Feasibility of an Integrated Traffic Management and Emergency Communication System for Birmingham, Alabama

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16. Abstract

This research project examined the feasibility of an integrated traffic management and emergency communication system for Birmingham and surrounding counties in Alabama. The research focused (1) on creating a coalition of stakeholders to develop a deployment plan for the location data platform, and (2) identifying opportunities for the development and marketing of applications to stimulate both public and private sector investment.

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Executive Summary

Acquiring and using incident data is central to the missions of both traffic management and emergency response agencies. Several market, political, and technological developments have created an enormous opportunity for integrating traffic management and emergency response data to achieve greater benefits and efficiencies. These developments include breakthroughs in the use of wireless technologies and the Federal Communications Commission's legislative mandate to locate wireless 9-1-1 callers. The feasibility of taking advantage of these opportunities, however, rests on a unique set of challenges. While the technological issues have been at the forefront, and are vital to the success of any intelligent transportation systems (ITS) integrated program, the guidance available is inadequate for dealing with the institutional and stakeholder issues that can "make or break" a deployment.

This research project examined the feasibility of an integrated traffic management and emergency communication system for Birmingham and surrounding counties in Alabama. The research focused on: (1) creating a coalition of stakeholders to develop a deployment plan for the location data platform; and (2) identifying opportunities for the development and marketing of applications to stimulate both public and private sector investment.

Key project activities and accomplishments included:

- Convening diverse stakeholders
- Uncovering shared interests and potential barriers
- Providing coordination and facilitation
- Developing conceptual system models
- Identifying potential funding opportunities
- Educating stakeholders on the need for integrated system

The results are a conceptual model of an integrated system that brings together the various perspectives of a diverse set of stakeholders and a plan for obtaining funding for deployment.

1.0 Introduction

There is a vision – hopefully in the not-too-distant future – of completely integrated public safety, Emergency Medical Services (EMS), and traffic management communications systems (Rendell 1999). It will save lives, reduce the impact of serious injuries, conserve public safety resources, and improve transportation efficiency. Here is how this ideal scenario may play out in a market like Birmingham, Alabama:

> *Assume there is a serious three-car pile-up on I-65, just north of Birmingham, Alabama – a ten-minute ambulance ride to the closest trauma center under normal traffic conditions. Several passengers suffer significant injuries. An automatic collision notification device in each of the impacted vehicles is activated. A wireless call to 9-1-1 is automatically dialed and the crash data (how fast the cars were traveling, the principal direction of force, whether the cars rolled over, and the type of cars) is simultaneously sent to the 9-1-1 center and the nearest trauma center (the latter because data indicated a very serious crash). 9-1-1 dispatchers know the exact location of the crash since it was instantly plotted on a computerized map. They also know that "good Samaritans" dialing 9-1-1 on their wireless phones are describing the same emergency.*
>
> *Based on the severity of the crash as indicated by the stream of data, the trauma center and 9-1-1 operator know immediately whether to send a patrol car (in the case of a fender bender), ambulances, or the medi-vac helicopter. On the same map identifying the location of the incident, the emergency dispatcher is able to tell where the nearest police cars are patrolling and where the closest ambulances and fire trucks are located based on inexpensive Automatic Vehicle Location (AVL) transmitters in the vehicles. For a better view, the nearest ITS-deployed camera, identified by this same location data, is automatically switched on and focused to the crash scene.*
>
> *As EMS arrives on the scene and takes the victims to the trauma center (avoiding other tie-ups due to the dispatcher's access to traffic data), the trauma teams are getting prepared, knowing from the crash data the specific kinds of internal and external injuries they should expect to treat.*
>
> *Because the system uses wireless telephones as "data probes," traffic information is available throughout the vicinity – not just where the transportation departments had installed cameras or sensors. Thus, the same location technology is giving traffic managers real-time descriptions of traffic patterns and speeds, and the crash is reported immediately, along with its effect on traffic. This allows effective incident management: diversion of traffic, saving time for other commuters heading home to their families and immediate dispatch of equipment to clear the highway. Wireless subscribers to traffic data services heading towards the incident are notified immediately of the clogged traffic situation ahead and are offered alternative routes. The same picture appears graphically via an Internet-delivered service to subscribers and any government official with approved access.*

