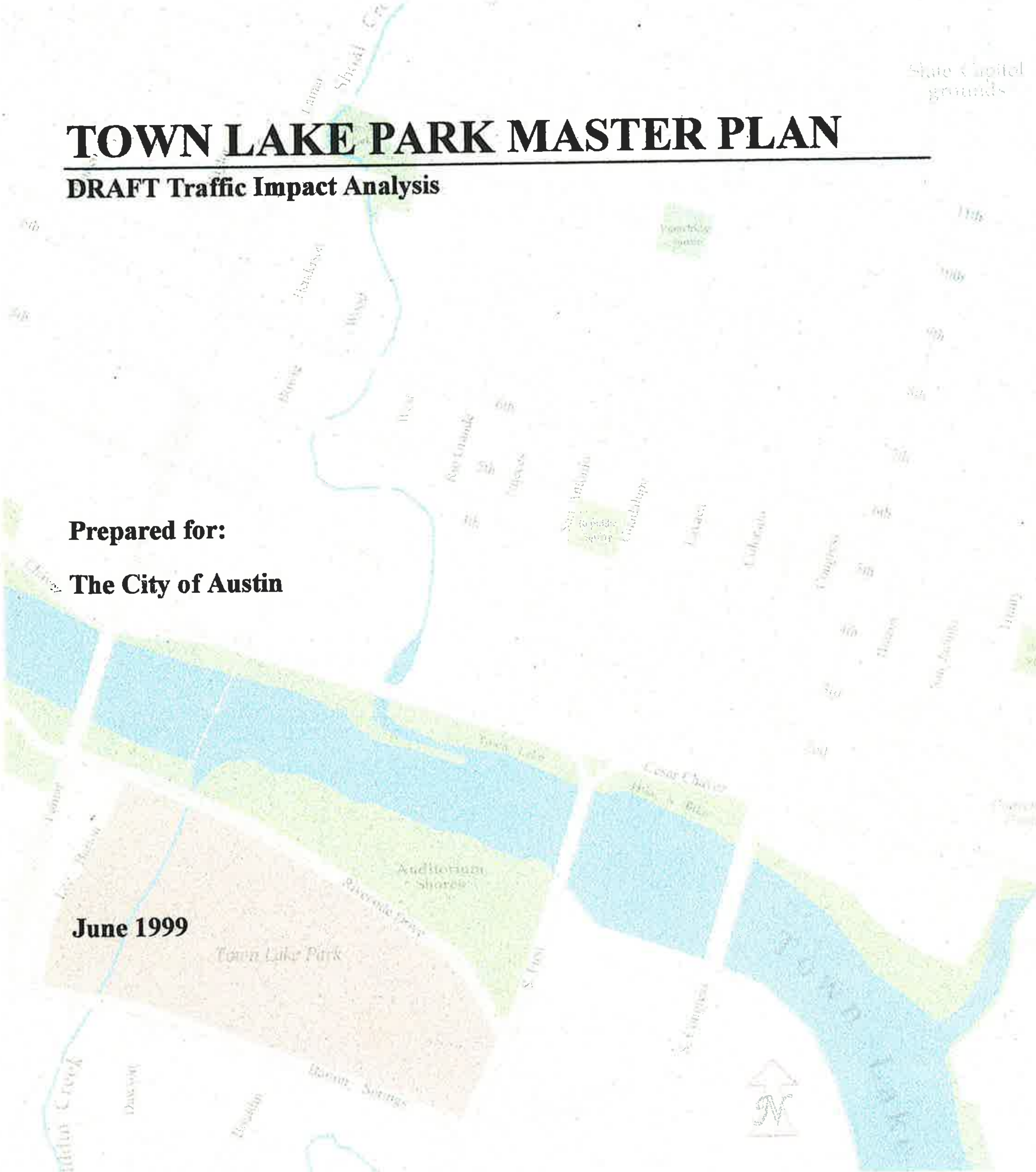
TOWN LAKE PARK MASTER PLAN

DRAFT Traffic Impact Analysis



Prepared for:

The City of Austin

June 1999

WHM

Town Lake Park Master Plan

DRAFT Traffic Impact Analysis

Prepared for:

The City of Austin

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June 1999

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EXECUTIVE SUMMARY

In November 1998, City of Austin voters approved Propositions 11 and 12, which authorized development of the Town Lake Park and construction of a new Community Events Center (CEC) to replace uses currently housed in Palmer Auditorium and the City Coliseum, and a parking garage. Improvements to the 54 acre park will also include renovation of the existing Palmer Auditorium facility with privately raised funds through ARTS* Center Stage.

The City of Austin selected EDAW Inc. to develop the master plan for Town Lake Park, and the joint venture of Barnes Taniguchi Centerbrook (BTC) as the architecture/engineering team for the CEC and parking garage design. WHM Transportation Engineering Consultants, Inc. was brought onto the BTC design team in March 1999 to provide traffic engineering services. The EDAW and BTC teams have been working closely with the City of Austin, the Stakeholders group - an appointed group of citizens which represents ARTS* Center Stage, the CEC, the Bouldin Neighborhood and South Central Coalition of Neighborhoods, and Friends of the Park - as well as the general public to develop a Master Plan for Town Lake Park.

WHM's scope of work has been divided into two distinct phases. Phase One of traffic engineering services was completed prior to an April 13-16, 1999 design charrette sponsored by the City of Austin, EDAW and BTC. Phase One work included determination of parking demand estimates and limited traffic impact studies which provided preliminary analysis results to the Stakeholders and enabled the group to enter into the design charrette process with a basic understanding of traffic issues in the vicinity of the Town Lake Park site. Phase Two of WHM's work was performed after a preliminary master plan was developed at the April 13-16 design charrette. Using the plan developed through the public process, WHM used the CORSIM analysis package to develop a simulation model of the roadway network in the vicinity of the Town Lake Park site to study the impact of removal of Riverside Drive as well as other changes to the surrounding roadway network which will result from construction of the new park. The traffic model simulates traffic operations for over 25 intersections bounded by Second Street on the north, Barton Springs Road on the south, Lamar Boulevard on the west, and Congress Avenue on the east.

Phase Two work consisted of determination of the network impacts of three alternative treatments of Riverside Drive, and development of a series of recommendations regarding operational issues, safety issues, and measures to mitigate problems with each roadway network. The three alternative analysis scenarios are as follows:

1. Project traffic operations on the existing roadway network with the addition of Town Lake Park facilities and other proposed project traffic in the area,
2. Project traffic operations on a roadway network that assumes removal of eastbound traffic lanes on Riverside Drive between South 1st Street and Lamar Boulevard, and
3. Project traffic operations on a roadway network that assumes removal of both directions of traffic on Riverside Drive between South 1st Street and Lamar Boulevard.

Based on analysis of existing and future conditions and in order to provide the safest and most effective movement into and out of the Park as well as movement into and out of the downtown area, the following observations were developed:

- In both the AM and PM analysis results, system delay, stop time, and delay increase with each alternative. In other words, the delay experienced by drivers in the existing network under existing conditions is the lowest delay value. If eastbound Riverside Drive is closed, delay values increase, and they increase even more if westbound Riverside Drive is closed. Average speeds show the opposite pattern, in that speed decreases from existing conditions to Riverside Drive closure.

  The AM peak "Riverside WB Only" simulation shows a 3.4 percent increase in system stop delay from the "Riverside As Is" forecasted condition (438.8 compared to 424.25). Similarly, during the PM peak, a 2.8 percent increase in system stop delay is shown.

  The AM peak "Riverside Closed" simulation shows an 8.1 percent increase in system stop delay from the "Riverside As Is" forecasted condition (458.64 compared to 424.25). Similarly, a 7.5 percent increase is shown in the PM peak.

- Sensitivity analyses identify the necessity for a 15 percent shift in traffic demands from South 1st Street to Lamar Boulevard in the "Riverside Closed" scenario to obtain similar delay results to those found for the "Riverside As Is" scenario. Implementation of a target program to provide incentive for this shift in traffic to occur would be necessary to obtain this level of redistribution in the roadway network.

- In order to obtain delay results similar to the "Riverside As Is" network, traffic volumes in the "Riverside WB Only" network would need to be reduced by one percent, or traffic volumes in the "Riverside Closed" network would need to be reduced by six percent.

- Although a few links which access the Town Lake Park are shown to operate at unacceptable levels during the AM and PM peak periods, this will not be the case during peak periods of demand for the facilities within the park. The facilities within the park will have peak demand periods in the evenings (after the typical peak hour) and on weekends, when adjacent street traffic is much lower than during weekday peak hours as shown in the following figure. Traffic signal timing and phasing plans can and should be developed to accommodate these peak demands and provide for efficient flow in and out of the Park. During extremely heavy demands, police assistance will be required to provide the most efficient access. In any case, event traffic plans which include signal timing and phasing which optimizes Park access can and should be developed in conjunction with construction of the new facilities in the Park.

- The level of traffic associated with Town Lake Park is negligible with respect to the volume of traffic traveling in the roadway network during peak hours. Park traffic comprises only two to three percent of total traffic entering the network. Traffic associated with new projects planned for the downtown area comprises eight to nine percent of future traffic volumes, and consequently, contributes more to overall network operational impacts.

- In order to accommodate potential operational problems identified during simulation of future traffic operations, relatively minor improvement recommendations have been developed. It should be noted that these analyses have evaluated a relatively short timeframe for development activity in the central business district. Due to significant costs associated with major roadway infrastructure improvements for transportation system capacity increases, reduction in trips must be accomplished to provide acceptable operation in the future. Such reduction in trips must be accomplished via stronger public transportation, ridesharing programs, management incentives, and other travel demand management techniques. Travel demand management (TDM) is essential to the successful operation of the City of Austin transportation system. TDM measures strive to balance the distribution of traffic volumes throughout the day so that the heavy peaks are reduced and the capacity of roadways can be used more efficiently throughout the day. Current travel patterns show that capacity problems exist for only a few hours a day. Changes to travel demands via TDM would improve peak hour operating conditions in the overall network.

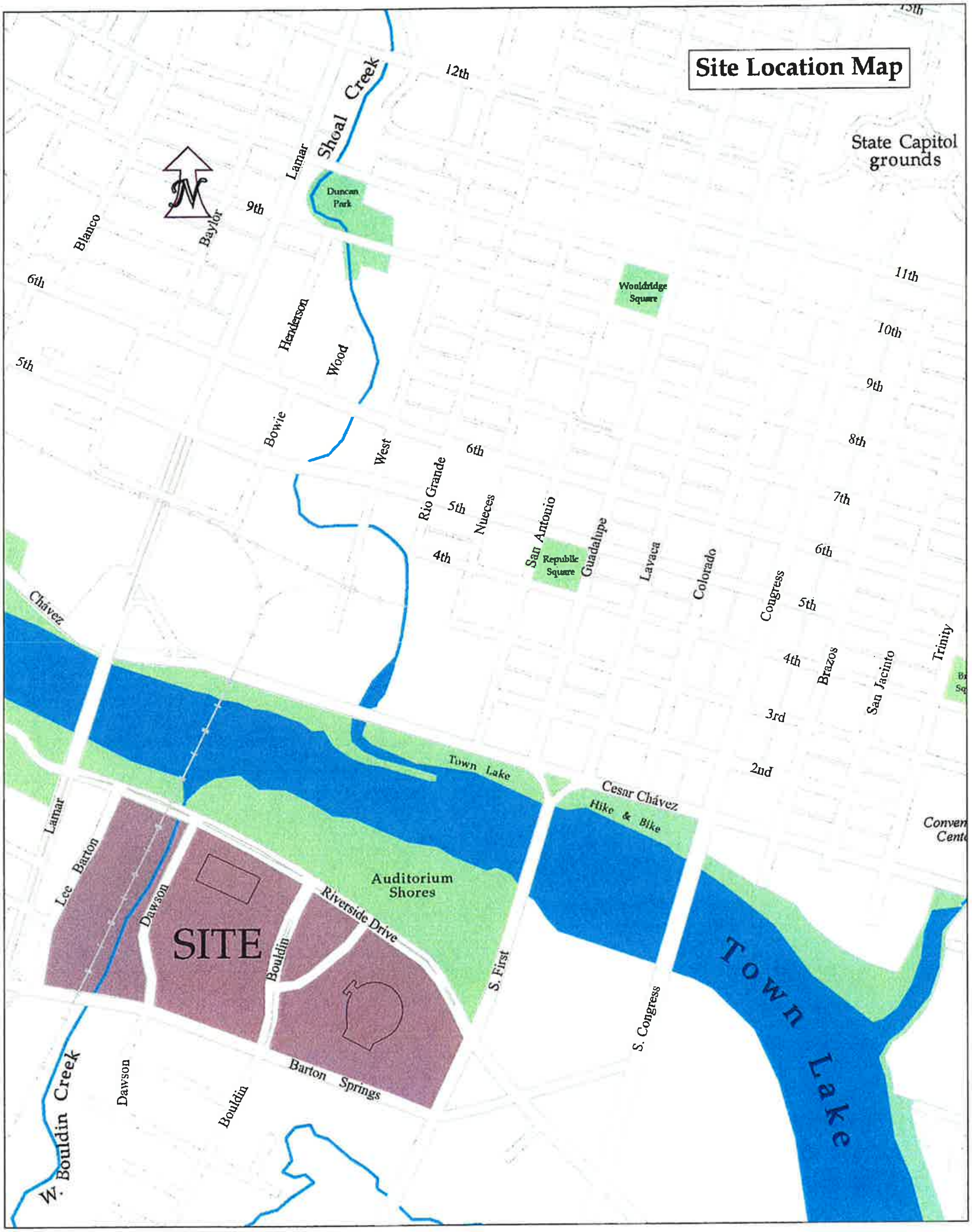
INTRODUCTION

In November 1998, City of Austin voters approved Propositions 11 and 12, which authorized development of the Town Lake Park and construction of a new Community Events Center (CEC) to replace uses currently housed in Palmer Auditorium and the City Coliseum, and a parking garage. Improvements to the 54 acre park will also include renovation of the existing Palmer Auditorium facility with privately raised funds through ARTS* Center Stage. The Site Location Figure shows the location of the Town Lake Park in relation to the City of Austin central business district.

The City of Austin selected EDAW Inc. to develop the master plan for Town Lake Park, and the joint venture of Barnes Taniguchi Centerbrook (BTC) as the architecture/engineering team for the CEC and parking garage design. WHM Transportation Engineering Consultants, Inc. was brought onto the BTC design team in March 1999 to provide traffic engineering services. The EDAW and BTC teams have been working closely with the City of Austin, the Stakeholders group - an appointed group of citizens which represents ARTS* Center Stage, the CEC, the Bouldin Neighborhood and South Central Coalition of Neighborhoods, and Friends of the Park - as well as the general public to develop a Master Plan for Town Lake Park.

WHM's scope of work has been divided into two distinct phases. Phase One of traffic engineering services was completed prior to an April 13-16 design charrette sponsored by the City of Austin, EDAW and BTC. Phase One work included determination of parking demand estimates and limited traffic impact studies which provided preliminary analysis results to the Stakeholders and enabled the group to enter into the design charrette process with a basic understanding of traffic issues in the vicinity of the Town Lake Park site. Phase Two of WHM's work was performed after a preliminary master plan was developed at the April 13-16 design charrette. Using the plan developed through the public process, WHM used the CORSIM analysis package to develop a simulation model of the roadway network in the vicinity of the Town Lake Park site to study the impact of removal of Riverside Drive as well as other changes to the surrounding roadway network which will result from construction of the new park. The traffic model simulates traffic operations for over 25 intersections bounded by Second Street on the north, Barton Springs Road on the south, Lamar Boulevard on the west, and Congress Avenue on the east. The model work enables WHM to evaluate the network impacts of various treatments of Riverside Drive, and led to the development of a series of recommendations regarding operational issues, safety issues, and measures to mitigate problems with the roadway network.

The purpose of the Traffic Impact Analysis (TIA) is to examine the interaction of existing and planned land use activities, their intensity and traffic characteristics, and identify actions that would create a successful, effective and safe development program under both existing and future traffic conditions. The traffic-related characteristics of the proposed development activities require evaluation to determine their effect on the adjacent roadway network. An analysis was conducted that emphasized planned compatibility and synergy from a transportation perspective and evaluated the impact of traffic generated by the project with the findings and recommendations reported herein.


