APPLICATION OF TRAFFIC MANAGEMENT TOOLS
FOR SPECIAL EVENTS IN SMALL AND MEDIUM CITIES

by

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SUMMARY

With all of the recent advancements in traffic management technology, new concepts or the proper application of existing concepts may greatly improve traffic management at special events in small and medium cities. The introduction of new or infrequently used concepts to any special event will especially help those traffic management plans where revisions have not been made for years or where a traffic management plan does not exist. It is well known that traffic generated by special events can severely overload the existing street or highway network. Therefore, careful planning must take place before any event. All available traffic management tools must be considered. With the cooperation of all involved, a Transportation Management Plan (TMP) can be developed that will improve traffic conditions to and from the special event.

The objectives of this research were to identify the traffic management measures used by selected special events, identify differences between the special events, and to apply the results to a case special event. Each of the selected special events is discussed including the street and highway network in the vicinity of each event, general information, and traffic operations. In addition, the state-of-the art is discussed with emphasis placed on general special events guidelines, the TMP used at the 1986 U.S. Golf Open, point diversion on freeways, and highway advisory radio. This research was undertaken with the goal of answering three questions: “What traffic management measures are currently used by special events in small and medium-sized cities”, “Which of those traffic management measures are the most effective”, and “ How can these results be applied to help any special event held in a small or medium-sized city”.

The research was approached through a series of telephone and personal interviews with six special event operators in Texas. The six special events were selected by their classification as either as a small town, small city, or medium-sized city. A questionnaire with 25 questions was developed to determine the current traffic operations for each of the special events.

The results of the surveys indicated that special event are very different from one another. There are many factors that influence the final TMP. Only two significant differences between specials were noted as a result of this study. First, small towns and cities do not include public transportation as a part of their TMP. Second, special events held in rural areas had ample parking available for all guests. In addition, traffic management measures particularly useful for special events in small and medium cities were established. The surveys indicated that the most valuable traffic management tools were:

1. Formal traffic management teams (TMT);
2. Variable starting times for events;
3. Pre- and post-event activities;
4. Bus-only lanes;
5. Strategic traffic officer placement;
6. Clear Route/Destination signing; and
7. Radio communication.
Using the TMPs of the six selected special events and the results obtained from the surveys, several additional traffic management measures were applied to the TMP used by the Wolf Pen Creek Amphitheater complex during Barney’s back-to-back appearances. The following is a list of the measures that were applied:

1. Assigned public parking at all parking lots;
2. Assigned entrances and exits for entering and leaving mall parking lot;
3. Improved bus operations;
4. Use of a bus-only lane;
5. Improved scheduling for the street festival; and
6. Finding out where people attending the show were coming from.

The Wolf Pen Creek Amphitheater example illustrates how the application of traffic management measures can be applied to improve the flow of traffic at special events held in small and medium-sized cities.

This research identifies the TMPs used by six very different special events and serves as an aid for identifying traffic management measures that are especially helpful for special events in small and medium-sized cities.
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BACKGROUND

Special events (e.g., ball games, parades, festivals, fireworks shows, etc.) often generate large volumes of traffic that are somewhat predictable in nature (1). Generally, congestion occurs on the street and highway network surrounding the traffic generator. Operational studies (2, 3) and results from special events such as the 1986 U.S. Open Golf Tournament (4) have shown that managing traffic during special events will result in extremely high payoffs in terms of reduced congestion and delay. Planning prior to the special event is essential to the orderly movement of traffic (1), as is the knowledge of useful traffic management tools that can be applied to minimize the congestion caused by special events.

Problem Statement

Proven traffic management techniques should be applied from the earliest planning stages through the actual operation of the event so that traffic congestion associated with the staging of the special events can be reduced (4). In a literature search, however, only two sources, the Federal Highway Administration’s Freeway Incident Management Handbook and Richard A. Somer’s “The Application of Advanced Traffic Management Systems for Special Events”, could be located where key activities required to efficiently plan for a special event were listed.

The points addressed by both of these sources may be applied to any special event. However, there is still a need for traffic management measures that can be applied by small or medium-sized cities, for smaller special events, or special events with limited resources. There is also a need for the documentation of transportation management plans currently used by special events in small and medium-sized cities which may be used by others as aids for planning special events.

Research Objectives

The objectives of this research were as follows:

1. Identify traffic management measures used during each of the six selected special events;

2. Using the results obtained in objective 1, identify differences, if any, in the traffic management measures used between special events held in medium-sized cities and small cities or towns; and

3. From Objectives 1 and 2, apply the results to modify the traffic management measures used by a typical special event in College Station, Texas.
Scope of Research

This study was divided into two sections. The first part of this research identified background information regarding special events and documented the traffic management strategies being used by six special events held in small and medium-sized cities. The second part of the study was to identify traffic management measures particularly useful to special events in small and medium-sized cites and to apply these traffic management measures to a typical event held at the Wolf Pen Creek Amphitheater in College Station, Texas.
SPECIAL EVENTS

Introduction

Special events may be defined as special trip generators that produce a large amount of traffic on an infrequent basis. The nature of the traffic may be somewhat predictable in some cases, (i.e. sporting events, concerts, and conventions) but in other cases, the traffic is not predictable due to the rarity and magnitude of the event, i.e. the 1984 Summer Olympic Games in Los Angeles. Special events may be divided into three categories: one-time only, occasional and frequent. One-time only events occur only once in a given city, such as the 1996 Summer Olympics in Atlanta, the 1984 Summer Olympics in Los Angeles, the 1994 World Cup, or the 1994 25th Anniversary Woodstock Concert. Traffic control planning for these events is much more complex because no local historical data relative to these events are available to help the agencies involved with planning and traffic control. Occasional events occur more than once in any given city but usually on an infrequent basis. An example of an occasional special event is the NFL Super Bowl game which has been held more than once at the Rose Bowl in Pasadena. The National Democratic and Republican Conventions are another example of an occasional special event. Frequent special events occur at least once a year and sometimes several times a year. Some examples of frequent special events include concerts, parades, professional or collegiate football games, and large conventions. Contrary to one-time only and occasional special events, frequent special events can be critiqued and improved to make the next special event’s traffic management plan more effective.