> *Inside the ambulance, devices are hooked up to the victims, communicating vital signs in real-time via wireless technologies to the trauma center. Each victim's medical history, blood type, and reactions to medication are accessed from a secure database to better prepare caregivers. On the way to the trauma center, the ambulances are routed along highways with the least amount of congestion and never have to maneuver through a red traffic light since they are preempted by a wireless signal beamed from the emergency vehicle.*

The benefits of this visionary system are immediately clear to those working in the traffic management and emergency response arenas. Traffic managers would use the data from the system to identify vehicle crashes, clean up wreckage, divert traffic, and ensure public safety – the primary focus being quick response to *improve traffic flow*. On the other hand, emergency response personnel would use the same data to locate injured motorists, identify the severity of the crash, and transport the victims to the most suitable medical facilities – the primary focus being quick response to *save lives and reduce injury severity.* Thus, an integrated approach to system management would allow appropriate sharing of critical data and the optimization of high priority outcomes.

To achieve an integrated system of traffic management and emergency response of this magnitude requires heavy reliance on intelligent transportation systems (ITS). Significant progress has been made in recent years to develop and deploy ITS programs on existing roadways to improve traffic flow without the addition of capacity. However, despite increasing acceptance and a growing number of ITS deployments, most projects are hardware-based (i.e., road sensors and video detection) and focus only on traffic applications. Thus, response times are being impeded and resources needlessly duplicated because advanced wireless technologies have not been incorporated and information is not shared effectively across traffic management and emergency response systems.

1.1 Problem Statement

The motivation for this project is based on a broad set of circumstances and conditions involving the public safety:

- A growing population with marginal capacity expansion means increasing traffic congestion
- No location information from 9-1-1 calls on wireless phones (vs. calls on a landline)
- Drivers often cannot pinpoint their own location
- In a crash, the driver may be unconscious or injured and cannot place the call
- Emergency vehicles have difficulty choosing the best route to the incident
- Traffic tie-ups from incidents often cause more problems

The problem in dealing with these circumstances is that traffic management systems and emergency response systems operate independently. Obviously, sharing data across legacy systems designed for different purposes presents substantial technological challenges. While emerging wireless technologies hold much promise for overcoming these challenges, the institutional issues involved in achieving the integration of traffic management and emergency response cannot be ignored. Such a system requires multiagency, multijurisdictional efforts and coordination of these different agencies and jurisdictions presents an immense hurdle – given their diverse institutional functions and goals.

Stakeholders from traffic management and emergency response draw their expertise from distinct bodies of knowledge and organizational cultures. They often see their missions in conflict to one another. n addition, the costs of the system are fragmented and difficult to quantify, investment responsibility is unclear, and public and private sector support is crucial. Furthermore, the leadership for deploying these integrated systems is unavoidably dispersed.

Institutional issues may therefore present the greatest challenge to the realization of an integrated traffic management and emergency response system.

1.2 Overall Project Approach

This project was a feasibility study to identify the institutional issues relevant to a potential deployment in Birmingham, Alabama, and to develop a strategy for dealing with the institutional issues. The project used a stakeholder approach to determine the market, political, technological, and institutional enablers and barriers for the integrated system described by the vision in the opening paragraphs of this report.

A stakeholder development process was developed and implemented throughout the project focusing on the institutional issues. This included personal contacts, in-depth interviews, small group meetings, and statewide symposiums. The outcomes include a conceptual system model created and embraced by the stakeholder participants and lessons learned for moving forward with a possible deployment.

2.0 Background

Cellular phones have become an integral part of American modern culture. In fact, by 2000 the number of cellular phone users in the United States exceeded 100 million. With so many American drivers possessing cellular phones and frequently using them during their travels, the potential for cell phone users to serve as "data probes" for traffic management and emergency response have been suggested and investigated by a number of transportation experts. The impetus to use wireless (cellular) phones as data probes grew from a parallel initiative to locate passengers in vehicles during emergency situations.