Site Location Map
State Capitol grounds
Shoal Creek
12th
Lamar
Duncan Park
9th
Baylor
Blanco
6th
5th
Henderson
Wood
Wooldridge Square
11th
10th
9th
8th
7th
6th
5th
4th
3rd
2nd
Bowie
West
Rio Grande
6th
5th
4th
Nueces
San Antonio
Republic Square
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Chávez
Town Lake
Cesar Chávez
Hike & Bike
Lamar
Lee Barton
Dawson
SITE
Bouldin
Riverside Drive
Auditorium Shores
S. First
S. Congress
Town Lake
Barton Springs
Dawson
Bouldin
W. Bouldin Creek

PHASE ONE TRAFFIC STUDIES

WHM's scope of work has been divided into two distinct phases. Phase One of traffic engineering services was completed prior to an April 13-16 design charrette sponsored by the City of Austin, EDAW and BTC. Phase One work included determination of parking demand estimates and limited traffic impact studies which provided preliminary analysis results to the Stakeholders and enabled the group to enter into the design charrette process with a basic understanding of traffic issues in the vicinity of the Town Lake Park site.

Parking Demand Estimates

The Parking Demand Analysis Procedure figure shows the step-by-step process used to develop parking demand estimates for the Town Lake Park Project. Assumed users of the Town Lake Park facilities include the following:

- ARTS* Center Stage
- CEC Events
- Dougherty Arts Center
- Town Lake Park patrons
- Park Concessions
- Austin Energy

Each step in the parking demand estimate process is described in more detail below:

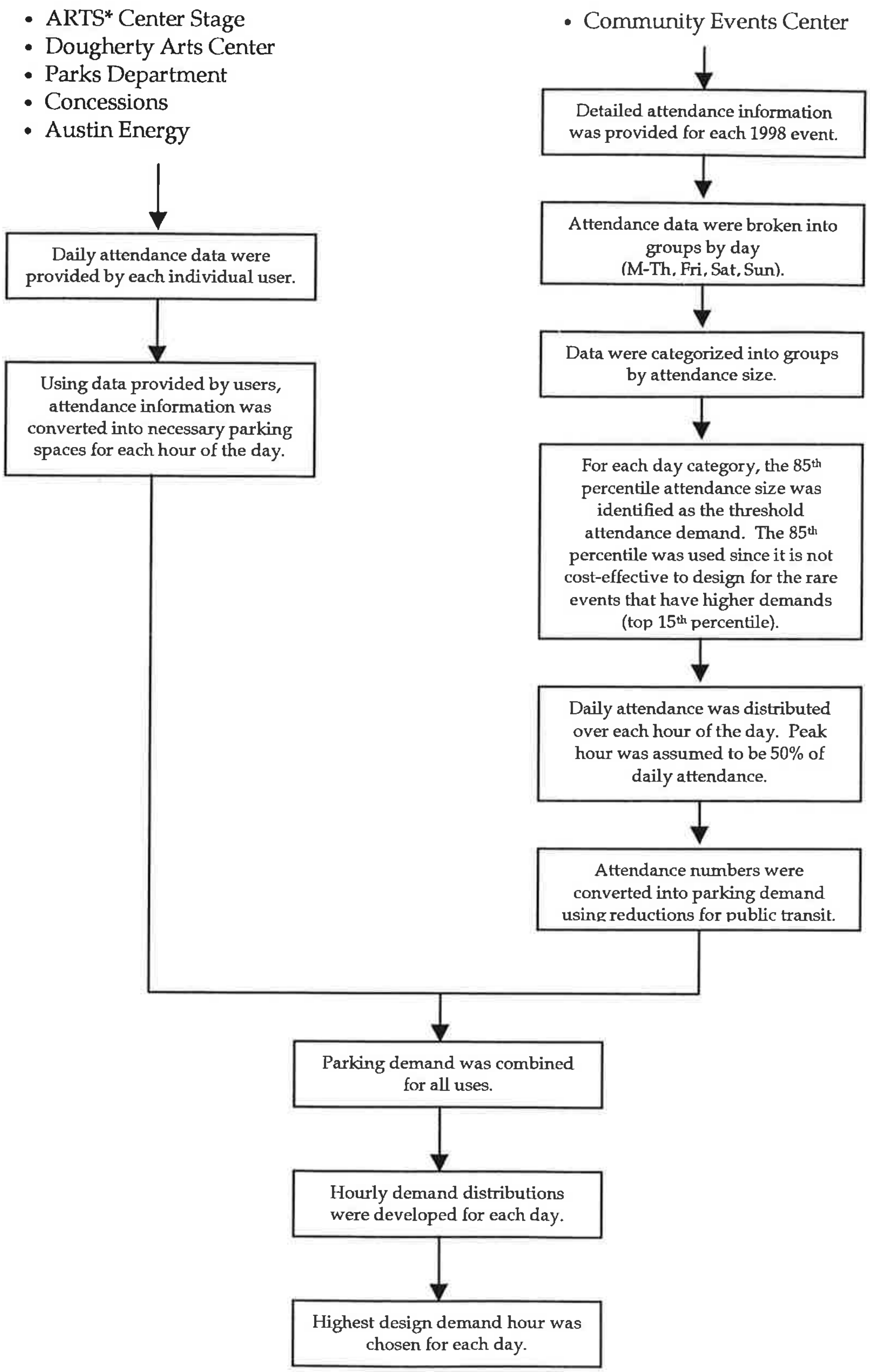
1. Daily attendance data were provided by each user.
2. Data were broken into groups by day (Monday through Thursday, Friday, Saturday, Sunday) since parking and attendance demands vary during different days of the week.
3. Using data provided by users other than the CEC, attendance information was converted into necessary parking spaces for each hour of the day.
4. For the CEC, a more detailed analysis was conducted and consisted of the following steps:
   a. Using attendance information for each 1998 event, data were sorted into groups by day (Monday through Thursday, Friday, Saturday, Sunday).
   b. Data were categorized into groups by attendance size.
   c. For each day category, the 85th percentile attendance size was identified as the threshold attendance demand for events in the CEC. Parking demands are based on the 85th percentile since it is not cost-effective to design for the rare events that have higher demands in the top 15th percentile.
   d. With the 85th percentile value, daily attendance was distributed over each hour of the day. Peak hour was assumed to be 50% of daily attendance.
   e. Attendance numbers were converted into parking demand using reductions for public transit.
5. Parking demand was combined for all uses.
6. Hourly demand distributions were developed for each day.
7. Highest design demand hour was chosen for each day.

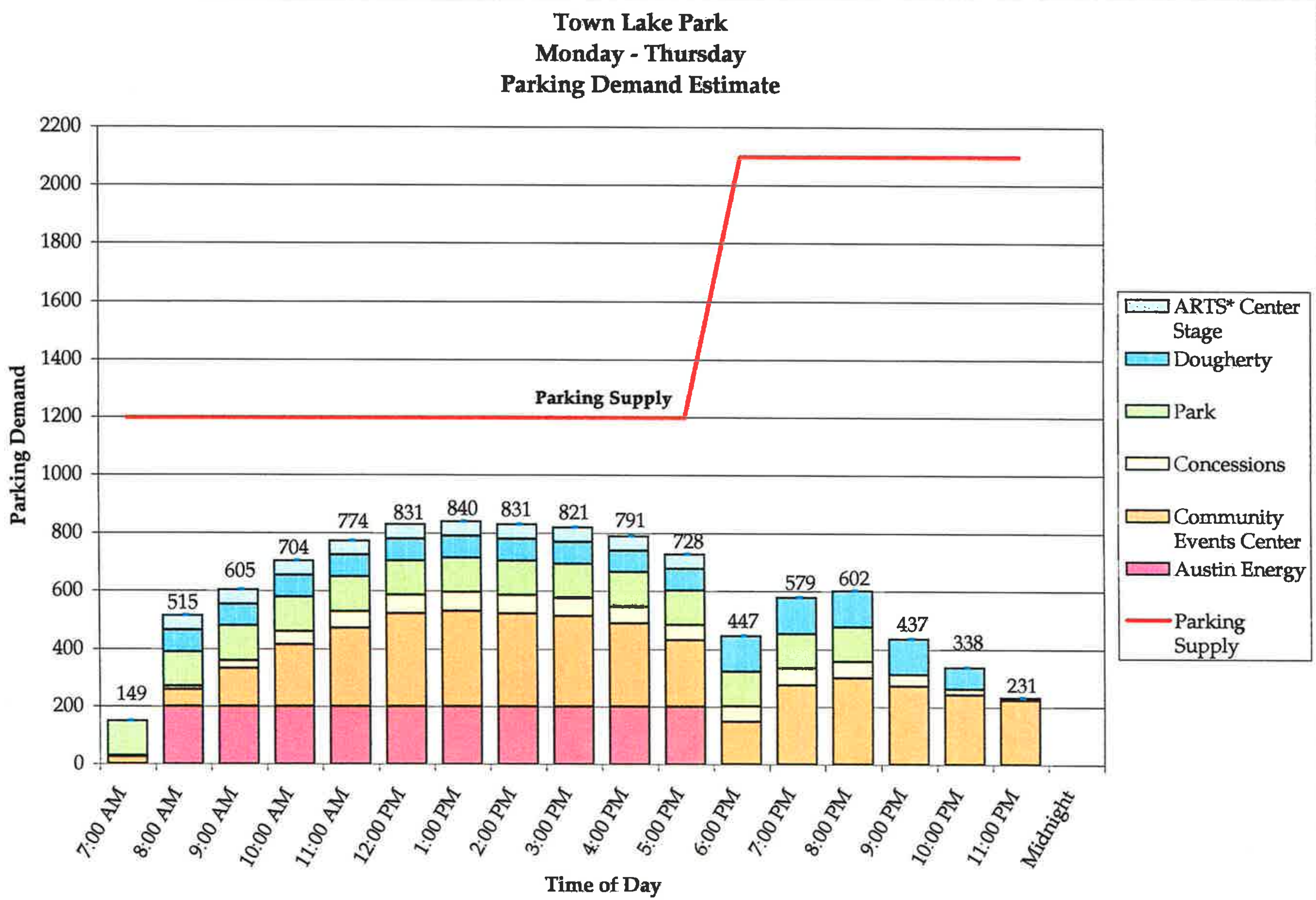
Parking demand frequency curves are shown in the following figures for each demand period (peak demands for Monday through Thursday = 840, Friday = 1772, Saturday = 1778, Sunday =

2008). The proposed parking garage on site will have 1200 parking spaces, and an additional 900 off-site parking spaces will be available at the City of Austin Town Lake Center (721 Barton Springs Road) and One Texas Center (505 Barton Springs Road) parking garages on weekdays after 5:00 PM and on weekends. The design parking demand will be satisfied by the parking supply except for a few hours on Friday. Although the Friday demand is shown to slightly exceed the parking supply during three hours based on data provided by individual users, it is anticipated that events can be coordinated among the entities within the Town Lake Park to avoid the occurrence of simultaneous events which would generate a higher demand than that provided on site or in the off-site garages.

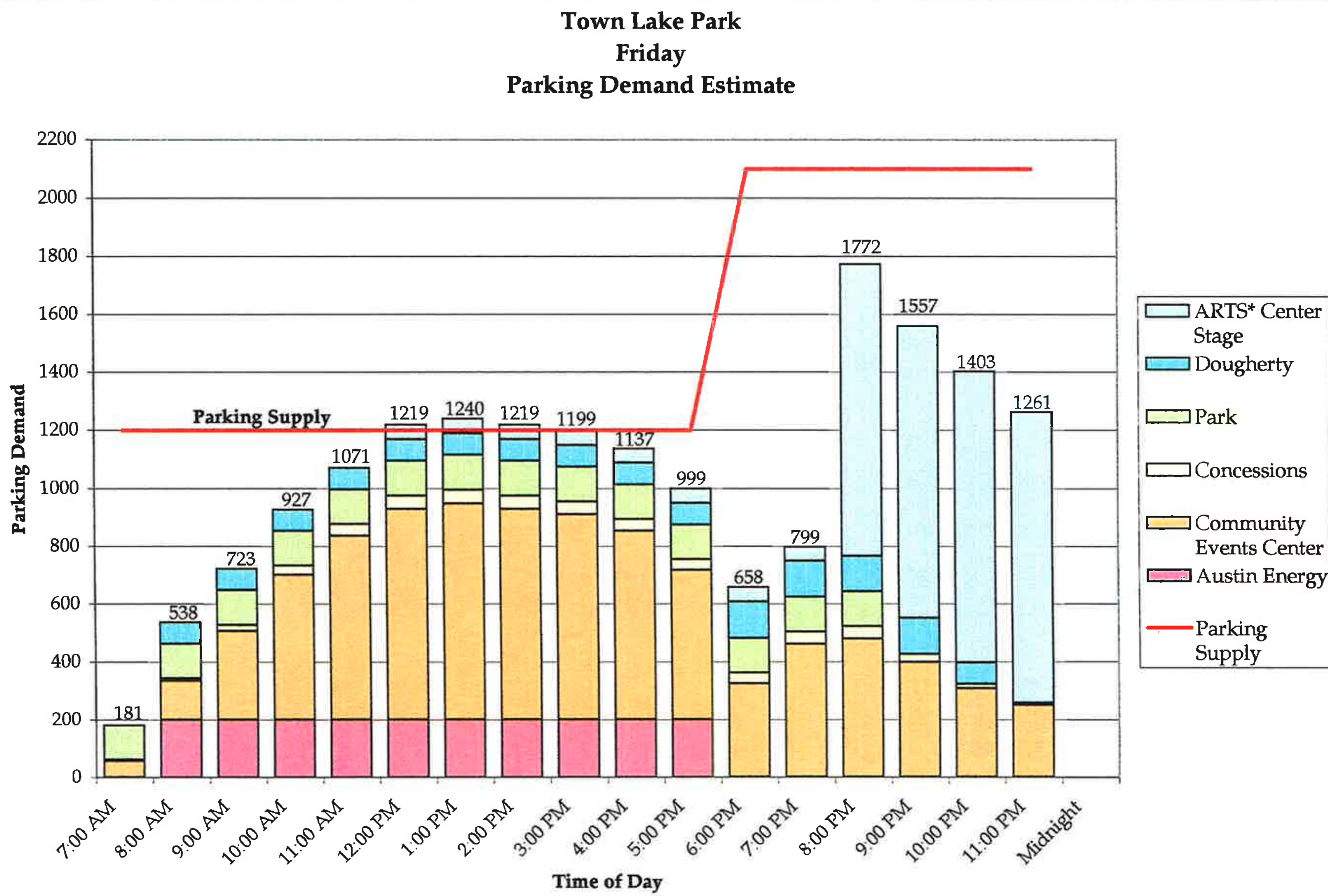
Moreover, the design demand does not provide for events with extremely high parking demands since it is not cost-effective to design for extreme demands (top 15^{th} percentile). When these high demand events occur, it will be necessary to coordinate event schedules among entities of the Town Lake Park and it is also recommended that an event plan be developed to coordinate off-site shuttle services as well as other measures to accommodate these high demand periods.

Parking Demand Analysis Procedure





Note: Demand estimates do not include Austin Lyric Opera since information was not available at the time this document was prepared.