State-of-the-art

General Special Events Planning Guidelines

The Federal Highway Administration’s Freeway Incident Management Handbook includes a section on special events planning. This section recommends that proven traffic management techniques be applied from the earliest planning stages. The handbook states that “before the event, good traffic management plans need to be prepared, procedures and working relationships need to be developed to bring about the essential coordination, and personnel and equipment to implement the plans need to be in place”. The handbook also lists the key activities required to effectively plan for a special event. See Table 1. The major subtopics of the list are the following:

1. Identify major concerns;
2. Assemble representatives from participating agencies;
3. Assess impact of event on affected roadways;
4. Prepare traffic management measures;
5. Implement plan; and
<table>
<thead>
<tr>
<th>Subtopic</th>
<th>Examples</th>
<th>Subtopic</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify Major Concerns</td>
<td>• Limited access to site&lt;br&gt;• Limited capacity of roadways feeding site&lt;br&gt;• Potential “Hot Spots”&lt;br&gt;• Coincidence of event with commuter or recreational peak periods&lt;br&gt;• Parking availability&lt;br&gt;• Transit service</td>
<td>Prepare Traffic Management Measures</td>
<td>• Identify mitigating measures&lt;br&gt;• Diversion to underutilized approach roads&lt;br&gt;• Designated parking lots with shuttle bus service&lt;br&gt;• Separation of pedestrian, automobile and shuttle bus traffic to extent possible&lt;br&gt;• Bus-only ramps and streets&lt;br&gt;• Temporary signing&lt;br&gt;• Parking restrictions&lt;br&gt;• Traffic officer placement&lt;br&gt;• Signal timing&lt;br&gt;• Highway advisory radio us&lt;br&gt;• Left turn restrictions&lt;br&gt;• Radio communications&lt;br&gt;• Aerial surveillance&lt;br&gt;• Temporary metering&lt;br&gt;• On-site traffic management&lt;br&gt;• Temporary lane control&lt;br&gt;• Temporary command center&lt;br&gt;• Establish media contacts and assign representatives&lt;br&gt;• Prepare information, brochures, releases</td>
</tr>
<tr>
<td>Assemble Representatives from Participating Agencies</td>
<td>• Assign task groups&lt;br&gt;• Develop working relationships among agencies&lt;br&gt;• Obtain inputs into development of special event plan&lt;br&gt;• Prepare Traffic Impact Study and Traffic Management Plan&lt;br&gt;• Engage consultant if external resources are required</td>
<td>Implement Plan</td>
<td>• Assign traffic management teams&lt;br&gt;• Build in flexibility to modify plan on-site as required&lt;br&gt;• If multi-day event, hold critique sessions each day to improve operations&lt;br&gt;• Provide information to media</td>
</tr>
<tr>
<td>Assess Impact of Event on Affected Roadways</td>
<td>• Review event schedules&lt;br&gt;• Estimate attendance&lt;br&gt;• Estimate modal split&lt;br&gt;• Assemble existing traffic data&lt;br&gt;• Estimate directional distribution of event generated attendance&lt;br&gt;• Assign traffic to approach roadways&lt;br&gt;• Compute composite traffic comprising event and non-event generated traffic&lt;br&gt;• Compare to capacity of approach roadways&lt;br&gt;• Identify problem locations</td>
<td>Evaluate Plan</td>
<td>• Hold critique session&lt;br&gt;• Identify shortcomings and possible solutions&lt;br&gt;• Identify future special events</td>
</tr>
</tbody>
</table>
Another paper entitled “The Application of Advanced Traffic Management Systems for Special Events” (6) by Somers also addressed general special events planning guidelines. Somers intended his paper as a “how to” manual for managing special events. In his paper, Somers states that “careful planning and implementation of a Transportation Management Plan (TMP) are essential to minimize congestion during special events” (6). Using this ideology, Somers developed the following eight-step methodology for managing special events:

1. Inventory resources;
2. Analyze traffic impact;
3. Identify problems;
4. Develop a TMP;
5. Analyze and modify the TMP;
6. Implement the TMP;
7. Operate the TMP; and
8. Critique the TMP.

Somers then used this eight step methodology to develop a TMP for a typical football game held at Texas A&M University’s Kyle Field in College Station, Texas.

Documented Traffic Management Plan

Traffic Management of Special Events: The 1986 U.S. Open Golf Tournament (4) by Dunn presents an extremely successful traffic management plan implemented during the 1986 U.S. Open Golf Tournament at the Shinnecock Hills Golf Club in Shinnecock Hills, Town of Southampton, New York. The Shinnecock Hills Golf Club is located on Long Island, New York. The success was measured by the fact that the anticipated “horrendous traffic jams never occurred” (4).

Three major concerns facing the 1986 U.S. Open Golf Tournament were addressed:

1. Coincidence of event with Long Island heavy recreational summer traffic;
2. Only two crossings over Shinnecock Canal; and
3. Only one major east-west roadway from New York City to Shinnecock Hills Golf Club.

Five major steps were undertaken as a part of the work effort. First, a feasibility study was prepared to determine the overall impact on the surrounding street and highway network. Second, a TMP was developed to ensure that the composite traffic flows could be handled by the existing roadway network through the use of proven traffic management techniques. The traffic management techniques used during the U.S. Open Golf Tournament are listed in Table 2. Third, design plans were prepared for the traffic operations and roadway signing that would be required by the TMP. The fourth step was the careful installation of the elements in the design plans. Lastly, on-site operation of the event permitted modifications to the initial TMP to accommodate the real-time traffic conditions.
Table 2. Traffic Management Techniques at the 1986 U.S. Open Golf Tournament (4).