2.1 Wireless E9-1-1: The 1996 Order and New Law

Over the last few years, there have been a number of significant changes in wireless telephone service legislation with significant impact on the potential of location technologies for various applications. In 1996, the Federal Communications Commission (FCC) issued an order (94-102) for U.S. wireless carriers to provide Public Safety Answering Points (PSAPs) with the location of wireless 9-1-1 callers in two steps (Order 94-102 is commonly referred to as Enhanced 9-1-1 or E9-1-1). Phase I of the FCC order mandated wireless carriers to provide PSAPs with automatic number identification (ANI), or callback number, and the cell site from which the call originated for wireless 9-1-1 callers. The FCC required wireless carriers to fulfill Phase I by April 1, 1998. In Phase II, carriers must provide the actual location of all 9-1-1 callers within 125 meters (~410 ft.) by October 1, 2001.

Both phases have the same three conditions for deployment to occur: (a) a PSAP request to the wireless carrier; (b) the PSAP has systems in place and is ready to use the data; and (c) a cost recovery mechanism is in place. While the FCC did not define cost recovery, it has been widely interpreted to mean that states would legislate special E9-1-1 fees from wireless subscribers. The funds would then be used to pay carrier and PSAP costs. More than 30 states have been funding the E9-1-1 upgrades with monthly fees from wireless subscribers. However, disputes over cost recovery and institutional issues have hindered meeting the mandate in many areas.

2.2 FCC Rule Changes – Fall 1999

Congress sought to encourage E9-1-1 deployment with the *Wireless Communications and Public Safety Act of 1999*. The act removed significant barriers to the deployment of E9-1-1 by protecting the privacy of wireless customers while allowing wireless carriers to collect anonymous data from telephones and other devices.

Furthermore, following the 1999 Act, the FCC adopted two important changes in its rules for wireless telephone services that have significant impact on the potential of location technologies for various applications:

Technology Choice. By late 2000, all carriers were required to announce their choice between "handset" (global positioning system (GPS) or "network" (terrestrial) location technologies as a Phase II E9-1-1 solution. The handset solution allowed for a phase-in period, requiring at least half of all new digital handsets sold are Automatic Location Identification (ALI) capable by October 1, 2001. The Commission also modified its Phase II accuracy standards for network and handset-based solutions. For the network solution, 67% of all 9-1-1 calls must be located within 100 meters and 95% within 300 meters. For handsets, 65% of calls must be located within 50 meters and 95% within 150 meters.

The choice between network- and handset-based solutions was largely determined by the size of the carrier's subscriber base. In general, large carriers chose a network solution since the cost of deployment would be dispersed among a higher number of subscribers per cell site. Small carriers – with fewer subscribers per cell site over which to amortize fixed costs – preferred the handset solution.

Cost Recovery. The FCC eliminated the wireless carrier cost recovery requirement, claiming it had delayed Phase I and would seriously delay Phase II. States *may* still provide cost recovery to carriers, but cost recovery is no longer a precondition. Aside from these two rule changes, the FCC left in place other preexisting requirements and deferred to state and local governments for further decisions. These include clarifying the meaning of cost recovery for PSAPs and the criteria determining whether a PSAP is ready and able to use automatic location data. Now, with the burden of funding the implementation turned back to the wireless carriers, they will be looking for new revenue sources to offset deployment costs. Moreover, the carriers may be more interested in undertaking new businesses that could result as a by-product of meeting the FCC mandate.

2.3 Implications of FCC Rulings

On one hand, E9-1-1 deployment will probably happen faster under the new FCC rules than under the previous rules. If a PSAP makes a legitimate request for E9-1-1, wireless carriers generally will have to accede. The FCC's retention of its October 1, 2001, deadline for Phase II capabilities, coupled with the removal of the cost recovery precondition, makes the E9-1-1 rule effectively a flat mandate. Hence, rapid deployment of location technology is expected to occur within the next 12-18 months.

On the other hand, a number of key challenges are likely to delay E9-1-1 development. These include the following:

Compliance. Not all carriers have reacted positively to the new rules, suggesting that compliance with the current legislation may be a problem. In fact, some in the industry are seeking to change the recent FCC rulings.