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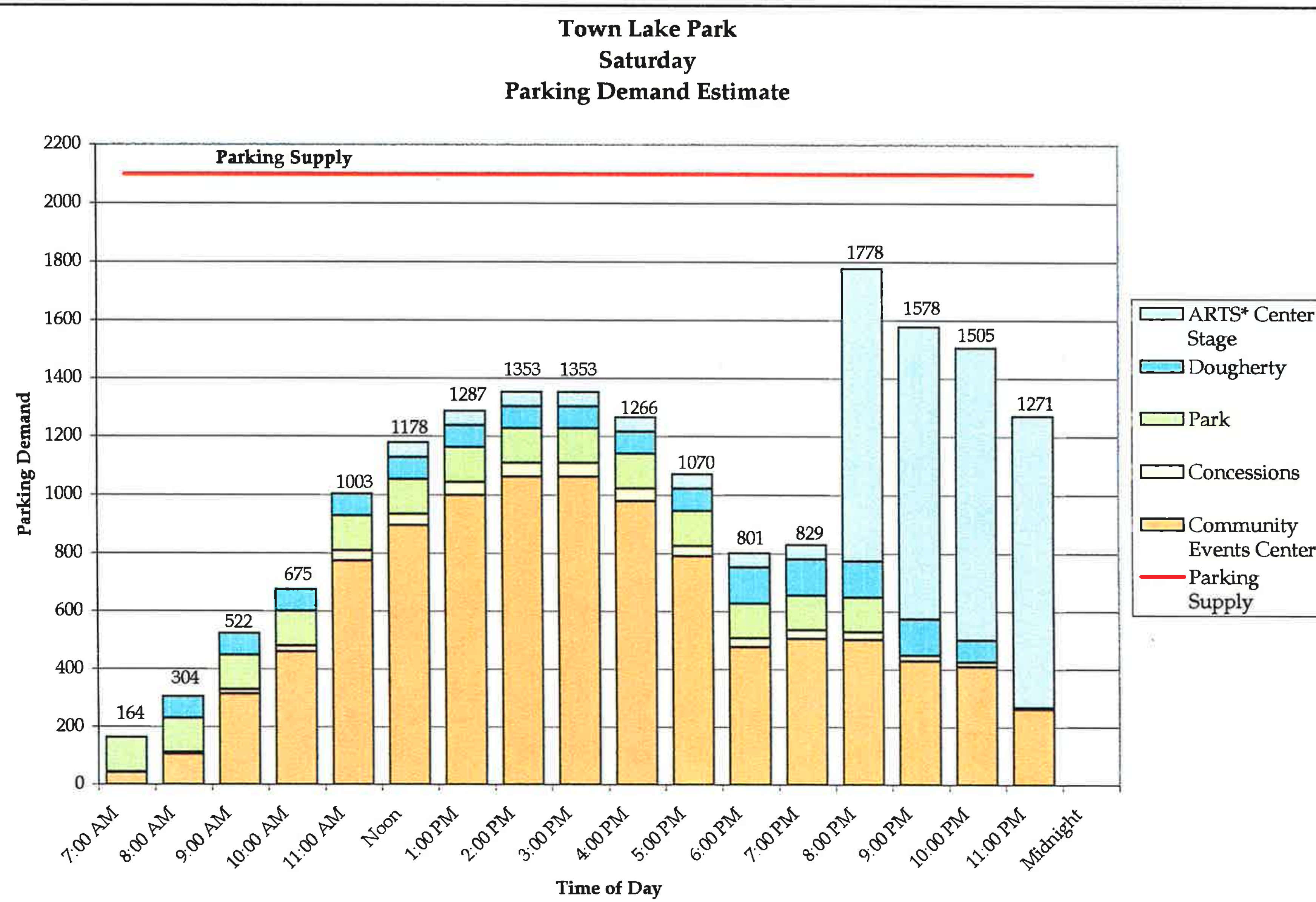

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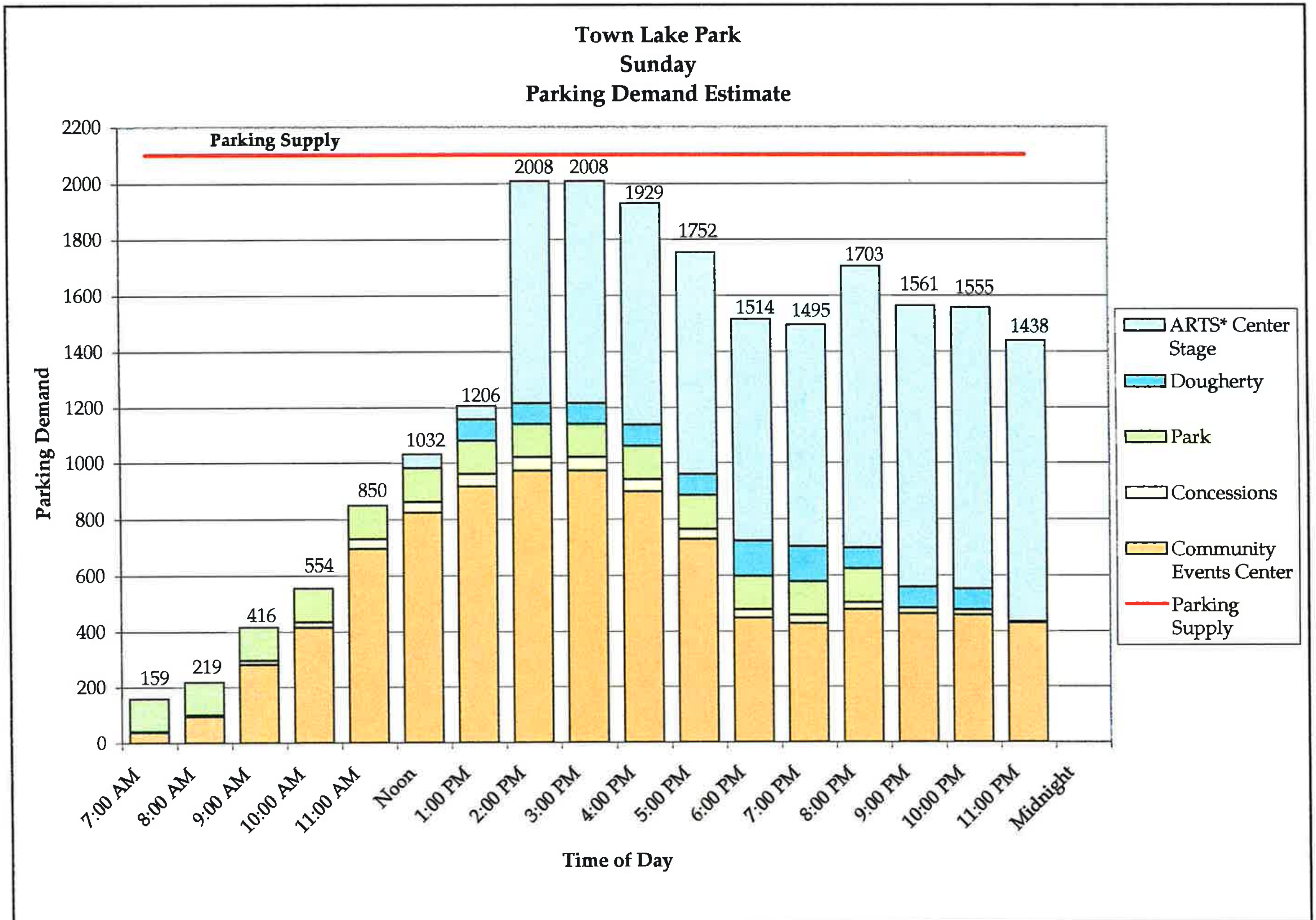


Town Lake Park
Sunday
Parking Demand Estimate
Parking Supply
Parking Demand
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
159
219
416
554
850
1032
1206
2008
2008
1929
1752
1514
1495
1703
1561
1555
1438
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
Noon
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
Midnight
Time of Day
ARTS* Center Stage
Dougherty
Park
Concessions
Community Events Center
Parking Supply

Preliminary Traffic Impact Analyses

A preliminary TIA for the project was conducted using accepted traffic engineering methods and techniques. Existing traffic conditions were examined on area roadways and at selected intersections surrounding the site and compared with traffic conditions that could be expected with various roadway network modifications. A total of 13 alternative roadway network scenarios were analyzed for the preliminary analysis, and the impact of the changes in the roadway network was documented using Highway Capacity Software (HCS) (Ref. 1) to analyze intersections surrounding the site. The preliminary analyses did not consider the network impact of various roadway changes. Due to time constraints associated with meeting the required schedule prior to the April 13-16 design charrette, intersections surrounding the site were analyzed as isolated intersections using HCS assuming the redistribution of existing traffic volumes. The analysis completed after the design charrette, described in more detail in the following sections, considered the network impact of roadway modifications/closures as well as traffic growth associated with other area projects, the airport relocation, and general background traffic growth.

As stated previously, a total of 13 preliminary roadway network scenarios were analyzed for PM peak hour traffic conditions prior to the design charrette. The specifics for 12 of these alternatives are summarized in the Roadway Network Scenario Tables, with the first alternative being to analyze the existing roadway network. The four figures following the Tables show graphically the assumptions for each analysis scenario. In summary, access locations to the Town Lake Park from Barton Springs Road vary in Scenarios 1, 2, and 3. Scenarios 1-A, 2-A, and 3-A assume Riverside Drive remains as is, 1-B, 2-B, and 3-B assume closure of eastbound through lanes on Riverside Drive, and 1-C, 2-C, and 3-C assume closure of through lanes in both directions on Riverside Drive through the Town Lake Park. As described in the Roadway Network Scenario Tables, Scenarios 1-D, 2-D, and 3-D assume turn prohibitions from the Town Lake Park access points along Barton Springs Road to Dawson Road and Bouldin Avenue south of Barton Springs Road.

The analysis completed prior to the April 13-16 charrette indicates that it may be feasible to remove the section of Riverside Drive between South 1st Street and Lamar Boulevard. Given the significant amount of traffic using westbound Riverside Drive currently (daily volumes total 9,000 westbound, and 3,000 eastbound), WHM recommended it would be desirable to maintain westbound traffic flow on Riverside Drive in an April 8 Stakeholder meeting prior to the design charrette. It was the decision of those who worked on the design of the Park during the design charrette to remove Riverside Drive based on WHM's finding that removal of Riverside Drive is a feasible alternative, although not the most desirable one. This decision led to the detailed network analysis conducted by WHM in Phase Two of the traffic studies.

SCENARIO	DRIVEWAY						
	North Dawson	North Bouldin	Riverside Driveway(s)	South Dawson	South Bouldin	Barton Spg Driveway	South First St.
1-A Riverside As Is	Park Only	Closed	Open	Dougherty Only	Closed	Open	Right In/ Right Out
1-B Riverside Westbound Only	Park Only (Left In/ Right In/ Left Out)	Closed	Left In/ Left Out/ Right Out	Dougherty Only	Closed	Open	Right In/ Right Out
1-C Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only	Closed	Open	Right In/ Right Out
1-D Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only Right In/ Right Out South Side	Closed	Open	Right In/ Right Out

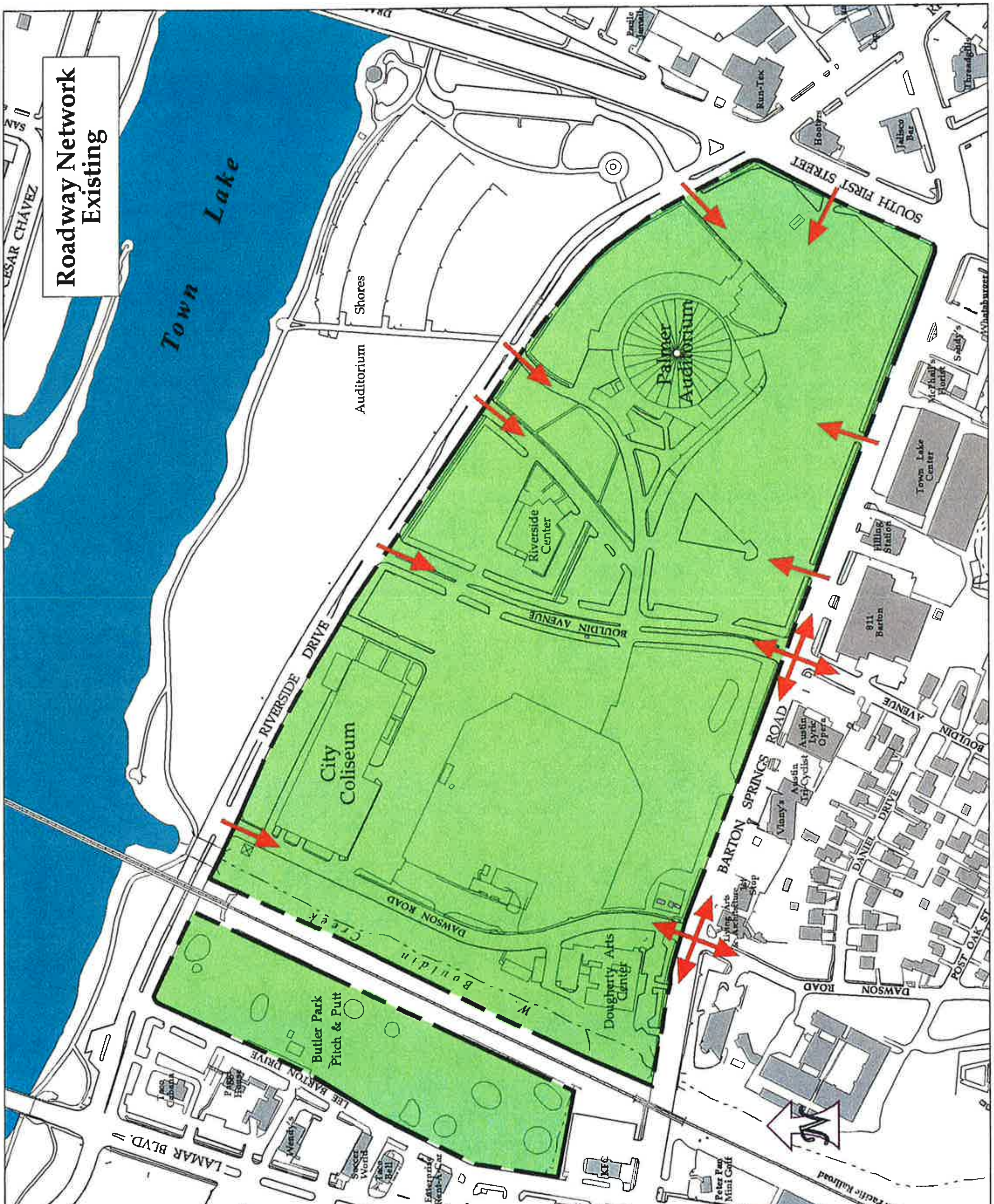
ROADWAY NETWORK SCENARIO 1

SCENARIO	DRIVEWAY						
	North Dawson	North Bouldin	Riverside Driveway(s)	South Dawson	South Bouldin	Barton Spg Driveway	South First St.
2-A Riverside As Is	Park Only	Closed	Open	Dougherty Only	Open	Closed	Right In/ Right Out
2-B Riverside Westbound Only	Park Only (Left In/ Right In/ Left Out)	Closed	Left In/ Left Out/ Right Out	Dougherty Only	Open	Closed	Right In/ Right Out
2-C Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only	Open	Closed	Right In/ Right Out
2-D Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only Right In/ Right Out South Side	Open Right In/ Right Out South Side	Closed	Right In/ Right Out