<table>
<thead>
<tr>
<th>Technique Used</th>
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<tbody>
<tr>
<td>Route marker/destination signing--color coded letter symbols, diversion via arrow change</td>
</tr>
<tr>
<td>Reversible 3 lane operation to provide additional capacity for peak traffic flows on normal 2 lane roadway</td>
</tr>
<tr>
<td>Highway advisory radio--status, information, diversion</td>
</tr>
<tr>
<td>Establishment of command center</td>
</tr>
<tr>
<td>Left turn restrictions</td>
</tr>
<tr>
<td>Radio communication</td>
</tr>
<tr>
<td>Traffic flow control--override of traffic signals, manual coordinated movement system</td>
</tr>
<tr>
<td>Metering System--bus capacity, walking time, parking lot metering</td>
</tr>
<tr>
<td>Specific roadway assignment</td>
</tr>
<tr>
<td>Aerial surveillance</td>
</tr>
<tr>
<td>Exclusive bus roadway</td>
</tr>
<tr>
<td>On-site traffic management</td>
</tr>
</tbody>
</table>

The paper included five key reasons for the successful traffic management experienced at the U.S. Open Golf Tournament that can be applied to any special event. They are:

1. Development of a good traffic management plan;
2. Input and participation of involved agencies;
3. Implementation of plan;
4. On site traffic management; and
5. Ability to modify the plan to accommodate real-time traffic.

The Use of Changeable Message Signs For Real-Time Diversion on Freeways

Dudek, et. al. report the findings of special-event route-diversion studies conducted in Dallas from 1976 to 1977 to evaluate 14 primary-candidate real-time messages that had resulted from extensive human-factors laboratory studies (2). The studies were conducted at the Dallas Fair Park, site of the annual Cotton Bowl football game, the annual Texas State Fair, and annual fireworks display. The results of the studies conducted concluded that all messages were effective in diverting freeway traffic to an alternate route. During the Fourth of July fireworks display in 1976, the results of using messages on two trailer-mounted lamp changeable message signs was an increase in route diversion. The first message caused 56.2 percent of the traffic to divert and the second 43.8 percent (7). During the opening weekend (October 9th and 10th, 1976) of the Texas State Fair, 83.6 percent of the drivers destined only for the Texas State Fair diverted (8). In contrast, only 58.8 percent of the 17 motorists destined for a Fair Park activity (e.g., rodeo, horse show, or music hall) other than the Fair or the Texas-Oklahoma football game diverted.
The messages were effective for events with a fixed starting time and events for which arrival times were spread over long periods of time. One of the other findings of this research were that any one of the messages tested would be effective, provided the information is credible to drivers. Another important finding was that one changeable-message sign that displays up to eight short words placed at a strategic location can result in significant diversion. As mentioned before, all of the messages were effective; however, the traffic-state descriptor messages (e.g., avoid traffic jam, congestion, or major delay) and temporal information (e.g., XX-min delay, save XX minutes) resulted in higher diversion percentages than the best-route messages (“Best Route to Fair Grounds”, “Fair Grounds Best Route”) during periods when the event did not start at a fixed time.

In a related study by Richards, Stockton, and Dudek (8), a questionnaire was designed to (a) obtain driver attitudes and reactions to the point-diversion signing systems, (b) explore trends in driver behavior related to the diversion decision, and © identify factors that influence a driver’s decision to divert. The results indicated that driver anticipation of conditions on the alternative route, driver familiarity with the routes, and whether the event had a fixed or variable start time had the most influence on diversion to alternate routes (8).

Highway Advisory Radio

A study by Dabney and Dudek (3), reports the effectiveness of diverting freeway traffic destined to the annual Wurstfest in New Braunfels, Texas from the primary arterial to an alternate arterial route using a monopole highway advisory radio (HAR). According to the study, placement of advanced signing for the HAR is imperative for successful operation. The final results showed that 56 percent of the total Wurstfest-bound traffic saw the advanced signing and tuned to the HAR station. Sixty-seven percent of those drivers diverted. This represented 22 percent of the total traffic bound for the Wurstfest.
STUDY APPROACH

In order to develop a list of traffic management measures particularly useful for small and medium-sized cities, case studies were conducted to gain insight into the types of traffic management measures currently being used. A 25-question telephone survey was developed, and six special event operators in Texas were contacted concerning the traffic planning and operations that take place for their respective special event. Of the six special event operators contacted one was located in a small town, two were in small cities, and three were in medium-sized cities. The six special event operators contacted were the 1.) Renaissance Festival Committee, 2.) Texas Department of Transportation concerning various parades in the city of Kerrville, 3.) Wurstfest Association, 4.) Wolf Pen Creek Amphitheater concerning various performance, 5.) College Station Noon Lion’s Club concerning the Fourth of July festivities in College Station, and 6.) Borderfest Streets of Laredo Committee. Table 3 presents information on the special event, the operators, the location, and the size of the city or town.

Table 3. Special Events Surveyed.

<table>
<thead>
<tr>
<th>Special Event’s Name</th>
<th>Special Event Operators</th>
<th>Site of Special Event</th>
<th>Size of City or Town*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renaissance Festival</td>
<td>Renaissance Festival Committee</td>
<td>Plantersville/Magnolia Area</td>
<td>Small Town Population--1,200</td>
</tr>
<tr>
<td>Various Parades</td>
<td>Texas Department of Transportation</td>
<td>Kerrville</td>
<td>Small City Population--16,000</td>
</tr>
<tr>
<td>Wurstfest</td>
<td>Wurstfest Association</td>
<td>New Braunfels</td>
<td>Small City Population--23,000</td>
</tr>
<tr>
<td>Various Live Entertainment</td>
<td>Wolf Pen Creek Amphitheater</td>
<td>Bryan/College Station Area</td>
<td>Medium City Population--82,000</td>
</tr>
<tr>
<td>Fireworks Extravaganza</td>
<td>College Station Noon Lion’s Club</td>
<td>Bryan/College Station Area</td>
<td>Medium City Population--82,000</td>
</tr>
<tr>
<td>Borderfest Streets of Laredo</td>
<td>Borderfest Streets of Laredo Committee</td>
<td>Laredo</td>
<td>Medium City Population--92,000</td>
</tr>
</tbody>
</table>

*Source: Texas Official Highway Travel Map

A copy of the survey is presented in the Appendix. The following section of the report contains the replies to these surveys.
CASE STUDIES OF SPECIAL EVENTS

Renaissance Festival, Plantersville, Texas

General

The Renaissance Festival is an annual festival that operates on Saturdays and Sundays for seven weekends during the fall. The festival operates from 9:00 am until dusk. The combined estimated attendance for all seven weekends of the festival is 250,000 people. The busiest weekends for the festival are during the 3rd, 4th, and 5th weekends of operation. The attendance is usually between 30,000 to 40,000 people for each of these weekends.