Technical Infrastructure. Many of the 5,550 PSAPs have inadequate equipment and/or software to meet the current needs of the system. Wireless carriers aggressively pursuing E9-1-1 deployment will encounter various infrastructure-related difficulties.

Institutional Issues. Since carriers' service boundaries are often state- or multistate-based, wireless carriers face complex and ill-defined institutional barriers. Moreover, there are no established state- and regionwide deployment planning processes to address these institutional challenges.

Market Opportunity. Although the potential exists to make E9-1-1 deployment an attractive business opportunity for developing new services and markets, for the most part, wireless carriers are slow to explore alternative uses of location technologies. Likely market location applications – beyond E9-1-1 – include using wireless phones as data probes to provide a stream of real-time traffic information, selling traffic and other location-based services to subscribers (E4-1-1), using wireless AVL devices for fleet management, and selling additional safety devices such as those for automatic crash notification. However, these products and services are only now being tested for commercial applications.

2.4 E9-1-1 Technology: Data Probes and ACN

To date, most transportation management agencies have concentrated their efforts on detection and monitoring equipment on major freeways and commuter routes. These stand-alone detection technologies – required for extensive coverage of a roadway network – are expensive, lack consistent reliability, are subject to wear and tear, and therefore result in additional maintenance and replacement costs. Finding sources for funding even limited systems has been challenging. Moreover, while these deployments provide useful information, the data is quite limited in scope.

Using wireless phones as data probes in conjunction with automatic crash notification (ACN) devices can augment and complement current traffic management and safety initiatives and may do so with a more advantageous cost/benefit ratio.

2.5 Wireless Phones as Data Probes

Several telecommunication providers (e.g., TruePosition, US Wireless, and others) have demonstrated the ability to accurately locate wireless callers as well as the efficacy of wireless E9-1-1 for public safety and emergency response applications. Successful field trials have been conducted through partnerships between the technology companies and wireless carriers in places such as southern New Jersey; Billings, Montana; Philadelphia; Baltimore; Houston; Fort Wayne, Indiana; and the Washington, D.C. beltway.

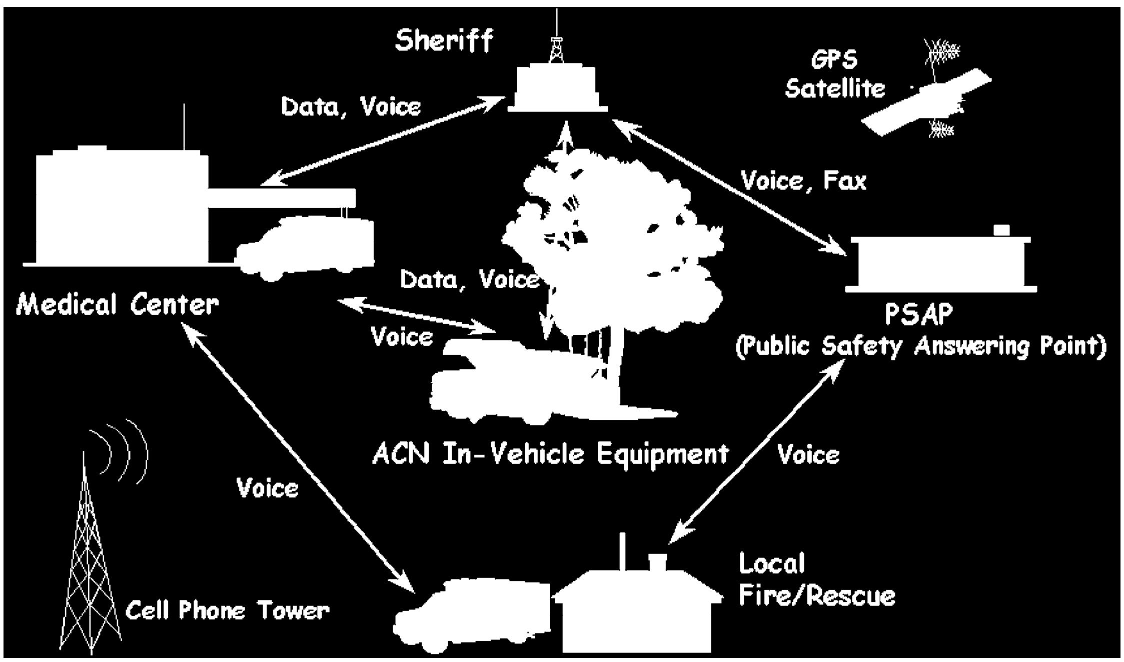
E9-1-1 location technologies not only provide latitude and longitude for individual phones, but also may indicate velocity and direction for aggregates of wireless phones, i.e., real-time traffic information. This is generally referred to as the "vehicles as probes" concept. When a wireless phone is turned on, whether or not it is being used, it periodically sends out a signal ("I'm here"), so the wireless network knows the location of the phone for incoming calls. This signal, not just relatively infrequent E9-1-1 calls, is what provides the data for Intelligent Transportation purposes.