ROADWAY NETWORK SCENARIO 2

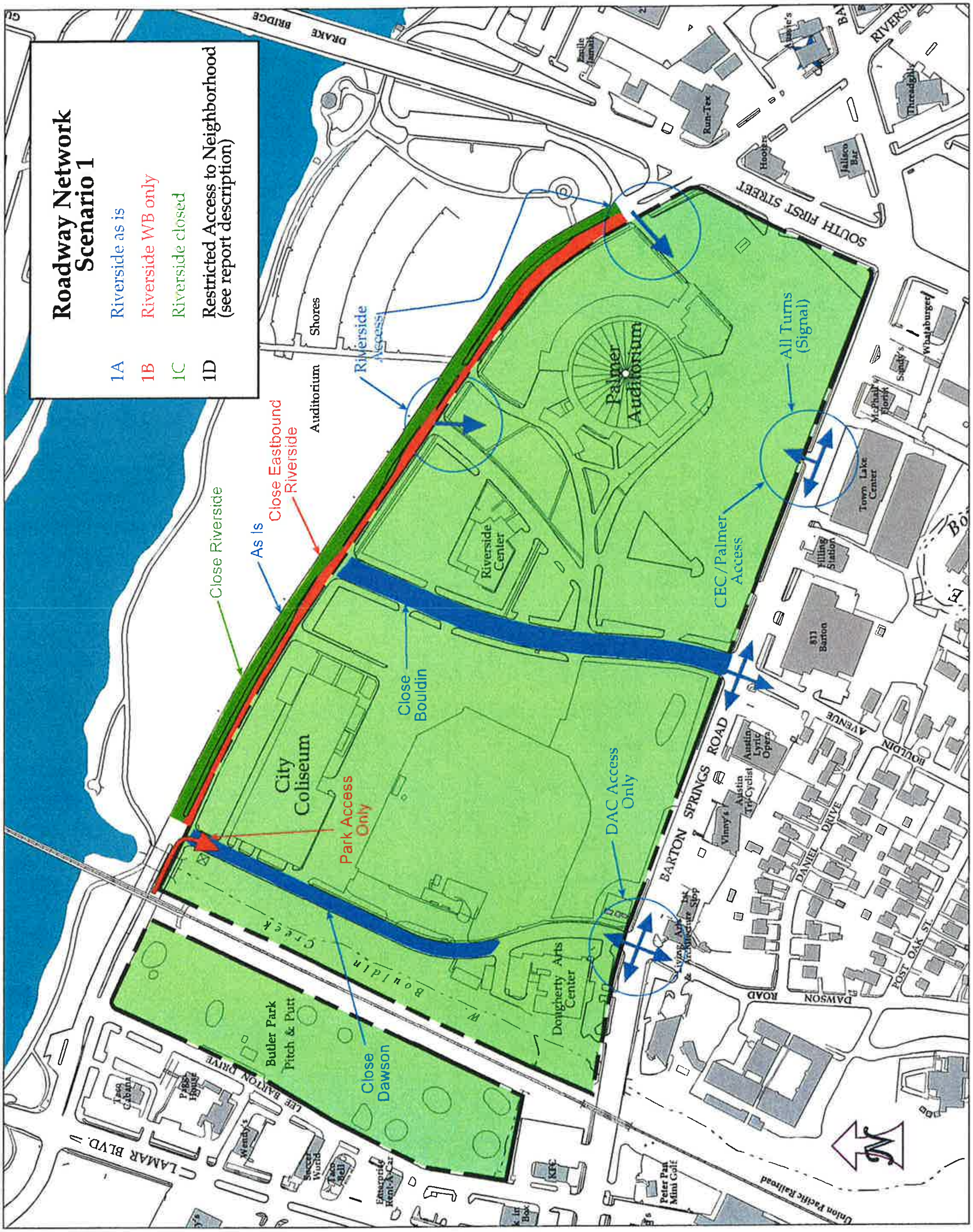
SCENARIO	DRIVEWAY						
	North Dawson	North Bouldin	Riverside Driveway(s)	South Dawson	South Bouldin	Barton Spg Driveway	South First St.
3-A Riverside As Is	Park Only	Closed	Open	Dougherty Only	Open	Open	Right In/ Right Out
3-B Riverside Westbound Only	Park Only (Left In/ Right In/ Left Out)	Closed	Left In/ Left Out/ Right Out	Dougherty Only	Open	Open	Right In/ Right Out
3-C Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only	Open	Open	Right In/ Right Out
3-D Riverside Closed Between 2 Out-side Driveways.	Park Only (Right In/ Left Out)	Closed	Left In/ Right Out	Dougherty Only Right In/ Right Out South Side	Open Right In/ Right Out South Side	Open	Right In/ Right Out

ROADWAY NETWORK SCENARIO 3



WHM Transportation Engineering Consultants, Inc.

Town Lake Park Master Plan
Traffic Impact Analysis



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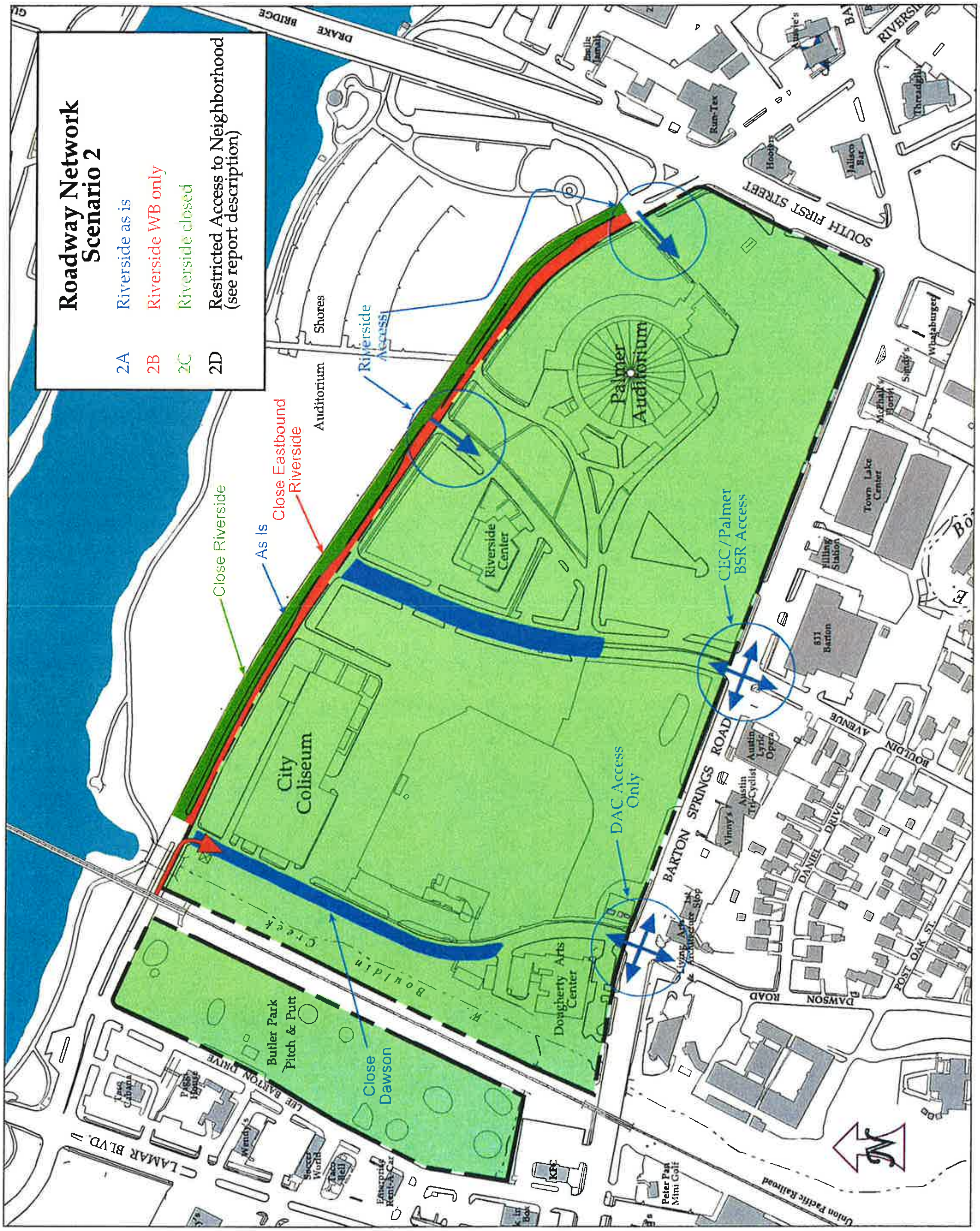
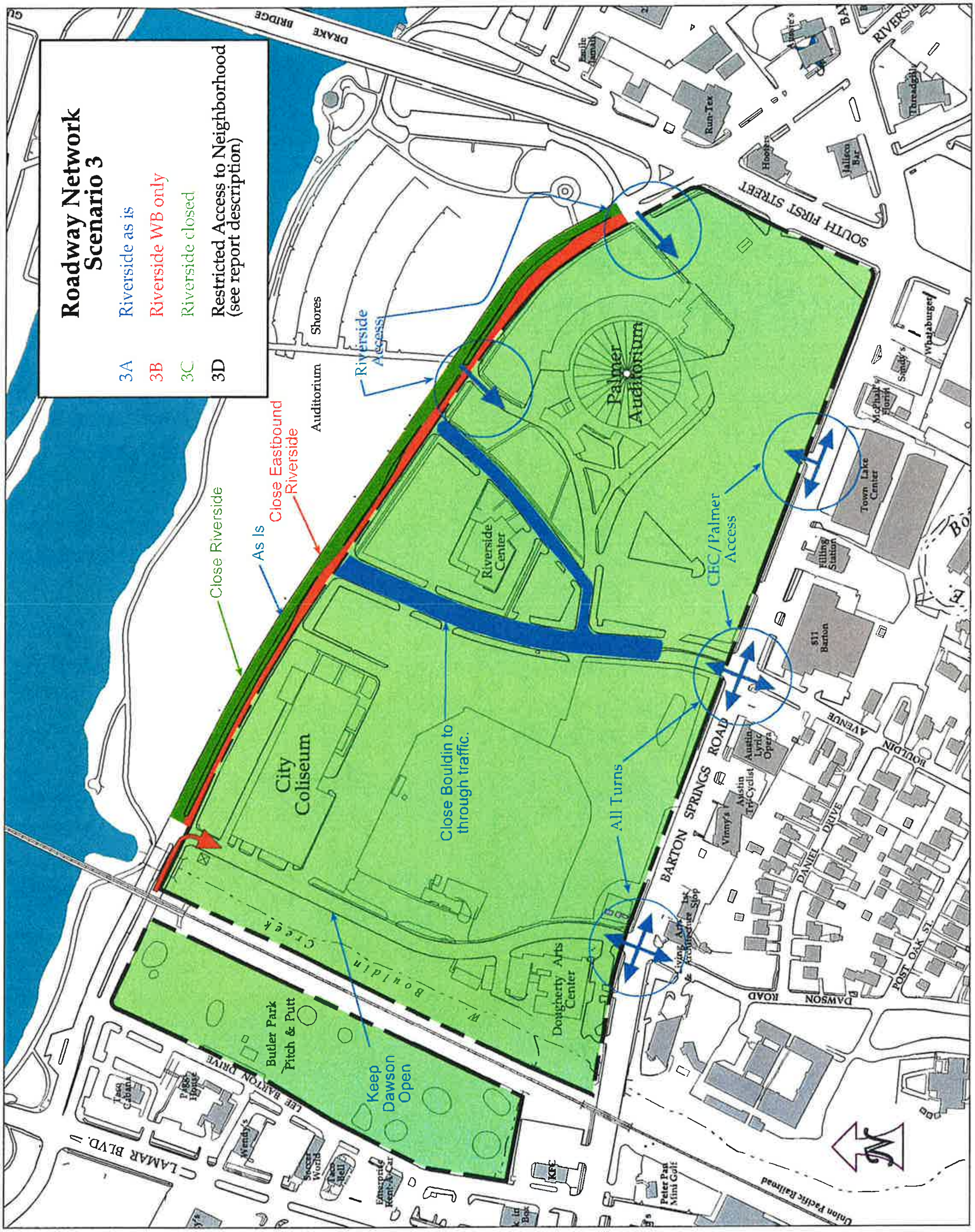

Roadway Network Scenario 2
2A Riverside as is
2B Riverside WB only
2C Riverside closed
2D Restricted Access to Neighborhood (see report description)
Close Riverside
As Is
Close Eastbound Riverside
Riverside Access
CEC/Palmer BSR Access
DAC Access Only
Close Dawson
Palmer Auditorium
City Coliseum
Riverside Center
Dougherty Arts Center
Butler Park Pitch & Putt
Auditorium Shores
Drake Bridge
South First Street
Barton Springs Road
Lee Barton Drive
Lamar Blvd.
Bouldin Avenue
Daniel Drive
Dawson Road
Post Oak St.
Union Pacific Railroad
Town Lake Center
811 Barton
Austin Lyric Opera
Austin Tri-Cyclist
Filling Station
Threadgill's
Jalisco Bar
Hooters
Run-Tex
Whataburger
Taco Cabana
Wendy's
Soccer World
Taco Bell
Enterprise Rent-A-Car
KFC
Peter Pan Mini Golf
Vinny's



WHM Transportation Engineering Consultants, Inc.

Town Lake Park Master Plan
Traffic Impact Analysis

An additional analysis was conducted to estimate the level of Town Lake Park related traffic which would cut-through the Bouldin neighborhood by traveling south on Bouldin Avenue and/or Dawson Road south of Barton Springs Road. The table shown below provides traffic volume estimates for each roadway for each analysis scenario. The right column provides an estimate of the delay incurred by Town Lake Park traffic which is attempting to cut-through the Bouldin neighborhood for each alternative roadway network scenario.

Estimated Peak Hour Traffic on Bouldin Neighborhood Streets

Alternative	Site Traffic on Dawson Road	Total Traffic on Dawson Road	Site Traffic on Bouldin Ave.	Total Traffic on Bouldin Ave.	Delay to Site Cut-Through Traffic (Sec/Veh)
Existing	108	380	88	255	23
1A	137	409	116	283	25
1B	137	411	116	284	29
1C	137	413	116	285	42
1D	30	168	223	308	-
2A	137	409	116	283	36
2B	137	411	116	284	36
2C	137	413	116	285	36
2D	30	168	31	116	-
3A	137	409	116	283	23
3B	137	411	116	284	23
3C	137	413	116	285	23
3D	30	168	31	116	-

PHASE TWO TRAFFIC STUDIES

A Master Plan for Town Lake Park (shown in the following figure) was the result of many hours of collaboration between the City of Austin, the stakeholders, the consultant teams, and the general public during the April 13-16 design charrette. The final product of the design charrette located the CEC and parking garage in the southeast quadrant of the Town Lake Park site near existing Palmer Auditorium. This design enabled the remainder of the site to be dedicated to green space. Riverside Drive was shown to be removed as a through street in the Park, and existing Auditorium Shores, located on the north side of Riverside Drive, was incorporated into the Master Plan.

WHM was engaged to further address the traffic issues in the area with specific focus on the issue of the feasibility of removal of Riverside Drive. The objective of the study was to provide detailed documentation for the following transportation activities:

- Use the CORSIM analysis package to develop a simulation model of the roadway network in the vicinity of the Town Lake Park site to study the impact of removal of Riverside Drive as well as other changes to the surrounding roadway network which will result from construction of the new park.
- Determine the network impacts of three alternative treatments of Riverside Drive, and develop a series of recommendations regarding operational issues, safety issues, and measures to mitigate problems with each roadway network. The three alternative analysis scenarios are as follows:
    1. Project traffic operations on the existing roadway network with the addition of Town Lake Park facilities and other proposed project traffic in the area,
    2. Project traffic operations on a roadway network that assumes removal of eastbound traffic lanes on Riverside Drive between South 1st Street and Lamar Boulevard, and
    3. Project traffic operations on a roadway network that assumes removal of both directions of traffic on Riverside Drive between South 1st Street and Lamar Boulevard.

The traffic models simulate traffic operations for over 25 intersections bounded by Second Street on the north, Barton Springs Road on the south, Lamar Boulevard on the west, and Congress Avenue on the east. It was not the intent of this analysis to recommend any particular roadway network, but to examine the viability of each alternative.

Background

The vehicular traffic situation in the study area has progressively worsened over the years due in part to growth in Austin. Less than desirable responses to public transportation systems, ridesharing programs, travel demand management incentives, etc. also contribute to peak hour traffic congestion. Commuters have few alternatives to driving to and from work in their private automobiles. The fact that the vehicular capacity for crossing Town Lake via the existing bridge structures does not meet current demands, compounds peak hour congestion problems in the area around the Town Lake Park. The intersections within the study area already consume available right-of-way. The City of Austin will most likely not construct major capacity improvements given right-of-way constraints and the substantial capital investment required to do so. This study explores the impact to the roadway network in the vicinity of the Town Lake Park given alternative modifications to Riverside Drive between South 1st Street and Lamar Boulevard. The information contained herein documents the results of development of alternatives and their evaluation, and provides recommendations for improvements.

Network Simulation

One of the most important analytical tools of traffic engineering is computer simulation. If a traffic system is simulated on a computer by means of a simulation model, it is possible to predict the effect of traffic control on the system's operational performance. Operational performance is expressed in terms of measures of effectiveness (MOE), which include average vehicle speed, vehicle stops, delays, vehicle hours of travel, maximum queue length per lane, vehicle miles of travel, and fuel consumption.