The Renaissance Festival is located between Plantersville and Magnolia on Farm-to-Market Road 1774 (FM 1774). FM 1774 also serves as the only road that accesses the entrances to the parking facilities for the Renaissance Festival. FM 1774 is thirteen miles long and intersects with State Highway 105 (TX 105) in Plantersville and with FM 1488 in Magnolia. The intersection of TX 105 and FM 1774 in Plantersville is controlled by a caution light. The intersection of FM 1488 and FM 1774 in Magnolia is controlled by a traffic signal. FM 1774, FM 1488, and TX 105 are all rural two-lane highways. TX 105 and FM 1488 are both east-west highways that intersect with Interstate 45 (I-45). See Figure 1 for a map showing the location of the Renaissance Festival, and the highway network serving the Plantersville-Magnolia area.

Traffic Operations

Several traffic management measures have been utilized by the Renaissance Festival Committee to improve the flow of traffic arriving for and departing from the festival.

First, from previous years’ operations, the Renaissance Festival Committee was able to determine that the primary route to the festival was I-45 to FM 1488 to FM 1774. To avoid long delays on FM 1448, a static sign was placed at the exit to the festival informing drivers of heavy traffic and to take TX 105 to reach I-45. In addition, anyone contacting the Renaissance Festival Committee for directions to the festival from I-45 is directed to TX 105.

Second, during a recent resurfacing of FM 1774, turning lanes were added at the entrances to the festival to reduce the interference of turning vehicles with thru traffic.

Third, the committee hires a subcontractor to handle the details of the traffic management. The subcontractor is responsible for hiring personnel, usually 16 off-duty officers to assist in the flow of traffic at the intersections of TX 105 & FM 1774, FM 1488 & FM 1774, and the two entrances to the festival. The subcontractor is also in charge of the 20 to 24 parking attendants, and any traffic decisions that arise during the operation of the festival. The subcontractor is in radio contact with all officers and parking personnel. If any problem does arise, the subcontractor will contact the local radio stations and the festival front office. By notifying the front office, information can be distributed to the general information booth, security officers, and other festival employees so they can inform guests about the traffic situation. No formal traffic control center is established during the festival.
Fourth, in order to create a slow, steady departure of guests from the festival, late shows are held at locations that will move people toward the festival exit. The events are scheduled and located in this manner with the hope that some guests will decide to leave early.

Public transportation is not utilized by the Renaissance Festival Committee for several reasons. First, no public transportation system exists in the area. Second, there are sufficient parking spaces on the property. And finally, due to the fact that the arrival and departure times for the festival are spread out over a long period of time, there is usually never an extremely high level of congestion on the highways.

Figure 1. Roadway Location Map in the Vicinity of the Renaissance Festival.
The parking lots, as previously mentioned, are located on the same property and well within walking distance of the festival entrance, therefore no shuttle bus service from the parking lots to the festival entrance is provided.

City Parades, Kerrville, Texas

General

The city of Kerrville has developed a transportation management plan for two parades routes: a short route and long route. Both parade routes are shown in figure 2. The short route is for parades with under 50 floats. The parade begins at Water Street and TX 27, travels down Water Street, turns right on TX 16, turns right on Thompson Drive, and finally enters Star Ranch at the entrance directly across from Cully Drive. The long route is for parades with over 50 floats. The long route begins at the intersection of Plaza Drive and TX 27, travels down TX 27 until it reaches the intersection of Water Street and TX 27. From this point, the long route follows the same route as the short route. The short route was developed to reduce the large cost of the long route and to better accommodate smaller parades like the Kerrville-Tivy High School Homecoming Parade.

Traffic Operations

In order to ensure that every parade operates with minimal disturbances to the existing street and highway network, every parade must obtain a permit from the Kerrville Police Department. The permit requires each parade sponsoring group to provide volunteers (75 people required for the long route) for the barricades that will close the local or residential streets affected by the parade. In order to obtain a permit, each organization must put up a deposit and agree to comply with all permit requirements. If the permit requirements are not followed or if the city must provide personnel, any costs incurred by the city are deducted from the deposit. The city of Kerrville began the permit requirement in order to gain control of the large number of parades that were taking place in the city. The number of parades has been greatly reduced since the permit requirements for parades were begun. Today there are three parades that use the long route, and two parades that use the short route.

After all parades and special events, the traffic management team reviews the traffic management plan in an attempt to improve the plan. The traffic management team consists of the city engineer, risk-management representative, police chief, street superintendent, Kerr County Sheriff’s Office, and the Texas Department of Transportation.

The Kerrville Police Department is responsible for patrolling the parade route to ensure compliance with all permit requirements and to aid in the flow of traffic. Even though no physical headquarters for a traffic control center is established, the police department’s traffic lieutenant can communicate with all police units by radio communication.

The city of Kerrville implements several traffic management measures during each of the parades. First, the five-lane bridge on TX 16 that crosses over the Guadalupe River is converted to a two-lane operation. The two east lanes which normally carry traffic north toward I-10 are converted to two-way traffic. The three remaining lanes are reserved for the parade. Advanced
Figure 2. Roadway Location Map in the Vicinity of the Kerrville Parade Routes.

Warning signs are placed prior to the bridge to inform drivers of the lane closings and their the appropriate lane.
Traffic is detoured to alternate roads only during parades using the long route. Because TX 27 is closed between Harper Road and Water Street, traffic traveling east on TX 27 is diverted north (left) at Harper Road, then right onto Jackson Road, followed by a right onto Circle Avenue which feeds into Water Street and leads back to TX 27. The parade route and detours for the parade are printed in the local newspaper and announced on local radio stations.

Also included in the transportation management plan is a list of traffic signals which must be placed in a flashing mode:

1. Thompson Drive and TX 16;
2. Water Street and TX 16;
3. Water Street and Lemos Street;
4. Water Street and TX 27; and
5. Harper Street and TX 27.

Although not a formal part of the parade traffic management plan, several parades have post-parade activities that lessen the impact on the street and highway network once the parade ends. Two examples are the Kerrville-Tivy Homecoming Parade and the Christmas Parade. After the homecoming parade, there is a pep rally and bonfire at the end of the parade route. After the Christmas Parade, the stores in town close to the parade route will have specials and promotions for the beginning of late evening shopping.