Once an E9-1-1 location platform has been deployed, it may also serve as a platform for other important applications for state and local government agencies and for commercial entities. Specifically, because the location, speed, and direction of vehicles carrying wireless devices (e.g., cell phones) can be pinpointed throughout the transportation network, traffic managers can measure the velocity and direction of travel on all roadways in an area. In addition, these data can be used to "pinpoint" the location of a traffic incident and thereby can be used to manage traffic congestion more efficiently. Moreover, Automatic Vehicle Location (AVL) for municipal and commercial vehicles could be provided inexpensively with a cheap wireless beacon. Commercial traffic data services could be supplied with extensive real-time information that might be personalized because of the data on vehicle location and direction of travel.

2.6 Automatic Collision Notification

In addition to providing the location of a vehicle making an emergency 9-1-1 call or serving as an anonymous vehicle probe for traffic flow, wireless technology is capable of improving incident management. A central element of an integrated traffic management and safety system is Automatic Collision Notification (ACN) devices installed in vehicles. In essence, ACN devices automatically notify emergency response units when an accident occurs. The ACN system accomplishes this by automatically sensing that a crash has occurred and immediately relaying information on the crash severity and location to the emergency 9-1-1 dispatcher. Figure 1 is an example of how the ACN system works for emergency response. Many people in the emergency response community share a vision of a system that would integrate a broad range of technologies both to reduce emergency response times and to provide a more suitable response for victims of motor vehicle accidents.

Figure 1: Example of Automatic Crash Notification



Several operational tests of ACN technologies demonstrate the ability to solve the technological challenges. The first, in Erie County, New York, was an operational test to evaluate the performance and benefits of the ACN system. The test was funded by a grant awarded to the Calspan Division of Veridian Corporation by the National Highway Traffic Safety Administration in partnership with CellularOne, Erie County Medical Center, and the Erie County Sheriff's office. The system used crash sensors, position-location instruments, signal processors, and cellular phones installed in approximately 1,000 privately owned automobiles with additional communications, special processing, and display hardware and software installed at Public Safety Answering Points (PSAPs).

The second ACN project was the *Mayday Plus* program in Rochester, Minnesota. Team members included the Minnesota Department of Transportation, Minnesota State Patrol, Mayo

Clinic, and Veridian Corporation; other collaborators include Midwest Wireless, American Trucking Association (ATA), and AAA-Minnesota/Iowa. Mayday Plus built on the Erie County, New York test by developing a system that intelligently routes emergency data to responders by taking into account the vehicle's location and the type of emergency. When a crash occurs, the Mayday Plus system relays the vehicle's location, its point of crash impact, the change in its velocity during the crash, and its final resting position. After transmitting this data, the system then opens a direct voice connection from the responders to passengers in the car.

The third and most recent project demonstrated that ACN data could be delivered from an equipped vehicle to a PSAP using existing 9-1-1 technologies. The participants included SCC Communications Corporation., Greater Harris County 9-1-1 Emergency Network, Veridian Engineering, Plant Equipment Inc., and Combix Technologies. The trial demonstration successfully transmitted crash data to the PSAP through the wireless phone system and an emergency communications network developed and maintained by SCC.

The next generation of ACN systems promises to overcome many of the technological problems associated with the misrouting of emergency calls, inaccurate crash location information, delayed notification, and unreliable eyewitness accounts – all of which delay emergency responses and further endanger crash victims.