CORSIM, a microscopic simulation model, represents movement of individual vehicles, which include the influences of driver behavior (Ref. 2). The effects of very detailed strategies, such as relocating bus stations or changing lane assignments, can be studied with such models. Input parameters using CORSIM are signal phasing and timing, turning movement counts, and intersection and roadway geometry. Observations of vehicular and pedestrian traffic operations were conducted at several locations to note conflicts, patterns and safety issues, and to correlate network simulations to real-world conditions. The CORSIM network coded for the Town Lake Park study area consists of the following intersections and is shown in the CORSIM Network Map figure:

1. South Congress Avenue and Riverside Drive
2. South Congress Avenue and Barton Springs Road
3. Barton Springs Road and W. Riverside Drive
4. South 1st St. and W. Riverside Drive
5. South 1st Street and Barton Springs Road
6. Bouldin Ave. and Barton Springs Road
7. Dawson Road and Barton Springs Road
8. Lee Barton Drive and Barton Springs Road
9. South Lamar Boulevard and Barton Springs Road
10. South Lamar Boulevard and W. Riverside Drive
11. Lee Barton Drive and W. Riverside Drive
12. Bouldin Ave. and W. Riverside Drive
13. Dawson Road and W. Riverside Drive
14. Congress Ave. and Cesar Chavez Street
15. Congress Ave. and 2nd Street
16. Colorado Street and W. Cesar Chavez Street
17. Colorado Street and W. 2nd Street
18. Lavaca Street and W. Cesar Chavez Street
19. Lavaca Street and W. 2nd Street
20. Guadalupe Street and W. Cesar Chavez Street
21. Guadalupe Street and W. 2nd Street
22. San Antonio Street and W. Cesar Chavez Street

23. N. Lamar Boulevard and Sandra Muraida Way/B.R. Reynolds
24. Sandra Muraida Way and W. Cesar Chavez Street
25. B. R. Reynolds Drive and W. Cesar Chavez Street

The CORSIM traffic simulation model provides network MOE's such as average vehicle speed, vehicle stops, delays, vehicle hours of travel, maximum queue lengths per lane, vehicle miles of travel, and fuel consumption for each link and for the entire network. Average link stopped delay resulting in LOS D or greater was established as the criteria for highlighting problem areas along the network and to provide a basis of comparison among the three roadway network conditions.

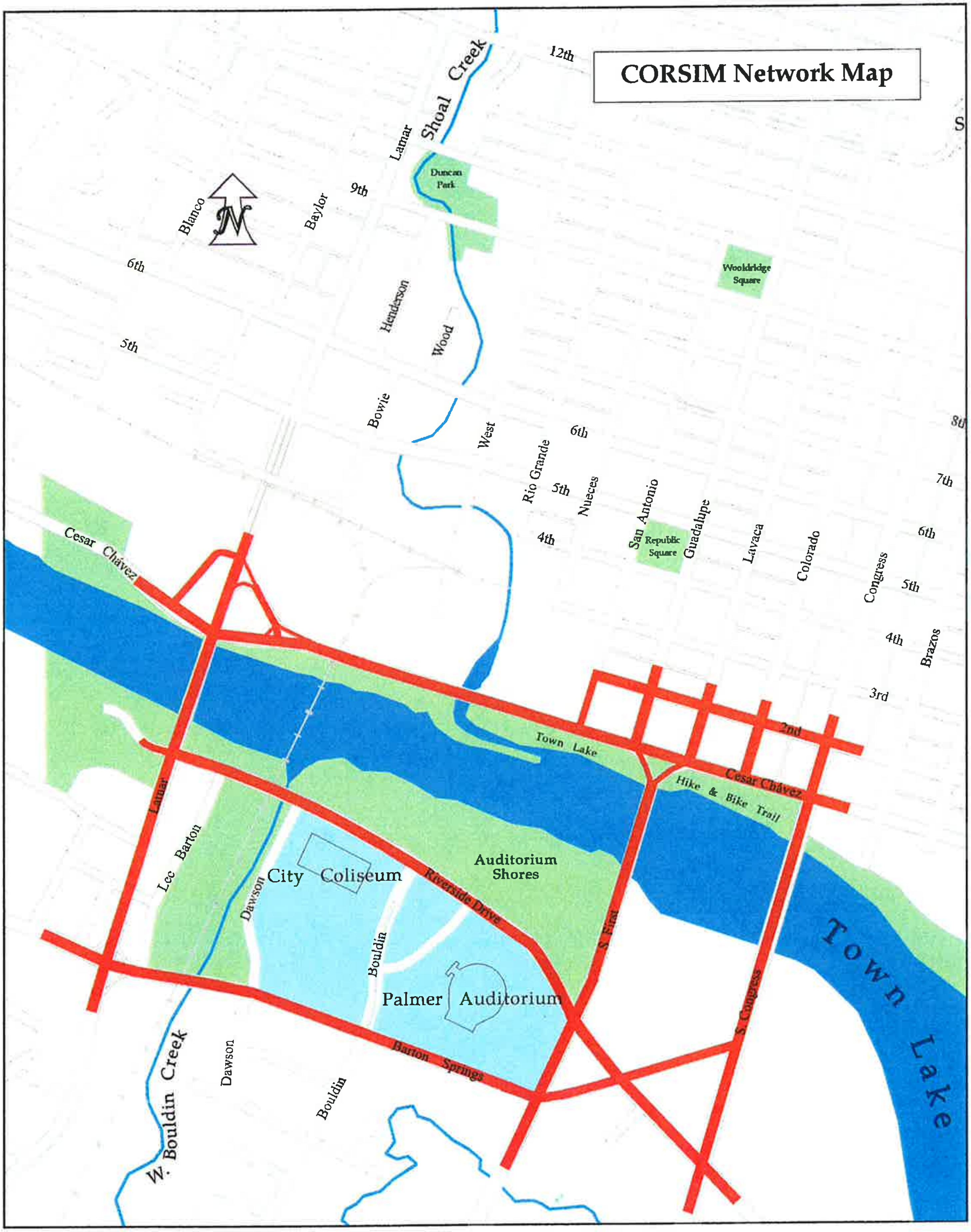
Intersection LOS is defined in terms of stopped delay, which is a direct and/or indirect measure of driver discomfort, frustration, fuel consumption, and lost travel time. The levels of service have been established based on driver acceptability of various delays. The delay for each approach lane group is calculated based on a number of factors including lane geometrics, percent of trucks, peak hour factor, number of lanes, signal progression, volume, signal green time to total cycle time ratio, roadway grades, pedestrian volume, and parking activity. In general, levels of service for intersection movements of A to D are acceptable, while an overall LOS of E or F is unacceptable. Following is a table which summarizes the levels of service that are appropriate for different levels of average stopped delay, and a qualitative description for each.

Intersection Level of Service
Measurement and Qualitative Descriptions (Ref. 3)

	Stopped Delay per Vehicle (sec)		
Level of Service	Signalized Intersection	Unsignalized Intersection	Qualitative Description
A	<5.0	<5.0	▪ Good progression and short cycle lengths
B	5.1 to 15.0	5.1 to 10.0	▪ Good progression or short cycle lengths, more vehicle stops
C	15.1 to 25.0	10.1 to 20.0	▪ Fair progression and/or longer cycle lengths, some cycle failures
D	25.1 to 40.0	20.1 to 30.0	▪ Congestion becomes noticeable, high volume to capacity ratio
E	40.1 to 60.0	30.1 to 45.0	▪ Limit of acceptable delay, poor progression, long cycles, and/or high volume
F	>60.0	>45.0	▪ Unacceptable to drivers, volume greater than capacity

Results of network simulations are summarized in tables in the following paragraphs, with statistical results detailed in the Appendix Report. Each of these tables identifies the direction of interest, the link boundaries, stopped delay, and level of service (LOS).


Town Lake Park Master Plan



WHM Transportation Engineering Consultants, Inc.

Town Lake Park Master Plan
Traffic Impact Analysis

Existing Conditions

The Town Lake Park study network was first simulated using existing traffic volumes and signal timing and phasing information to assess the performance of the network for two peak periods, AM (7:30 AM to 8:30 AM) and PM (5:00 PM to 6:00 PM).

AM Peak Evaluation - The AM peak analysis is summarized in the following figure. As shown, ten links were identified as problem areas based on the screening criteria (problem links are identified with red). However, when the overall intersection level of service was calculated for each intersection, no intersections were found to operate at unacceptable levels of service. The intersection LOS is computed as a weighted average of vehicle delay; therefore, an intersection may have an overall LOS C or D and have individual movements (or approaches) which are LOS E or F, since the majority of traffic is served at an acceptable level of service and minor movements are provided less capacity via signal timing and phasing.

In general, traffic flows well on the existing roadway network during the morning peak hour. Traffic conditions at the following locations warrant mentioning as locations of congestion:

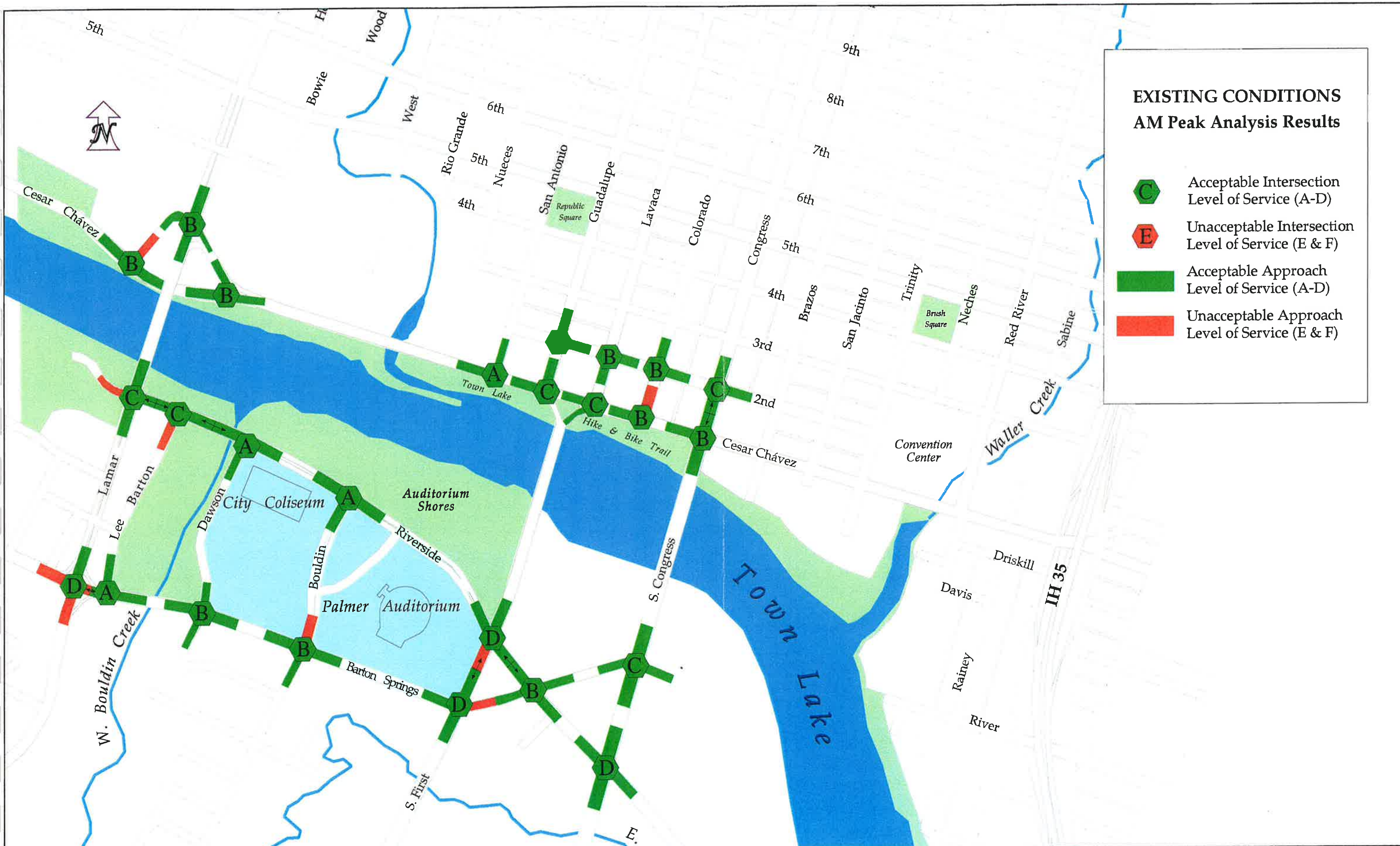
- Intersection of Lamar Boulevard and Barton Springs Road – Significant queuing occurs on the northbound, eastbound, and westbound approaches as commuters enter the central business district from the south and west.
- Lamar Boulevard – Heavy queuing on Lamar Boulevard occurs in the northbound direction south of 5th Street. The queue backs up beyond B.R. Reynolds Drive/Sandra Muraida Way to the middle of the Lamar Boulevard bridge.
- Eastbound Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the morning peak hour. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.
- South 1st Street Bridge – Northbound queues at the Lavaca Street and Cesar Chavez Street intersection extend across approximately one-fourth of the South 1st Street bridge.
- Congress Avenue Bridge – Northbound queues at the Congress Avenue and Cesar Chavez Street intersection extend across approximately one-fourth of the Congress Avenue bridge.
- Westbound Riverside Drive at Lamar Boulevard – Right turning vehicles on Riverside Drive experience significant queuing at this intersection during existing conditions.

PM Peak Evaluation - The PM peak analysis is summarized in the following figure. As shown, seven links were identified as problem areas based on the screening criteria. When the overall intersection level of service was calculated for each intersection, only one intersection (Congress Avenue and Riverside Drive) was found to operate at an unacceptable level of service.

In general, traffic flows well on the existing roadway network during the evening peak hour. Traffic conditions at the following locations warrant mentioning as locations of congestion:

- Lamar Boulevard – Heavy queuing on Lamar Boulevard occurs in the southbound direction north of Riverside Drive. The queue extends regularly across one-half of the Lamar Boulevard bridge, and often beyond that.
- South 1st Street Bridge – Southbound queues at the South 1st Street and Riverside Drive intersection extend across approximately two-thirds of the South 1st Street bridge.

- Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the evening peak hour. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.
- Congress Avenue and Riverside Drive Intersection – Southbound queues at this intersection extend beyond the Barton Springs Road intersection. This intersection operates at an unacceptable level of service, as shown by queuing on the southbound approach as well as the eastbound and westbound approaches.
- Westbound Riverside Drive and Lamar Boulevard – Right turning vehicles on Riverside Drive experience significant queuing at this intersection during existing conditions.