Wurstfest, New Braunfels, Texas

General

The Wurstfest is a festival that begins on the Friday before the 1st Monday in November for 10 days. The festival operates from 5:00 pm to 10:30 pm on Sundays through Thursday, 11:00 am to 11:30 pm on Friday, and 11:00 am to 12:30 am on Saturday. The estimated attendance for the entire festival is 100,000 people. The busiest day of operation is Saturday with an estimated attendance of 25,000 people.

Wurstfest is held at Landa Park, which is located near the downtown area. The main entrance to Wurstfest is Landa Street (Business Highway 46). Other entrances to the park include Landa Park Drive and Elizabeth Avenue. Landa Park, Main Plaza, and all streets included in the Wurstfest Association’s transportation management plan are shown in Figure 3. All of these entrances are pedestrian-only entrances. Vehicles may park in an adjacent recreation area, the Knights of Columbus Hall parking lot, a property owned by the Lower Colorado River Authority, and other smaller parking lots throughout Landa Park. The majority of the people attending Wurstfest pay to park or park in Landa Park. A few parking lots are assigned for VIPs, volunteers, and workers.

Traffic Operations

The Wurstfest Association has implemented several traffic management measures to improve the flow of traffic to and from Wurstfest. These traffic management measures are implemented by the joint cooperation of the Wurstfest Association Security Committee, New Braunfels Police
Department, Comal County Sheriff’s Office, and city hall representatives. These same organizations review the effectiveness of the traffic management measures and identify problem areas and possible improvements at the conclusion of the 10-day festival. No formal permit for a traffic management plan is required by the city of New Braunfels due to its long history of existence in the city and the joint cooperation of the traffic management team.

Figure 3. Roadway Location Map in the Vicinity of Landa Park.
One of these traffic management measures is to control the attendance. By design, the attendance of the festival today is smaller than it was 15 years ago. This, in itself, has reduced the congestion experienced on the street and highway network.

Another of these measures is giving directions to the less congested arterial streets that lead to Landa Park. This serves the purposes of utilizing all available streets. The directions given to drivers traveling on I-35 are to exit on Walnut Avenue and proceed to Landa Street. The directions given to drivers traveling on TX 46 (Loop 337) is to take Common Street and proceed to Elizabeth Avenue. The Convention and Visitor Bureau of New Braunfels owns a highway advisory radio system that has been used in the past. The broadcasted messages are usually for drivers on I-35 and recommend exiting on Walnut Avenue.

Public transportation, namely bus and shuttle operations, plays a big part in the traffic management plan for Wurstfest. In 1980 the section of Landa Street that turns into Landa Park Drive was purchased by the Wurstfest Association in order to add an extra lane to the street that could be used as a bus lane during Wurstfest. This bus lane is also used as a loading and unloading zone. The Wurstfest Association is also permitted by the city of New Braunfels to close Landa Park Drive during busy times for short periods of time (approximately 30 minutes) for an additional loading and unloading zone. Shuttle buses from hotels, motels and major downtown areas significantly help in reducing the amount of traffic on the street network.

Temporary signing is also used to help direct traffic. Temporary signs can be found on Loop 337 giving directions to Common Street. Signs are also located around the plaza. Flashing arrow signs are often used by private businesses to attract attention to a pay-to-park lot.

During the hours of the festival, the traffic signal timing plan at Landa Street and Landa Park Drive is modified to handle the large surge of traffic attracted by the festival.

Off-duty police officers and the Emergency Communications Club (ECC) are two separate organizations that help facilitate the movement of traffic during Wurstfest. The off-duty police officers help people cross the street on busy streets. The ECC helps with the loading and unloading of buses and also establishes a temporary traffic command center (TCC). The physical headquarters of the TCC is on the property of the Lower Colorado River Authority where ECC monitors radio communications of its members, the local police, and sheriff’s office.

**Wolf Pen Creek Amphitheater, College Station, Texas**

**General**

During the 1994 season, Wolf Pen Creek Amphitheater hosted more than 32,000 visitors and 16 events. The amphitheater has established a remarkable reputation for “quality shows, clean beautiful facilities, and down-home hospitality to both performers and guests.” Performers include Joe Diffie, Tim McGraw, Jackopierce, and Barney, the purple dinosaur. Wolf Pen Creek Amphitheater is located at the intersection of Holleman Drive and Dartmouth Street. All facilities and streets included in the transportation management plan are shown in Figure 4. The main entrance and the only accessible street to vehicles is on Colgate Drive. The largest attendances for
Figure 4. Roadway Location Map in the Vicinity of Wolf Pen Creek Amphitheater.
an event at the amphitheater was actually two shows for Barney, the purple dinosaur, with a combined attendance of 14,500. The shows were held on Sunday, September 11 and lasted one and a half hours each. The first show began at 1:00 pm and the second show began at 4:30 pm. In addition to the two shows, a festival was held from 12:00 pm to 4:30 pm (ended before second show).

Traffic Operations

College Station Parks and Recreation, the College Station Police Department, KAMU Radio Station, and Brazos Valley Transit Services were all involved in the traffic management plan implemented during the Barney shows.

First, a section of Holleman Drive from Dartmouth Street to the East Bypass frontage road was closed for the Barney Festival. This action required a permit from the city of College Station because a street was going to be closed. Barricades manned by traffic officers were used to close the intersection of Holleman Drive and Dartmouth Street. A detour sign directing traffic to turn left onto Dartmouth and then right onto Harvey was also located at this site. Traffic officers and a “Barney Parking” sign with a left arrow were the only traffic control measures used to direct traffic at the intersection of Holleman Drive and the frontage road. The only access to the closed section of Holleman was limited to vehicles entering from the frontage road and parking in the Post Oak Mall parking lot for the Barney Shows. (Wolf Pen Creek Amphitheater has a year-round lease for 1/3 of the Post Oak Mall parking lot during events held at the amphitheater). Drivers entering the closed section of Holleman Drive were directed into the mall parking lot by traffic officers stationed at the mall entrance. Another barricade was located just past the mall entrance for additional traffic control and protection for the Barney Festival. Other traffic officers were stationed at the remaining two non-signal controlled mall entrances and the intersection of Dartmouth Street and Colgate Drive.

