Develop Guidelines for Access Management in Las Vegas

**Project Team**
Dr. Mohamed Kaseko, PI  
Dept of Civil and Environmental Engineering, and  
Transportation Research Center  
University of Nevada Las Vegas  
4505 Maryland Parkway, Box 454015  
Las Vegas, NV 89154-4015  
702-895-1360

Dr. Hualiang Teng, Co-PI  
Dept of Civil and Environmental Engineering, and  
Transportation Research Center  
University of Nevada Las Vegas  
4505 Maryland Parkway, Box 454015  
702-895-4940

Dr. Zong Z. Tian, P.E., Co-PI  
Department of Civil & Environmental Engineering  
University of Nevada, Reno  
Reno, NV 89557  
775-784-1232

Timur Mauga  
Graduate Research Assistant  
Dept of Civil and Environmental Engineering, and  
Transportation Research Center  
University of Nevada Las Vegas  
4505 Maryland Parkway, Box 454015

Xuecai Xu  
Graduate Research Assistant  
Dept of Civil and Environmental Engineering, and  
Transportation Research Center  
University of Nevada Las Vegas  
4505 Maryland Parkway, Box 454015

**External Project Contact**
None

**Project Objective**
The objective of the study is to develop guidelines on access management for the Las Vegas area. Specially, the spacing between accesses including signal intersections,
driveways, and opening in medians will be investigated. The benefit of corner clearance, circulations in commercial subdivisions, and frontage roads will also be evaluated. The investigation and evaluation will be conducted based on (1) using statistics model analyzing field data and (2) developing microscopic simulation models. The findings from the study will be used as a foundation for developing guidelines on access management for the Las Vegas area.

**Project Orientation**

Guidelines

**Project Abstract**

Las Vegas is a rapidly developing area where existing roads may reach their capacity quickly after their open to public. In this case, the roads would have to be widened. A good example for this case may be the Blue Diamond Road. The worry about this road is that the widened road may become congested soon again if the accesses to this road are not well controlled. In that case, there may not be sufficient land available to widen it again.

In the City of Las Vegas, it has been observed that land use plays a dominant role on influencing the operations of transportation system. It has been well recognized that traffic operations can be improved if only one or two corners of an intersection is used for commercial development. It can be seen that over the Las Vegas area, gas stations or retail stores are on every corner of a major intersection. It has been going on for years and the chance to see it changing would not be much.

One way to reduce the number of accesses is to develop a large commercial division at a corner of an intersection in which a circulation system is provided. With fewer access provided to connect to the outside road network, customers or motorists have no problem accessing to their activity destinations. In the current Las Vegas area, there are not many such circulation systems existing.

Conceptually, the spacing between accesses may not need to be too long or too short. If it is too long, traffic would concentrate on one point in space. If it is too short, there would be more conflict points over space. Finding the optimal spacing is actually to find the balancing point. Note that there are two sets of criteria: mobility and safety. It is also worthwhile to investigate the balance points when these two sets of criteria are considered together.

Basically, two approaches will be taken to evaluate the spacing for different accesses. One is based on field data, and the other is based on microscopic simulation. In the first approach, field observational data such as travel time and speed data derived from GPS and crash data from RTC will be used to derive the spacing of different accesses. This approach relies upon the statistical models to derive the optimal spacing criteria. In the second approach, microscopic traffic simulation models will be developed. By conducting sensitivity type of analysis, the optimal spacing can also be derived. In addition to the investigation of spacing, the effectiveness of some typical access management strategies such as street corner circulation system and frontage roads will be analyzed using
simulation models. Basically, simulation models will be calibrated for several locations (including both corridors and intersections) in the Las Vegas area. The measures of effectiveness for mobility and safety that can be produced in the traffic simulation model can be used in the investigation.