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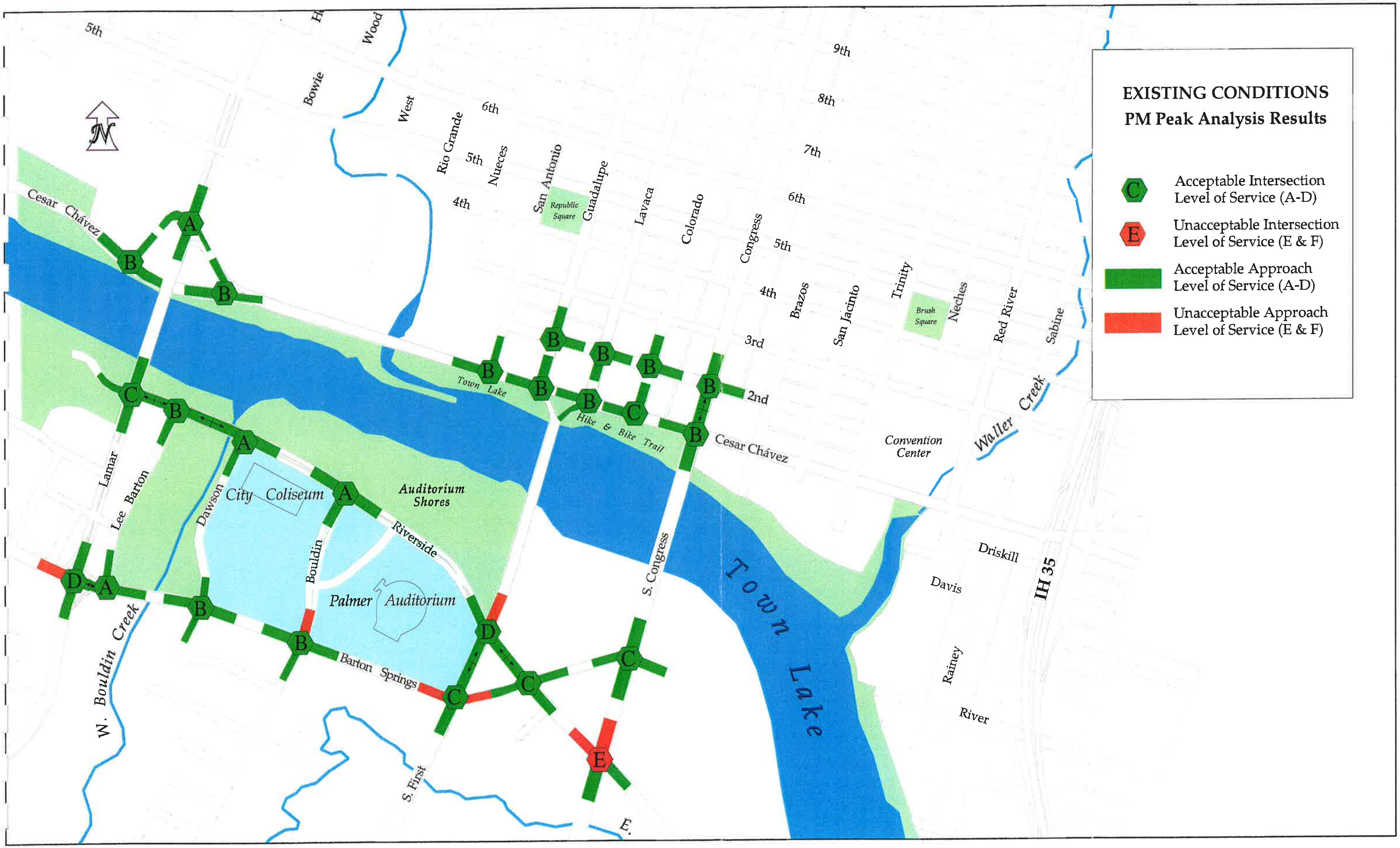

EXISTING CONDITIONS
PM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
Cesar Chávez
Town Lake Hike & Bike Trail
City Coliseum
Auditorium Shores
Palmer Auditorium
Riverside
Barton Springs
Lamar
Lee Barton
Dawson
Bouldin
W. Bouldin Creek
S. First
S. Congress
Town Lake
Convention Center
Waller Creek
Republic Square
Brush Square
Driskill
Davis
Rainey
River
IH 35
5th
6th
7th
8th
9th
4th
3rd
2nd
Bowie
West
Wood
Rio Grande
Nueces
San Antonio
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Neches
Red River
Sabine

Future Conditions

For the future condition, the Town Lake Park study area was simulated using optimized signal timing and existing intersection geometry information to assess the performance of the network for two peak periods, AM and PM, for each of the three roadway network scenarios. A growth rate of 0.5 percent was applied in the analysis to account for background traffic growth over the next six years to 2005. The Emerging Projects Figure shows other planned projects for which traffic estimates were included in the simulation. The list of background projects to include in the simulation was developed based on discussions with City of Austin staff. Also included were traffic associated with the Austin-Bergstrom International Airport and with the assumed infill of property in the area between South 1st Street and Congress Avenue near the intersection of Barton Springs Road and Riverside Drive. The time period for the future condition simulations was assumed to be the year 2005. The Appendix Report shows traffic volume assumptions for each network entry point for existing and future traffic conditions.

For future traffic conditions, the following operational modifications were made to the roadway network. These assumed improvement recommendations were developed based on the knowledge of limitations in right-of-way which exist in the central business district and which would preclude addition of vehicular capacity through roadway widening projects. Given this limitation, minor improvements related to roadway widening were assumed for the analyses. Capacity limitations were mitigated using traffic signal timing and phasing changes, lane use changes, and minor turn lane extensions and/or construction.

- ❖ Construct a 300 foot westbound right turn bay and the Congress Avenue and Riverside Drive intersection.
- ❖ Extend the existing westbound left turn bay at the Congress Avenue and Riverside Drive intersection from 230 feet to 300 feet.
- ❖ Extend the northbound South 1st Street left turn bay 90 feet at the Barton Springs Road intersection.
- ❖ Modify lane use assignments at the Guadalupe Street and Lavaca Street intersections with 2nd Street.
- ❖ Signalize the intersection of Cesar Chavez Street with Colorado Street (assumed to occur with proposed development in the area).

Network modifications associated with Town Lake Park construction include removal of Dawson Road and Bouldin Avenue between Riverside Drive and Barton Springs Road. Also, the intersection of the proposed Town Lake Park parking garage driveway on Barton Springs Road is assumed to be signalized in all future analyses.

With the assumed improvements, it is not likely that capacity limitations will be mitigated to the extent of obtaining acceptable operating levels at all intersections within the study network. Rather, the improvements which have been suggested optimize traffic flow through the network and strive to maintain steady traffic operations. It is to be expected that a few intersections within the central business district, as well as those immediately south of Town Lake, will operate at an unacceptable level during peak hours. The intent of the future conditions analyses it to obtain the relative difference in delays experienced by drivers traveling through the network given the alternative modifications to Riverside Drive.

Riverside Drive As Is (Between South 1st Street and Lamar Boulevard)

AM Peak Evaluation - The AM peak analysis is summarized in the following figure. As shown, nine links were identified as problem areas based on the screening. When the overall intersection level of service was calculated for each intersection, only one intersection was found to operate at an unacceptable level of service (South 1st Street and Barton Springs Road).

In general, traffic flow is similar to the existing roadway network during the morning peak hour, with the problem areas similar to current problem areas. Traffic conditions at the following locations warrant mentioning as locations of congestion:

- Intersection of Lamar Boulevard and Barton Springs Road – Queuing occurs on the approaches to this intersection, but operations have improved from existing conditions via signal timing and phasing modifications.
- Lamar Boulevard – Heavy queuing on Lamar Boulevard occurs in the northbound direction south of 5th Street. The queue backs up beyond B.R. Reynolds Drive/Sandra Muraida Way to the middle of the Lamar Boulevard bridge.
- Eastbound Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the morning peak hour. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.
- South 1st Street Bridge – Northbound queues at the Lavaca Street and Cesar Chavez Street intersection extend across approximately one-third of the South 1st Street bridge.
- Congress Avenue Bridge – Northbound queues at the Congress Avenue and Cesar Chavez Street intersection extend across approximately one-fourth of the Congress Avenue bridge.
- Westbound Riverside Drive at Lamar Boulevard – Right turning vehicles on Riverside Drive experience significant queuing at this intersection during forecasted conditions.
- South 1st Street at Barton Springs Road – This intersection is the only one shown to operate at unacceptable levels. The poor level of service is due to the significant queues on the northbound and eastbound approaches to the intersection.

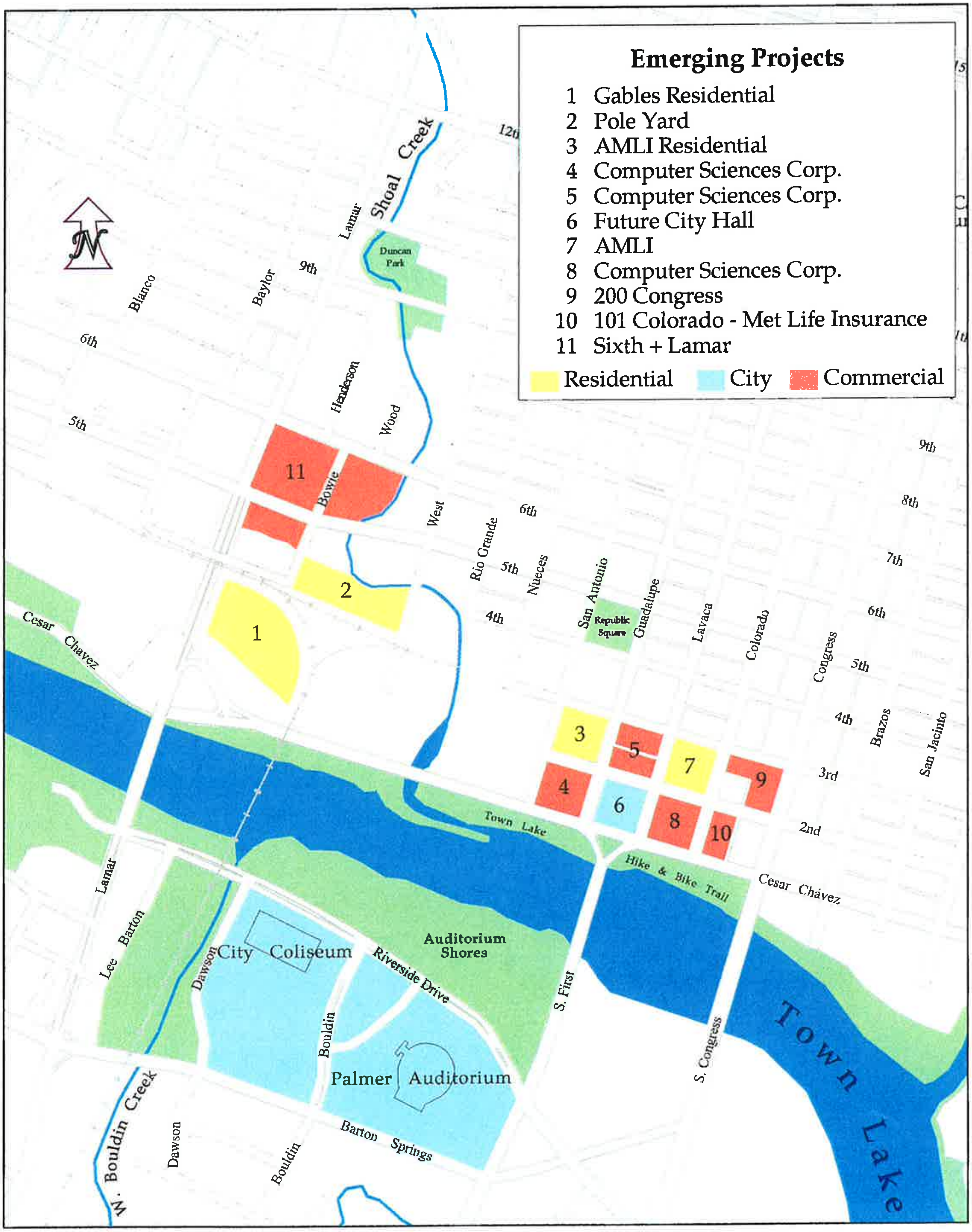
PM Peak Evaluation - The PM peak analysis is summarized in the following figure. As shown, six links were identified as problem areas based on the screening criteria. When the overall intersection level of service was calculated for each intersection, only one intersection (Colorado Street and 2nd Street) was found to operate at an unacceptable level of service.

In general, traffic flow is similar to the existing roadway network during the evening peak hour, with the problem areas similar to current problem areas. Traffic conditions at the following locations warrant mentioning as locations of congestion:

- Lamar Boulevard – Heavy queuing on Lamar Boulevard occurs in the southbound direction north of Riverside Drive. The queue backs up regularly across one-half of the Lamar Boulevard bridge, and often beyond that.
- South 1st Street Bridge – Southbound queues at the South 1st Street and Riverside Drive intersection extend across approximately two-thirds of the South 1st Street bridge.
- Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the evening peak hour. While traffic flow is heavy along this roadway, progression is

maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.

- Congress Avenue and Riverside Drive Intersection – Eastbound queues at this intersection extend beyond the Barton Springs Road intersection almost to South 1st Street, causing friction in the area where Barton Springs Road and Riverside Drive intersect. However, the intersection operates at an acceptable level due to minor intersection improvements mentioned previously.
- Westbound Riverside Drive and Lamar Boulevard – Right turning vehicles on Riverside Drive experience significant queuing at this intersection during forecasted conditions.
- The proposed projects in the downtown area near Cesar Chavez Street and Lavaca Street which were included in the forecasted traffic analysis impact the volume of traffic on the roadway network in that area. Therefore, queuing at the four intersections formed by Lavaca, Guadalupe, 2nd, and Cesar Chavez Streets indicates an increase in congestion due to the additional traffic introduced to the roadway network by these emerging projects.



WHM Transportation Engineering Consultants, Inc.

Town Lake Park Master Plan
Traffic Impact Analysis


2005 FORECASTED CONDITIONS
Riverside Drive As Is
AM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
Cesar Chávez
Lamar
Lee Barton
W. Bouldin Creek
Dawson
Bouldin
Barton Springs
S. First
Riverside
Auditorium Shores
Town Lake
Hike & Bike Trail
S. Congress
E.
Convention Center
Waller Creek
Driskill
Davis
Rainey
River
IH 35
Republic Square
Brush Square
Bowie
West
Wood
Rio Grande
Nueces
San Antonio
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Neches
Red River
Sabine
9th
8th
7th
6th
5th
4th
3rd
2nd

2005 FORECASTED CONDITIONS
Riverside Drive As Is
PM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
Town Lake
Auditorium Shores
Hike & Bike Trail
Convention Center
Republic Square
Brush Square
Cesar Chávez
Riverside
Barton Springs
Lamar
Lee Barton
S. Congress
S. First
W. Bouldin Creek
Waller Creek
Dawson
Bouldin
Driskill
Davis
Rainey
River
IH 35
Bowie
West
Rio Grande
Nueces
San Antonio
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Neches
Red River
Sabine
Wood
5th
6th
4th
9th
8th
7th
3rd
2nd
E.

Riverside Drive Westbound Only (Between South 1st Street and Lamar Boulevard)

For this analysis scenario, travel on Riverside Drive is limited to one lane in the westbound direction between South 1st Street and Lee Barton Drive (east of Lamar Boulevard). No eastbound flow is assumed on Riverside Drive in this section.

AM Peak Evaluation - The AM peak analysis is summarized in the following figure. As shown, eight links were identified as problem areas based on the screening. When the overall intersection level of service was calculated for each intersection, only one intersection was found to operate at an unacceptable level of service (South 1st Street and Barton Springs Road).

In general, traffic flow is similar to the previous roadway network condition (Riverside As Is) during the morning peak hour. Since eastbound Riverside Drive carries low traffic volumes, the impact of removal of this direction of flow has little effect on overall network operations. The major impact is seen with the reduction of Riverside Drive to a one lane section, which results in shorter queues for the right turn maneuver from Riverside Drive to Lamar Boulevard, and results in longer queues on the South 1st Street bridge as a result of drivers altering travel paths from Riverside Drive. Traffic conditions at the following locations warrant mentioning as locations of congestion:

- Lamar Boulevard – Heavy queuing on Lamar Boulevard occurs in the northbound direction south of 5th Street. The queue extends across the Lamar Boulevard bridge to Riverside Drive.
- Eastbound Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the morning peak hour. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.
- South 1st Street Bridge – Northbound queues at the Lavaca Street and Cesar Chavez Street intersection extend across approximately one-half of the South 1st Street bridge.
- Congress Avenue Bridge – Northbound queues at the Congress Avenue and Cesar Chavez Street intersection extend across approximately one-fourth of the Congress Avenue bridge.
- Westbound Riverside Drive at Lamar Boulevard – Right turning vehicles on Riverside Drive experience queuing at this intersection during existing conditions; however, queues are shorter with this network analysis since the demand for travel on Riverside Drive is decreased with the reduction from two to one westbound travel lane.
- South 1st Street at Barton Springs Road – This intersection is the only one shown to operate at unacceptable levels. The poor level of service is due to significant queues on the northbound approach to the intersection.

PM Peak Evaluation - The PM peak analysis is summarized in the following figure. As shown, ten links were identified as problem areas based on the screening criteria. When the overall intersection level of service was calculated for each intersection, no intersections were found to operate at unacceptable levels of service.

Traffic flow is similar to the previous roadway network condition (Riverside As Is) during the evening peak hour. Traffic conditions at the locations discussed for the Riverside As Is condition apply for this condition as well. In addition, the following warrants mentioning:

- Westbound Riverside Drive and Lamar Boulevard – Right turning vehicles on Riverside Drive experience less queuing at this intersection given the reduction in demand resulting from reduction of Riverside Drive to one, rather than two, westbound travel lanes. This reduction in demand has a positive impact on traffic flow along Lamar Boulevard since fewer cars are entering the Lamar Boulevard traffic stream at the Riverside Drive intersection.