Second, transit services were provided by four Brazos Valley Trolleys from the Brazos Center parking lots located in Bryan to the amphitheater. See Figure 4. This action, however, was not very effective because the trolleys could not reach the amphitheater due to the traffic.

Third, information packets were sent with every ticket to inform drivers about the park and ride lot at the Brazos Center, the Holleman street closing, and the parking available in the Post Oak Mall parking lot.

Fourth, KAMU radio station placed temporary signs reading “Barney Parking” to aid drivers in finding a parking space close to the amphitheater. In addition to these temporary signs, year round signs for the amphitheater are located throughout the Wolf Pen Creek Tax District, Harvey Drive, Southwest Parkway, and TX 6.

Fifth, no traffic signal timing plans were changed because the planning committee was not sure what routes the traffic would be using to access the amphitheater.

Sixth, an event command center was established where the head officer had radio access to all traffic officers and amphitheater staff assisting with parking.
36th Annual Fourth of July Fireworks Extravaganza, College Station, Texas

General

The 36th Annual Fourth of July Fireworks Extravaganza was held on Tuesday, July 4, 1995 at Olsen Field on the campus of Texas A&M University, College Station, Texas. The main entrance to Olsen Field is located on Olsen Road. See # 47 on figure 5. The gates to Olsen Field opened at 5:30 pm. At 6:00 pm various children’s games began. Approximately 500 to 700 people were inside the gates at this time. At 8:00 pm the vocal entertainment began. Approximately 3,000 to 4,000 people were inside the stadium at this time. By 10:00 pm the attendance had risen to 7,000+. The fireworks began at 10:05 pm.

Figure 5. Roadway Location Map in the Vicinity of Olsen Field.
Traffic Operations

The College Station Noon Lion’s Club, University Police, College Station Police Department, the Department of Public Safety, the Texas Transportation Institute, and the Texas Department of Transportation were all involved in the operations and planning of this event.

One of the traffic management measures taken for this event was to divide Bryan and College Station into living zones. Each living zone was assigned a parking lot and a route for leaving the fireworks display. Many signs were used to aid drivers to the proper routes. Police officers were located at several strategic locations and controlled some of the key traffic signals.

Another measure taken was to publicize the assigned parking lots and routes to the assigned parking lots in the Bryan-College Station Eagle, local TV news, and noon day TV shows. In addition to this publicity, two radio stations, FM 104 and FM 106, broadcasted traffic information prior to and during the fireworks extravaganza.

Another important traffic management measure implemented during the fireworks extravaganza was to convert Olsen Road and George Bush to one-way operation in both directions at the end of the fireworks display. That is, once drivers turned left onto Olsen Road both lanes were carrying traffic away from Olsen Field. Olsen Road normally operates at a two-way two-lane road. In the same way, once drivers turned right onto Olsen Road, the road from that point on became one-way. This same type of design was also used at the intersection of Olsen Road and George Bush Drive. The left lane of Olsen Road was used for drivers turning left onto George Bush Drive where from that point on the traffic became one-way. The right lane of Olsen Road was used for drivers turning right onto George Bush Drive. In the same way, from that point on the traffic on George Bush became one way. George Bush Drive also normally functions as a two-way two-lane road.

Public transportation was not included as a part of the traffic management plan for the fireworks display.

Borderfest Streets of Laredo, Laredo, Texas

General

Borderfest Streets of Laredo is a celebration for the Fourth of July that has been taking place 16 years highlighting the cultural aspects of Laredo. The festival is normally held on a Friday night and a Saturday night where the estimated attendance is 10,000 and 6,000 people, respectively. The hours of operation are from 5:00 pm to 1:00 am. The festival is held near the outskirts of the city at L.I.F.E. (Laredo International Fair and Exposition) Downs on US 59, a two-lane highway with shoulders.
Traffic Operations

The Borderfest Security Committee and administrative assistant to the president, the Laredo Police Department, the Webb County Sheriff’s Office, and the Department of Public Safety were all involved in the planning and operations of this special event. No formal traffic control center was established during the festival; however, one officer is in charge. This officer meets with all officers overseeing a major section of the festival, and is in radio contact with all officers, security personnel, and Borderfest Committee members. The sheriff’s office also has a very active role during the festival. The sheriff’s office has the responsibility of directing traffic at the entrances to the festival, and for organizing and directing the parking of vehicles.

The only parking lots assigned were those for the food and crafts people. All remaining parking areas were left unassigned. Even though plenty of parking was available on the premises of L.I.F.E. Downs, El Metro Buses were contracted to establish a park and ride lot at the airport. The buses operated from 5:00 pm to 1:00 am and traveled on the shoulders to avoid the traffic. The headway between buses was 30 minutes. The possibility of using the shoulders for extra passenger car capacity was also explored but not implemented.
Because the festival does not have one fixed start time, no formal action, in addition to the heat of the day, was needed to distribute the arrival of vehicles to the festival. The performance of only one band at a time and the different types of entertainment served to distribute the departure of vehicles from the event.

Only one new sign was posted for the event. The sign read “Be Prepared to Stop”. This sign was intended for unsuspecting high speed traffic traveling on US 59 into Laredo from Freer. Lastly, special announcements were made by two radio stations that had live remotes at the festival.
STUDY RESULTS

Of the six events surveyed, four were fixed time events, and two were events where the arrival times were spread out over a long period of time. Three events operated over a period of more than one day. On the day of the event, it was determined that only two events held pre-event functions prior to the main event, and only one event held a post-event function at the conclusion of the main event. Only two of the six events were required to obtain a permit for the operation of their event.

In the area of communication, the results indicated that all six events formed a traffic management team to handle all traffic concerns, and that the primary form of communication between event personnel and traffic personnel was radio communication. It was learned from the interviews that all six events used local radio stations as a means of communicating important traffic information to drivers heading to the festival. Only one of these events is aware of an accessible HAR system. Also, only two events established a formal transportation control center.

Other results included information on public transportation and the street and highway network supporting each special event. Three of the six events used public transportation (buses), and two of those three established special bus-only lanes. In all six events, traffic officers were used to improve the flow of traffic. In all but one case, traffic signal timings were changed to improve the flow of traffic. Normal street operations were changed during four of the six events to increase the capacity of the road network. Streets were closed during three events, but traffic was diverted or advised to use certain roads during all but one event. Parking lots were assigned to the public in only one case.