Project Task
To achieve the objectives of this study, the following tasks are proposed:

Task 1: Review Literature
In this task, the research team will review literature on access management. Lesson and experience on access management on the level of statewide, MPO, county and city will be compiled. The other rapidly developing areas such as Orlando in Florida would be given more attention. The literature could be technical papers, reports, and articles. It can be from different sources such as websites and libraries.
Product: a working paper on literature review

Task 2: Inventory Access Management Condition
In this task, the research team will inventory the situation of access management conditions in the Las Vegas area using several different approaches. Meetings with the professionals in the cities, county, RTCSN, and NDOT who are responsible for access management for their agencies will be held. In the meetings, their concerns in the practice of access management will be solicited. The issues to be discussed in the meeting may include the coordination of professionals who suggest access decisions and commissions who make the final decision of access applications. The locations of roadway network that are problematic from the perspective of access management will be identified through the help of these professionals. Field trips to the identified locations will be made. The cases that show inconsistency between the decisions made by professionals and those by commissions will be investigated. The history of these locations from when they are planned to the current conditions will be documented. Based on the meetings, field trips, and case investigation, a summary about the status quo of access management in this area will be developed.
Product: a working paper documenting the status quo of access management in this area

Task 3: Statistical Analysis of Access Spacing
In this task, the spacing of accesses that can produce the desired system performance of mobility and safety will be determined based on observation data. Regression models will be developed to relate the performance measures of roadways (e.g., speed, speed variance, number of accidents, and severity of accident) to the spacing of different accesses which vary for different road classes. Three dimension curves may be derived based on the regression models. The balancing point corresponding to the optimal criteria may be observable from the curves.
Table 1 provides a list of accesses for typical road classes to be considered in this study. For freeway, the access is interchange; for arterial and collector roads, the type of access includes intersections and driveways. In the Las Vegas area, there are two types of driveway design: pan driveway and radius driveway. The type of accidents caused by these two types of driveway designs is different. Pan driveways tend to cause more rear-end crashes. Thus, distinction will be made for these two different driveways. In addition, raised median and traversable median has different control on access and thus need to be
considered separately. Whether the corners of intersections on a corridor are cleared is also important in evaluating the performance of roadway network, thus will also be included in the regression models.

**Table 1 Tentative Variable in the Proposed Regression Models**

<table>
<thead>
<tr>
<th>Road function classification</th>
<th>Interchange spacing</th>
<th>Signalized intersection spacing</th>
<th>Driveway spacing</th>
<th>Median opening spacing</th>
<th>Corners</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pan driveway</td>
<td>Radius driveway</td>
<td>Raised median</td>
</tr>
<tr>
<td>Freeways</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Traverse median</td>
</tr>
<tr>
<td>Arterial</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Collector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

The spacing data will be obtained from relevant agencies such as RTCSN. If such data are not available, they can be made available by measuring in the field. Distance measuring devices are available in the market that can be installed in vehicles. The spacing data can be derived while a vehicle is running. The speed data can be derived using the paratransit GPS data. In a recent project by TRC for RTCSN, the GPS data were used to derive travel time and speed data for all the roads in the Las Vegas area. Currently, the paratransit GPS data are kept in RTCSN. The accident data can be obtained from an on-going project by TRC for RTC. By the end of this RTC project, an accident database will be established. As planned, all the accidents happened in the Las Vegas area will be included in this database. The PI Hualiang Teng of this proposal is the Co-PI of the on-going accident database project.

It has been realized that the travel time and speed data derived based on paratransit GPS data may not be accurate because the derived travel time and speed data are actually for paratransit vehicles which usually run slower than most of other general traffic. To make necessary correction, the study will run a vehicle representing general traffic on roads where paratransit vehicles also running. The parallel running of paratransit vehicles and test vehicle will be conducted on different road classes and for different time periods. Note that the results from this calibration of speed and travel time is important not only for this study, but also to the overall access management program in this area because the calibrated travel and speed data can be used for the monitoring of access management program.