2005 FORECASTED CONDITIONS
Riverside Drive WB Only AM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
Cesar Chávez
Lamar
Lee Barton
Auditorium Shores
Riverside
Barton Springs
Town Lake
Hike & Bike Trail
Convention Center
S. Congress
S. First
Dawson
Bouldin
W. Bouldin Creek
Waller Creek
Driskill
Davis
Rainey
River
IH 35
Republic Square
Brush Square
Bowie
West
Rio Grande
Nueces
San Antonio
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Neches
Red River
Sabine
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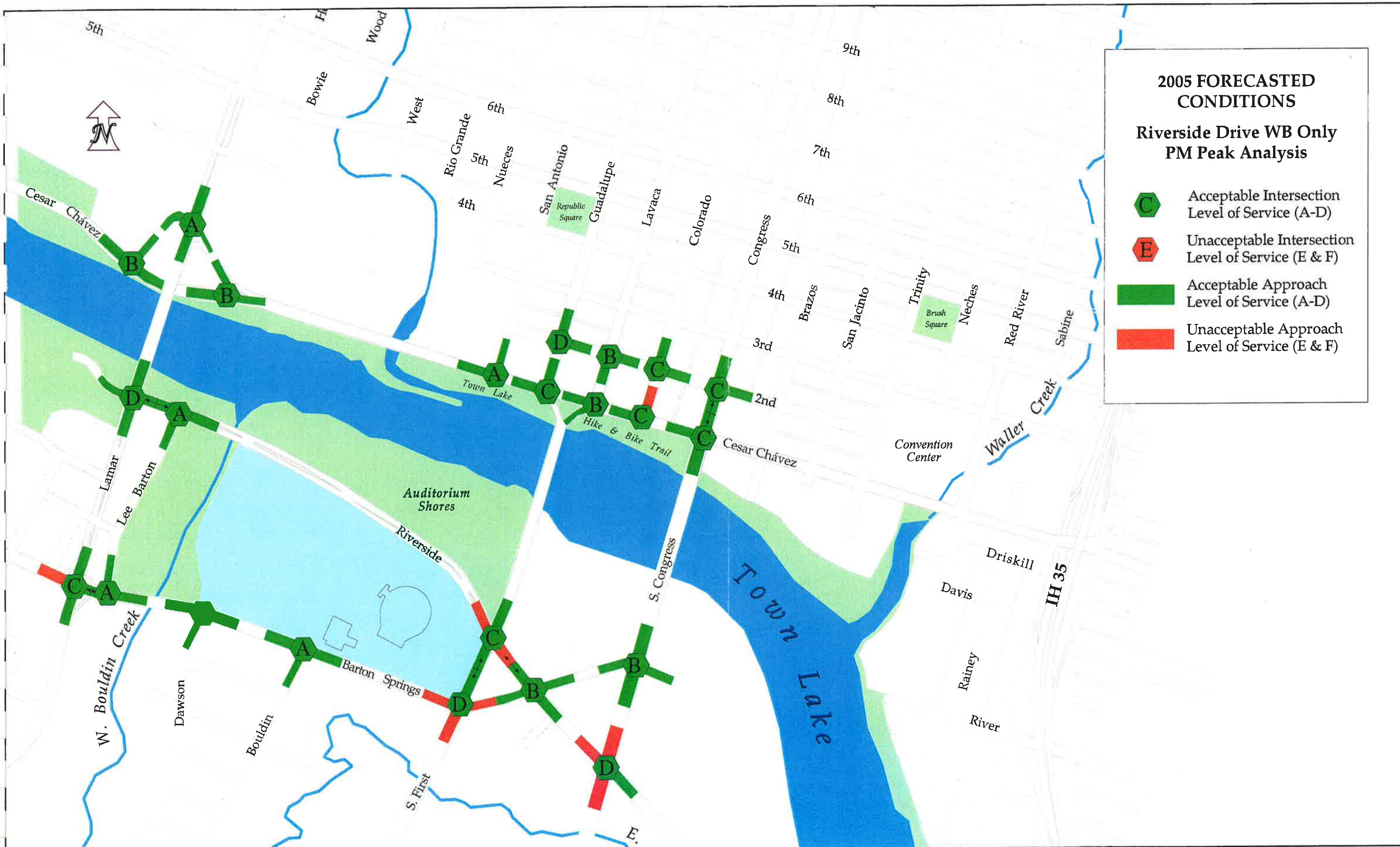
6th
5th
4th
3rd
2nd


2005 FORECASTED CONDITIONS
Riverside Drive WB Only PM Peak Analysis
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
N
5th
Bowie
Wood
West
6th
Rio Grande
5th
Nueces
4th
San Antonio
Republic Square
Guadalupe
Lavaca
Colorado
Congress
9th
8th
7th
6th
5th
4th
3rd
2nd
Brazos
San Jacinto
Trinity
Brush Square
Neches
Red River
Sabine
Waller Creek
Cesar Chávez
Town Lake
Hike & Bike Trail
Cesar Chávez
Convention Center
Auditorium Shores
Riverside
Lamar
Lee Barton
W. Bouldin Creek
Dawson
Bouldin
Barton Springs
S. First
S. Congress
E.
Town Lake
Driskill
Davis
IH 35
Rainey
River

Riverside Drive Closed (Between South 1st Street and Lamar Boulevard)

For this analysis scenario, Riverside Drive is removed, and no through travel is possible between South 1st Street and Lee Barton Drive (east of Lamar Boulevard).

AM Peak Evaluation - The AM peak analysis is summarized in the following figure. As shown, 10 links were identified as problem areas based on the screening. When the overall intersection level of service was calculated for each intersection, only one intersection was found to operate at an unacceptable level of service (South 1st Street and Barton Springs Road).

Traffic flow previously seen on the Lamar Boulevard bridge is shifted to the other two bridge crossings during the morning peak hour. Closure of Riverside Drive re-routes drivers previously using the roadway to alternative paths, resulting in queuing relief to Lamar Boulevard traffic, and queue lengthening at the South 1st Street and Congress Avenue bridges. Traffic conditions at the following locations warrant mentioning as locations of congestion:

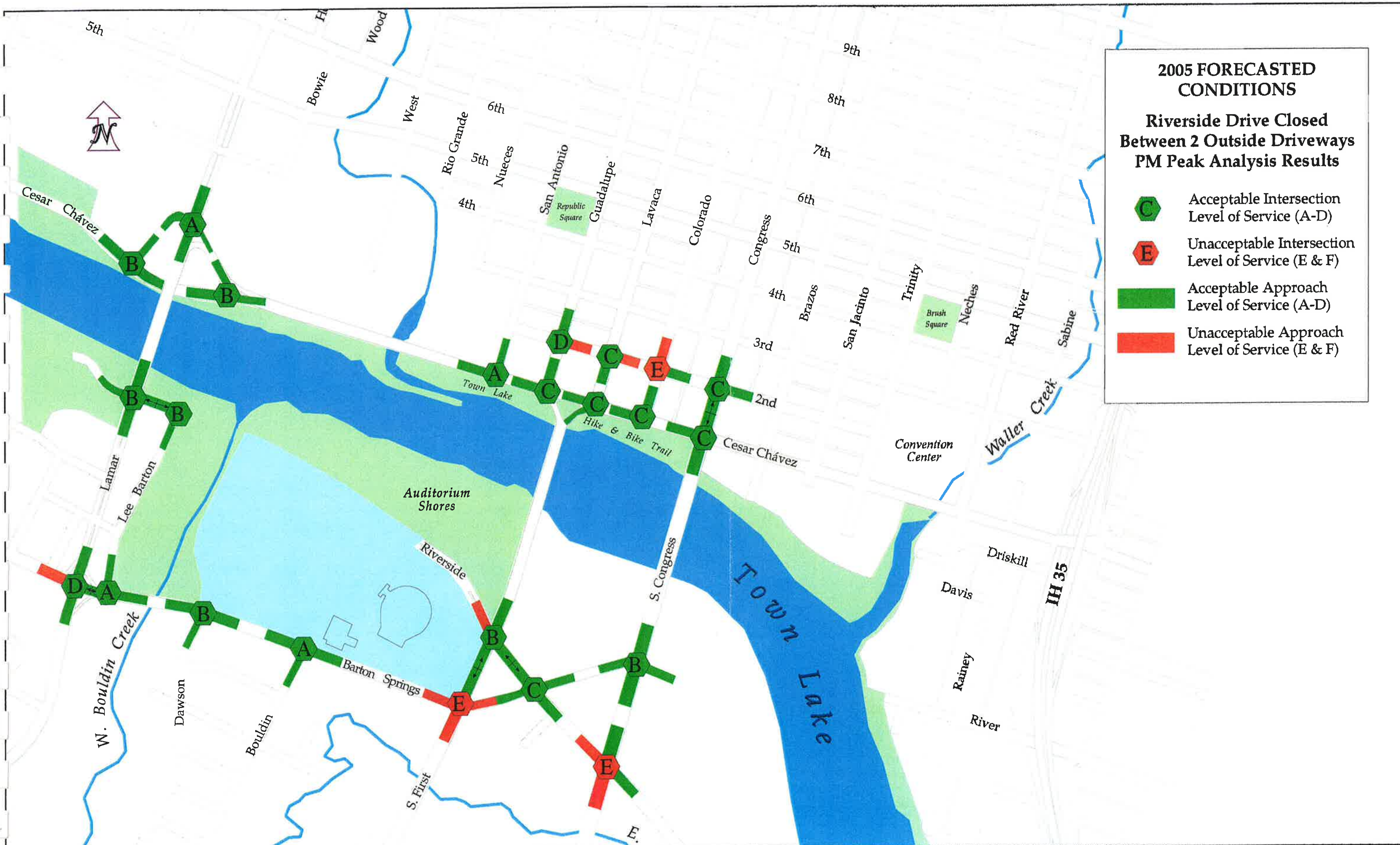
- Lamar Boulevard – Queuing on Lamar Boulevard occurs in the northbound direction south of 5th Street; however, queues are significantly reduced from the previous scenarios since the demand on Lamar Boulevard is reduced with removal of the Riverside Drive connection.
- Riverside Drive at South 1st Street – Removal of Riverside Drive to the west results in a heavy westbound right turn demand from Riverside Drive to South 1st Street. Queues for this turning maneuver extend to the Barton Springs Road intersection.
- South 1st Street Bridge – Northbound queues at the Lavaca Street and Cesar Chavez Street intersection extend across the entire South 1st Street bridge, through Riverside Drive and Barton Springs Road.
- Congress Avenue Bridge – Northbound queues at the Congress Avenue and Cesar Chavez Street intersection extend across approximately one-half of the Congress Avenue bridge.
- South 1st Street at Barton Springs Road – This intersection is the only one shown to operate at unacceptable levels. The poor level of service is due to significant queues on the northbound approach to the intersection.
- Eastbound Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes during the morning peak hour. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans due to the number of drivers traveling along the roadway.

PM Peak Evaluation - The PM peak analysis is summarized in the following figure. As shown, ten links were identified as problem areas based on the screening criteria. When the overall intersection level of service was calculated for each intersection, three intersections were found to operate at unacceptable levels of service (Congress Avenue and Riverside Drive, Colorado Street and 2nd Street, and South 1st Street and Barton Springs Road).

As with the morning peak hour, northbound traffic flow previously seen on the Lamar Boulevard bridge is shifted to the other two bridge crossings during the evening peak hour. The impact of this situation during the PM peak is not as great, since primary travel during this peak is in the southbound direction, and the impact created by the closure of Riverside Drive affects northbound travel patterns. Traffic conditions at the following locations warrant mentioning as locations of congestion:

- Lamar Boulevard – Queuing on Lamar Boulevard is significantly reduced from the previous scenarios since the demand on Lamar Boulevard is reduced with removal of the Riverside Drive connection.
- Riverside Drive at South 1st Street – Removal of Riverside Drive to the west results in a heavy westbound right turn demand from Riverside Drive to South 1st Street. Queues for this turning maneuver extend beyond the Barton Springs Road intersection.
- South 1st Street at Barton Springs Road – This intersection is one of three shown to operate at unacceptable levels. The poor level of service is due to significant queues on the southbound approach to the intersection and the priority which must be given to this movement.
- Cesar Chavez Street – Cesar Chavez Street carries very large traffic volumes. While traffic flow is heavy along this roadway, progression is maintained since this roadway is given priority in signal timing and phasing plans.
- The proposed projects in the downtown area near Cesar Chavez Street and Lavaca Street which were included in the traffic analysis impact the volume of traffic on the roadway network in that area. Therefore, queuing at the four intersections formed by Lavaca, Guadalupe, 2nd, and Cesar Chavez Streets indicates an increase in congestion due to the additional traffic introduced to the roadway network by these emerging projects.


2005 FORECASTED CONDITIONS
Riverside Drive Closed Between 2 Outside Driveways AM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
N
5th
Bowie
West
Wood
6th
Rio Grande
5th
Nueces
4th
San Antonio
Republic Square
Guadalupe
Lavaca
Colorado
Congress
9th
8th
7th
6th
5th
4th
3rd
2nd
Brazos
San Jacinto
Trinity
Brush Square
Neches
Red River
Sabine
Cesar Chávez
Town Lake Hike & Bike Trail
Cesar Chávez
Convention Center
Waller Creek
Lamar
Lee Barton
Auditorium Shores
Riverside
S. Congress
Town Lake
Driskill
Davis
IH 35
Rainey
River
W. Bouldin Creek
Dawson
Bouldin
Barton Springs
S. First
E.


2005 FORECASTED CONDITIONS
Riverside Drive Closed Between 2 Outside Driveways PM Peak Analysis Results
Acceptable Intersection Level of Service (A-D)
Unacceptable Intersection Level of Service (E & F)
Acceptable Approach Level of Service (A-D)
Unacceptable Approach Level of Service (E & F)
Cesar Chávez
Lamar
Lee Barton
W. Bouldin Creek
Dawson
Bouldin
Barton Springs
Riverside
S. First
S. Congress
Auditorium Shores
Town Lake
Hike & Bike Trail
Republic Square
Brush Square
Convention Center
Waller Creek
IH 35
Driskill
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7th
8th
9th
Bowie
West
Rio Grande
Nueces
San Antonio
Guadalupe
Lavaca
Colorado
Congress
Brazos
San Jacinto
Trinity
Neches
Red River
Sabine
Wood

SUMMARY OF RESULTS

The preceding analyses have illustrated the effects of modifications of Riverside Drive upon the street and roadway network adjacent to and in the vicinity of the Town Lake Park site. Based on analysis of existing and future conditions and in order to provide the safest and most effective movement to and from the Park as well as movement to and from the downtown area, the following observations were developed:

- The table shown below provides a comparison of MOE's for each alternative analysis network.

Traffic Condition	Move Time	Delay Time	Delay Time	Queue Time	Stop Time	Average Speed	System Stop Delay
	vehicle hours		minutes/vehicle trip			mph	veh-hrs.
AM Peak							
Existing	407	644	2.67	1.68	1.58	12.8	380.57
2005 Riv. As Is	460	720	2.53	1.59	1.49	12.8	424.25
2005 Riv. WB Only	453	753	2.64	1.65	1.54	12.3	438.80
2005 Riv. Closed	443	753	2.64	1.74	1.61	12.2	458.64
PM Peak							
Existing	456	567	2.04	1.34	1.27	14.7	352.83
2005 Riv. As Is	514	727	2.15	1.43	1.35	13.5	457.45
2005 Riv. WB Only	520	759	2.20	1.44	1.36	13.3	470.04
2005 Riv. Closed	502	776	2.27	1.53	1.44	12.8	491.52

Note that in both the AM and PM analysis results, system delay, stop time, and delay increase with each alternative. In other words, the delay experienced by drivers in the existing network under existing conditions is the lowest delay value. If eastbound Riverside Drive is closed, delay values increase, and they increase even more if westbound Riverside Drive is closed. Average speeds show the opposite pattern, in that they decrease from existing conditions to Riverside Drive closure.

The AM peak "Riverside WB Only" simulation shows a 3.4 percent increase in system stop delay from the "Riverside As Is" forecasted condition (438.8 compared to 424.25). Similarly, during the PM peak, a 2.8 percent increase in system stop delay is shown.