Several issues were addressed by those answering the survey questions. First every special event used a traffic management team to plan and organize the traffic management plan. The number of agencies included on each traffic management team varied between events. Also noted was the fact that there are three major factors for not using public transportation: unavailability of services, cost of service, and availability of parking. Two of the three events that used public transportation made provisions for bus-only lanes. Finally, it was not that two events held a pre-event function and one held a post-event function.

A summary of the traffic management measures used by each of the special events surveyed is presented in Table 4.

Only two differences could be made between the traffic management measures used in small cities and medium sized-cities. The first difference was in the availability of public transportation services. Small towns, like Plantersville, do not have any form of public transportation system and can therefore not incorporate public transportation into the traffic management plan. In medium-sized cities, transit services are available but must often be contracted. In College Station, there are two options. The cost of chartering a Texas A&M bus is $33/hour for a minimum of two hours. The two hours can be split up. The cost of chartering a Brazos Transit Trolley Bus is $50 per hour with a $25 preparation fee and $25 post fee per bus.
Second, special events held in rural areas have an adequate amount of parking to accommodate all vehicles. Examples of this are the Renaissance Festival and Borderfest Streets of Laredo. Both events were held outside the city limits, and both events had plenty of parking available to accommodate all visitors. Special held in urban areas such as Wurstfest and shows at the Wolf Pen Creek Amphitheater have very little parking available on-site. In urban areas, special arrangements with private businesses and property owners are required in order to provide adequate parking.

Aside from those differences already discussed, there were no other common differences where a definite relation could be determined.
Table 4. Summary of Traffic Management Measures used by Special Events Surveyed.

<table>
<thead>
<tr>
<th></th>
<th>Renaissance Festival</th>
<th>Kerrville Parades</th>
<th>Wurstfest</th>
<th>Wolf Pen Creek</th>
<th>4th of July</th>
<th>Borderfest</th>
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<tr>
<td>Starting Time</td>
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<td>F</td>
<td>S</td>
<td>F</td>
<td>S</td>
<td>S</td>
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<td>Multi-day Operation</td>
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<td>X</td>
<td>X</td>
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<td>Temporary Command Center/Radio Communication</td>
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<td>R</td>
<td>TCC/R</td>
<td>TCC/R</td>
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<td>R</td>
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<tr>
<td>Streets Closed</td>
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<td>X</td>
<td></td>
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<td>HAR/Local</td>
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</tbody>
</table>

X-- indicates that respective traffic management measure was used
S--indicates arrival times spread out over long periods of time
F--indicates fixed time
R-- indicates radio communication used
TCC--indicates temporary command center established
HAR--indicates highway advisory radio used
Local--indicates local radio stations used
CASE STUDY EXAMPLE: APPLICATION OF RESULTS

Using the results obtained from the six telephone and/or personal interviews, the traffic management measures used for events held at the Wolf Pen Creek Amphitheater in College Station, Texas were modified to demonstrate the effectiveness of traffic management measures particularly useful for events held in medium-sized cities, small cities, or small towns.

Identification of Major Concerns

The Wolf Pen Creek Amphitheater was selected as the case study example for several reasons. See Figure 7 for a map of the amphitheater and the immediate area. First, in the opinion of the amphitheater venue manager, the Wolf Pen Creek Complex does not have a formal traffic management plan that can be applied for all events. The amphitheater, in the past, has only used a traffic management plan for the College Station Fourth of July Fireworks Display and for an appearance by Barney, the purple dinosaur.

Second, during the amphitheater’s largest event, back-to-back Barney shows, several unexpected problems arose due to the large number of people that attended the event. First, the parking lots and roads became very congested. This was caused by traffic leaving the first show and traffic arriving for the second show. Second, buses, from the specially established park-and-ride lot at the Brazos Center in Bryan, were heavily delayed by the congested traffic conditions caused by the Barney shows. Third, the Wolf Pen Creek Staff did not know what cities people would be coming from; nor did they know what roads people would be using to arrive at the amphitheater complex.

Third, this special event location was selected because the available parking on the premises of the amphitheater is not sufficient for the majority of the events held at the complex. In order to partially solve this problem, the amphitheater has leased one-third of the Post Oak Mall parking lot for guests attending events at the amphitheater.

Finally, the Wolf Pen Creek Amphitheater was selected because most of the events, usually concerts and shows, held at the amphitheater have a fixed starting time. A few events, such as the Barney shows and the Fourth of July Fireworks Display, however, had a variable starting time allowing traffic to arrive over a slightly longer period of time.

Application of Traffic Management Measures to Barney Shows

First, in order to solve the parking problems associated with the event, two traffic management measures are recommended. The first measure is to assign all parking lots. This especially applies to the mall parking lot. For a situation, such as this, where there are two separate shows. The parking lot should be divided into two sections. One section will be reserved for guests attending the first show, and the second section can be reserved for guests attending the second show.
Second, in order to improve the parking lot operations between shows, it is recommended that mall shoppers and guests departing from the first show only be allowed to exit the parking lot at exit-only driveways. In a similar fashion, mall shoppers and guests arriving for the second show should only be allowed to enter the parking lot at entrance-only driveways. It is recommended that the driveways on Harvey Road be designated as the exit driveways. These driveways were selected because drivers have several possible routes to choose from once they leave the Post Oak Mall parking lot. Drivers may turn left onto Harvey Road in order to reach Texas Avenue, College-Station and Bryan’s main arterial street, or drivers may turn right onto Harvey Road and have quick access to the east-bypass, SH-6. See figure 4 for a map of Bryan-College Station. The recommended entrance driveways are located on the frontage road and on Holleman Dr. By assigning the entrances and exits in this manner, departing traffic will not interfere with arriving traffic. This situation, however, should only occur for a short period of time between shows.

Third, bus operations must be improved. More buses will serve to reduce the headway. Smaller headways translate to reliability and efficiency. Smaller headways will encourage guests to park at the park-and-ride lot.