Product: a working paper on the spacing criteria derived based on analyzing the observation data

**Task 4: In-Depth Analysis of Chosen Locations**

In this task, critical access management practices will be evaluated using microscopic traffic simulation models (e.g., VISSIM). The critical access practice includes the spacing between accesses (e.g., intersection, driveway of different type, median type, and corner clearance). In addition, the impact of reducing the number of access on the corners of intersections and providing frontage roads along freeways will be evaluated.

**Task 4.1 Evaluating Spacing**

To evaluate the spacing between accesses, corridors, each including a different road classes, will be chosen for simulation. The selection of the corridors will take the advantage of the results in the statistics analysis in previous task. The transportation professionals in the relevant agencies will also be consulted. Different scenarios of access locations producing different spacing of accesses will be generated and then simulated. The measures of effectiveness to evaluate the spacing include speed, travel, speed variance, and the
number of excessive decelerations. Before using the simulation model, it has to be calibrated using specific local data for the chosen corridors. By varying the number of spacing of accesses, the optimal space criteria can be identified.

**Task 4.2 Evaluating Typical Access Management Strategies**

For simulating the land development in the corners of intersections, scenarios with different number of access will be generated. More importantly, the option of commercial division with internal circulations will also be included. The performance of road networks with different scenarios will be compared.

For evaluating the impact of providing frontage roads, a freeway corridor will be chosen. In addition to the existing condition, the scenarios with frontage roads on both sides of freeway will be developed. The frontage roads could have different level of connectivity to the freeways. Incidents of different severity like blocking different number of lanes will be included in the scenarios. The feasibility of providing frontage roads will also be evaluated based on cost and benefit analysis. Here, the costs may include those for the acquisition of right of way, planning, design, and operation. The benefits may include the savings in travel time over the chosen corridor.

Product: A working paper compiling the evaluation of spacing and other access management techniques.

**Task 5: Guideline Development**

In this task, the research team will develop guidelines of access management based on the results in previous tasks. Specially, the spacing between accesses, the circulation development at corners of intersections, and the provision of frontage roads will be recommended for adoption by local agencies in the Las Vegas area. In developing the guidelines, the guidelines that are being used in the local agencies will be reviewed and compared with what recommended in this study. The guidelines will include examples that are simulated in this study. A meeting with local agencies will be held for information exchanging. The feedback from these agencies on the suggested guideline will be incorporated in the final document of guidelines.

Product: a working paper describing the guidelines for access management in the Las Vegas area

**Task 6: Prepare Final Report**

In this task, the research team would develop a final report documenting the products developed in all the previous tasks performed in this study. A draft report would be developed first and submitted to project panel. These comments would be incorporated in the final report.


**Project Milestones**

The duration of the project is 24 months. In the first year, the tasks Review Literature, Inventory Conditions, and Statistical Analysis will be completed. All these three tasks will start right at the beginning of the project. The tasks Review Literature and Inventory Conditions will take half year. The task Statistical Analysis takes one year because it involves data preparation, learning advanced statistical models, and applying the models in analysis. The task In-Depth Analysis will start half year after the beginning of the project. It will also take one year to finish. UNLV and UNR will work on this task in
parallel, each for different simulation tasks. Actually, this task can also start right at the beginning of the project.

**Total Budget**
$73,705.00

**Project Duration**
Start Date : 2007-09-01
End Date : 2008-08-31

**Student Involvement**
Three students will be involved in this project; one student is responsible for Review Literature and simulation, the other for inventory current conditions and simulation. The third student takes the responsibility of statistical analysis and guideline development.

**Relationship to Other Project**
None

**Technology Transfer Activities**
None

**Potential Project Benefits**
Las Vegas is developing in a pace that is unprecedented in America history. The access management issues are noticeable for a brief trip around this area. To address them is becoming pressing. With the guide developed in this study to be used in practice in this area, the development can be healthier. Costs for correcting the problems caused by mis-management of access can be saved in future with the adoption of the guidelines in access management.

**Project Keywords**
Access Management, Guidelines, Las Vegas, Land Use, Access Spacing