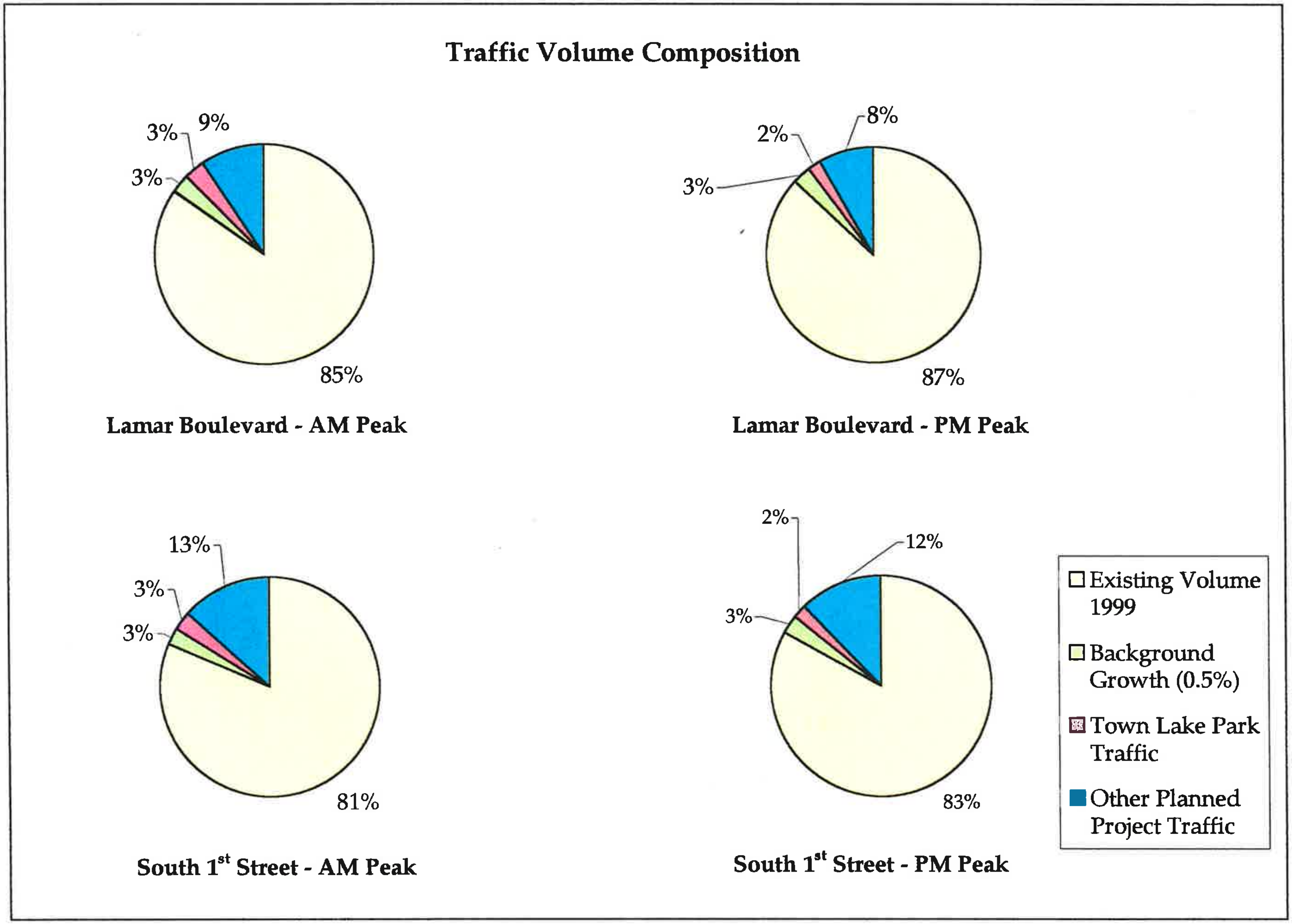
The AM peak "Riverside Closed" simulation shows an 8.1 percent increase in system stop delay from the "Riverside As" Is forecasted condition (458.64 compared to 424.25). Similarly, a 7.5 percent increase is shown in the PM peak.

- Sensitivity analyses identify the necessity for a 15 percent shift in traffic demands from South 1st Street to Lamar Boulevard in the "Riverside Closed" scenario to obtain similar delay results to those found for the "Riverside As Is" scenario. Implementation of a target program to provide incentive for this shift in traffic to occur would be necessary to obtain this level of redistribution in the roadway network.

- In order to obtain delay results similar to the "Riverside As Is" network, traffic volumes in the "Riverside WB Only" network would need to be reduced by one percent, or traffic volumes in the "Riverside Closed" network would need to be reduced by six percent.

- Although a few links which access the Town Lake Park are shown to operate at unacceptable levels during the AM and PM peak periods, this will not be the case during peak periods of demand for the facilities within the park. The facilities within the park will have peak demand periods in the evenings (after the typical peak hour) and on weekends, when adjacent street traffic is much lower than during weekday peak hours as shown in the following figure. Traffic signal timing and phasing plans can and should be developed to accommodate these peak demands and provide for efficient flow in and out of the Park. During extremely heavy demands, police assistance will be required to provide the most efficient access. In any case, event traffic plans which include signal timing and phasing which optimizes Park access can and should be developed in conjunction with construction of the new facilities in the Park.

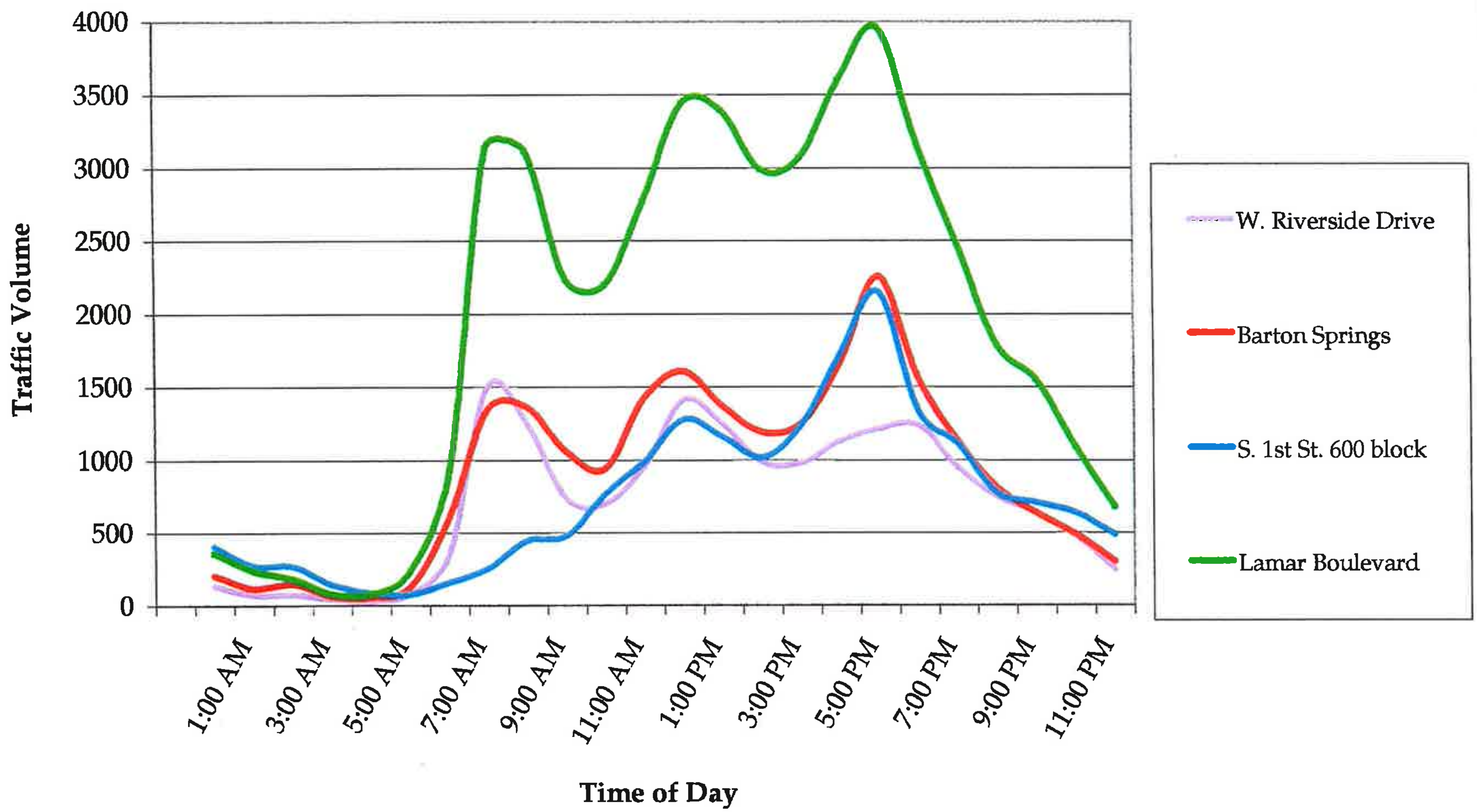
- It should be noted that the level of traffic associated with Town Lake Park is negligible with respect to the volume of traffic traveling in the roadway network during peak hours. The following figure displays the composition of future traffic volumes assumed to enter the network at the South 1st Street and Lamar Boulevard locations south of Town Lake Park. Park traffic comprises only two to three percent of total traffic entering the network. Traffic associated with new projects planned for the downtown area comprises eight to nine percent of future traffic volumes, and consequently, contributes more to overall network operational impacts.


Traffic Volume Composition
3%
9%
3%
85%
Lamar Boulevard - AM Peak
2%
8%
3%
87%
Lamar Boulevard - PM Peak
13%
3%
3%
81%
South 1st Street - AM Peak
2%
12%
3%
83%
South 1st Street - PM Peak
Existing Volume 1999
Background Growth (0.5%)
Town Lake Park Traffic
Other Planned Project Traffic

- In order to accommodate potential operational problems identified during simulation of future traffic operations, relatively minor improvement recommendations have been developed and listed previously. It should be noted that these analyses have evaluated a relatively short timeframe for development activity in the central business district. Due to significant costs associated with major roadway infrastructure improvements for transportation system capacity increases, reduction in trips must be accomplished to provide acceptable operation in the future. Such reduction in trips must be accomplished via stronger public transportation, ridesharing programs, management incentives, and other travel demand management techniques. Travel demand management (TDM) is essential to the successful operation of the City of Austin transportation system. The following section details several TDM techniques.

The following figure shows the daily traffic distribution by hour for Barton Springs Road, Riverside Drive, Lamar Boulevard, and South 1st Street in the vicinity of Town Lake Park. Note the similar peaking characteristics of each roadway as seen by peaks in the distribution curves during the morning, noon, and evening rush hours. Although Lamar Boulevard carries much more traffic than the other three roadways, the typical weekday peak occurs at the same time on each roadway. The purpose of showing the volume distribution curves for these roadways is to emphasize the time period of concern – only a few hours a day. TDM measures discussed below strive to balance the distribution of traffic volumes throughout the day so that the heavy peaks are reduced and the capacity of roadways can be more efficiently used throughout the day.

Town Lake Park
Hourly Traffic Volume Distribution on Area Roadways



TRAVEL DEMAND MANAGEMENT

Travel demand management is any action or group of actions whose intent is to influence the intensity, timing, and spatial distribution of transportation demand in order to reduce traffic impact. A demand management program is one element of an overall congestion management program, which also includes a supply management element aimed at addressing mobility needs.

There are no data available documenting the ability to achieve region-wide reductions in travel demand resulting from these activities. The effectiveness of a Travel Demand Management (TDM) program is highly variable and dependent upon many external factors, including the combination of programs, goals, and policies which are implemented.

TDM Measures

TDM measures (or techniques) are the tools used by governmental bodies and/or private employers to influence travel behavior, either by increasing vehicle occupancy, by eliminating trips, or by transferring those trips outside of the normal peak period. Presented below is a summary of some TDM measures (Ref. 4).

Trip Reduction Ordinances

This measure is controlled by local or state governments. Region-wide reductions in vehicle miles traveled (VMT) through implementation of a trip reduction ordinance (TRO) will vary depending upon the percentage of employees covered by the ordinance and the trip reduction goals. A TRO is a program using legislation to regulate trip generation to and from office and residential developments in a region. The requirements set forth in the ordinances are a condition of subdivision approval. Failure by employers to make good faith efforts at complying with the legislation could result in fines being assessed against the organization. Application of a TRO is commonly based upon either the number of employees, or the amount of floor area of the office space.

Alternative Work Hours

This measure is controlled by individual employers. Alternative Work Hours are designed to modify the arrival and departure times of employees at major activity centers. The basic premise of this alternative is to spread the peak period demand over a wider band of time. This allows the existing roadway network to serve more commuters without providing additional peak period capacity.

Alternative work hours programs include staggered work hours, flex-time, and compressed work weeks. Staggered work hours and flex-time involve modifying start and end work times while maintaining a regular five-day 40-hour work schedule. A compressed work week, while also adjusting commuting times on work days, results in one fewer commuting trip per week.

Benefits derived from Alternative Work Hours may include increased employee morale, reduced tardiness and absenteeism, easier commuting, reduced employee turnover, and increased productivity.

Telecommuting

This measure is also employer controlled. Telecommuters are employees who work at home or at a "telecenter" close to their home, one or more days per week utilizing personal computers, telephones, modems, and/or facsimile (fax) machines. The primary benefit of a telecommuting program to the employee is reduced commuting costs.

Parking Management

This measure is controlled by individual property owners for private parking or by governmental agencies for public parking. Region-wide effects of this measure are highly variable. Most available data for this measure relate to individual sites. Parking management is described as any activity associated with the design, construction, management, or operation of a parking facility to control, regulate, or restrict parking. The primary objectives of most parking management programs are to improve the quality of the urban area, and to encourage commuters to shift to a mode other than the personal automobile. In addition to providing parking spaces in urban areas, these programs also include parking restrictions, placement of facilities, regulatory measures, and pricing mechanisms to discourage driving alone.

Ridesharing

This measure is controlled by employers or by a third-party agency, such as the Ridefinders program through Capital Metro. The success of a ridesharing program is often dependent upon the employers commitment to encourage ridesharing. By providing preferential parking or subsidies to rideshare vehicles, the employer can influence the mode choice of the employees. Ridesharing is the most common technique aimed at reducing traffic congestion. The shared vehicle may be either a personal car, a van, or a bus.

Growth Management

This method is controlled by governments. Growth management involves the use of public policy to regulate development, thereby influencing traffic conditions. These policies may regulate the location, pattern, density, quality, and rate of growth of proposed development. A growth management strategy is not limited to transportation actions, but also may contain actions dealing with housing, economic development, open space, and community development.

Road Pricing

This measure is government controlled for public roadways, and privately controlled for private toll roads. Road pricing, also referred to as congestion pricing, involves charging drivers a fee for using a particular roadway, or to enter a specified area, particularly during peak periods. The intent is to "price" highway facilities such that sufficient capacity is provided to drivers willing to pay this "price". This concept is similar to toll roads. As a result of this fee, drivers will either pay this price, change modes, change routes, or not make the trip.

Auto Restricted Zones

This measure is controlled by governments. An auto restricted zone (ARZ) is any land area where vehicular travel is restricted, regulated, or controlled in some fashion. These zones can be established through the use of physical barriers, parking controls, exclusive lane uses, and turn prohibitions. ARZs are implemented to preserve and enhance urban centers, improve the environmental quality of urban centers, and to encourage the use of non-auto modes.

Site Design To Minimize Traffic

This measure is developer controlled, with some influence exerted by government. This measure is aimed at individual sites and is therefore likely to a have a limited effect on the region-wide VMT. By providing on-site activities and services frequented by commuters (banking, day-care, etc.) on the way to or from work, there is less need for an individual employee to drive his/her own personal vehicle.

Transit

This measure is controlled by the transit service provider. Transit services are a specialized form of ridesharing. For most people, the only transit service option is to ride a bus. However, in order to use the bus, commuters must live and work within bus service areas. Park-and-ride facilities are often available and interconnected to transit services. Other types of transit service include heavy-rail, light-rail, and automated guideway systems.

TDM Summary

TDM techniques have been shown to reduce trips at individual work sites. If these techniques were to be assumed to be universally adopted on a region-wide basis, one could assume that there would be a reduction in regional VMT. If, for example, all employers over a certain size in Austin implemented parking fees for employees, or four day work weeks, one could expect to see reductions in regional VMT. The caution in this is, by forcing employers to charge for parking only within the city of Austin, employers may be influenced to relocate within other jurisdictional boundaries, which may theoretically increase VMT (assuming minimal employee relocation). Any proposed TDM program should be comprehensively reviewed prior to implementation to ensure that the elements selected for the program are compatible with one another, as a combination of measures provide the greatest effectiveness. For example, a combination of reduced parking downtown with increased opportunities for alternate modes will provide a greater benefit than either of these by themselves.

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