Fourth, it is recommend that a bus-only lane or road be included as a part of the TMP for any special event using public transportation. Public transportation without bus-only lanes or roads will usually get stuck in traffic. Buses traveling from the Brazos Center should use the following route: take SH-6 south, exit on Southwest Parkway, turn right at intersection of frontage road and Southwest Parkway, turn right on Eastmark Dr., turn left on Colgate, and unload/load passengers at intersection of Colgate and Central Park Lane. To return to the Brazos centers from the unloading/loading point, a bus should take the following route: turn left onto Central Park Lane, turn...
left onto Southwest Parkway, turn left onto far side frontage road, take entrance ramp for SH-6, exit Briarcrest Drive, turn right at intersection of frontage road and Briarcrest, and turn right into Brazos Center parking lot. See Figures 4 and 7 for all roads used for the bus-only route. This route serves two purposes. First, the route avoids major congestion by utilizing an exit downstream of the Wolf Pen Creek Amphitheater complex. Second, the buses are not required to perform any complex turnarounds.

Fifth, it is recommended that the scheduling of the festival be designed to ensure that the festival is operating before, between, and after all shows. This will help to spread-out the departure and arrival of the crowds.

Lastly, it is recommended that the Wolf Pen Creek Staff attempt to estimate:

1. How many people will attend the event;
2. What city(ies) those people will be coming from; and
3. What routes they plan to take to arrive at the amphitheater.

This can be determined when tickets are sold or mailed.
CONCLUSIONS

This research accomplished of its objectives and succeeded in addressing many issues concerned with special events held in small and medium-sized cities. Among those issues was the fact that parking availability often dictates the urgency with which many measures are addressed.

Another area that was addressed was public transportation. Sometimes transit services are not available in a particular area. When transit services are available, lack of funds is usually the limiting factor for not using such services. Also, buses are most effective when consistent, frequent, and provided a bus-only lane or road. Shoulders on roadways provide good bus lanes.

Traffic signs and signals was another area that was addressed. First, advanced signing is an extremely effective guidance tool. Second, street closings and associated detours should be properly signed and publicized ahead of time. Lastly, intersections with traffic signals should be changed to accommodate surges in traffic or manned by a traffic officer.

Finally, the last area addressed was scheduling and planning. First, it was noted to multi-day and non-fixed starting time events help to reduce congestion by spreading out crowds over a long period of time. Pre-event and post-event activities also reduce congestion by spreading out the arrival and departure of vehicles to and from an event. Lastly, it was noted that after-event reviews are extremely critical for the improvement of the current TMP.

Recommendations

After reviewing the information collected from the six surveys, it is recommended that the following traffic management measures be seriously considered when developing or revising a TMP. The traffic management measures are:

1. Formation of a formal traffic management team (The benefit-to-cost ratio for the team and carrying out the activities they recommended was estimated at 15-to-1 (15)) .
2. Use of bus-only lanes and/or roads (Separates automobile and bus traffic);
3. Variable starting time for event attractions (Spreads out crowds);
4. Pre-event and Post-event activities (Spreads out crowds);
5. Clear route/destination signing (Directs motorists to parking areas, and alternate routes);
6. Strategic officer placement (Accommodates real-time conditions); and
7. Radio communication between traffic and event personnel (Accommodates real-time traffic conditions).
Benefits of Research

This report has combined the transportation management plans for six different types of special events in Texas to document the current state-of-the-art in special events planning for special events held in small and medium-sized cities. In addition, several traffic management measures were identified as particularly useful for special events held in small and medium-sized cites. Lastly, this report suggests several improvements to the current TMP used by the Wolf Pen Creek Amphitheater complex, a direct benefit to the city of College Station, and residents in the Bryan-College Station area.
ACKNOWLEDGMENTS

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Cheryl Vinson  Renaissance Festival Committee
Bill Tucker  TXDot--Kerrville Parades
Suzanne Herbelin  Wurstfest Association
Shelia Walker  Wolf Pen Creek Amphitheater
Marshall Crawford  College Station Noon Lion’s Club--Fireworks Display
Luiz Munoz  Borderfest Streets of Laredo
REFERENCES


9. Telephone interview with Cheryl Vinson, Renaissance Festival Committee.

10. Telephone interview with Bill Tucker, Area Engineer, Texas Department of Transportation, Kerrville.

11. Telephone interview with Suzanne Herbelin, Executive Director, Wurstfest Association.

12. Personal Interview with Shelia Walker, Venue Manager, Wolf Pen Creek Amphitheater.

13. Telephone interview with Marshall Crawford, Committee Chair, College Station Noon Lions Club’s 36th Annual July Fourth Fireworks Extravaganza.

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QUESTIONNAIRE FOR TELEPHONE INTERVIEWS

GENERAL
1. What is the name of your event?
2. What is the projected attendance for your event?
3. Where is your special event located? Please give name of adjacent streets or highways.
4. When is your event held? Weekday or Weekend? Holiday?
5. What are the hours of operation for each day?
6. What event(s) were held before the official event started?
7. What event(s) were held after the official event ended?
8. Was anything done to distribute the arrival of vehicles to the event (refreshments, Bar-B-Q, Band)?
9. Was anything done to distribute the departure of vehicles from the event (refreshments, Bar-B-Q, Band)?

COMMUNICATION
10. How many agencies/committees are involved in developing a traffic management plan? Please list agency/committee and responsibility.
11. Was highway advisory radio used?
12. Were changeable message signs used?
13. Was temporary signing used?
14. Was a temporary command center established?
15. Was any permit required by the TxDOT or the municipality for a traffic management plan? Why or why not?

ROAD NETWORK
16. Was incoming or outgoing traffic diverted to different roadways? If yes, please explain.
17. Were normal street/highway operations changed to increase the capacity of the roadway (i.e. temporary one-way streets, addition of a lane of travel, left-turn restrictions)? If yes, please explain.
18. Were any streets closed?
19. Were signal timings changed?
20. Where were traffic officers/personnel placed in order to facilitate the movement of traffic?
21. How were parking lots assigned?

PUBLIC TRANSPORTATION
22. What part did public transportation have in the traffic management plan? Please list all forms of public transportation that were used. Also, please explain how each was used.
23. Were special bus lanes used?
24. Were bus-only roads used?
25. Was there shuttle bus services from the parking lots to the event?