2.7 Opportunity for a Fully Integrated System

The parallel developments of wireless location technology and ACN devices – coupled with a FCC mandate for E9-1-1 – create an enormous opportunity for the integration of traffic management and emergency response. In regions where carriers choose a network solution to Phase II of E9-1-1, an integrated system would provide broad-reaching benefits to a wide range of stakeholders including revenue-generating businesses.

Achieving the vision described herein will require an unprecedented and unique effort. The significant challenges – aside from the technological difficulties – are to identify institutional and market barriers, and to develop the process by which a disparate set of stakeholders can come together to achieve a deployment.

Several developments at the national and state level have created an opportunistic level of readiness for an integrated traffic management and emergency communication system in the Birmingham, Alabama region:

- Concern for highway safety is intensifying among Alabama citizens;
- Wireless subscriptions in the Birmingham area are growing rapidly;
- The University of Alabama at Birmingham is successfully operating a six-county trauma response network;
- The Department of Transportation for the City of Birmingham has begun an ambitious enhancement of its traffic management system, and
- The federal government is encouraging both research and deployment of integrated ITS applications.

The confluence of these events and trends motivated a pilot study of the feasibility of an integrated system in the Birmingham, Alabama region. The study focused on the local needs for improved traffic flow, better management of incidents, fewer accidents, improved survival rates from crashes, and lower severity of injuries.

3.0 Methodology

This research undertakes a sociotechnical systems perspective. This is a method of viewing organizations in a way that emphasizes the interrelatedness of technological and social subsystems and the relation of the organization as a whole to the environment in which it operates. Extant research on sociotechnical systems reveals there is greater risk of misunderstanding and territorial infighting if the process ignores the "human side" of the process. Doing so requires a balanced focus between the technical issues on the one hand and the organizational and institutional processes on the other.

In this case, the sociotechnical perspective requires an understanding of the interrelated nature of the tasks required to plan, evaluate, and develop the appropriate systems to achieve the ultimate goal of an integrated traffic management and emergency response system. Thus, the purpose and goals of the system assume a central place in our assessment in relation to the environment.

Because of the nature of integrated deployments, this research further adopts a stakeholder development approach. The stakeholder development process draws heavily from the strategic stakeholder analysis area of management research. According to the literature, stakeholder theory is based on the notion that, "the firm takes into account all of those groups and individuals that can affect, or are affected by, the accomplishment of organizational purpose" (Freeman 1984).

We define stakeholders as those groups, organizations, or other entities that have an influence upon the deployment of an integrated traffic management and emergency communication system. Strategic stakeholder analysis provides various techniques for developing collaboration among diverse stakeholders. In short, strategic stakeholder analysis provides the theory and tools for identifying, differentiating among, and drawing together the most relevant set of stakeholders for the deployment of an integrated traffic management and safety system.

3.1 Overview

The study involved several major sets of activities. We identified and convened a diverse set of stakeholders in several general meetings and then established task forces to focus on specific issues. Thus, an organizational structure was created to coordinate and facilitate the stakeholder exchanges. The project methods included qualitative social science tools including secondary data collection, administering focus group meetings, conducting telephone and face-to-face interviews, and holding facilitated symposiums.

3.2 Major Project Activities and Methods

In this section, we describe the key activities completed in the feasibility study along with a description of the methods used. While the various activities were overlapping and iterative, we classify and explain them according to seven categories.

Activity #1: Developed an Understanding of the Current State of Knowledge and Practices

We conducted a thorough review of the marketing, management, and engineering literature as well as related industry trade publications and government reports.

We contacted and/or met with others across the country working on integration issues related to traffic management to learn from their experiences. These included, for example, the Virginia Department of Transportation, NYS Emergency Call Locator Partnership, and Federal Highway Administration.

Finally, we attended several professional and government-sponsored conferences, participated in meetings of nonprofit organizations, and gave presentations to a variety of stakeholder groups (including, for example, the ITSA 2000 Annual Conference; ITSA/USDOT Public Safety Conference, and ComCARE Alliance member meetings).

A list of information sources is provided in Appendix A and a chronology of key project events is given in Appendix B.

Activity #2 Recruited Key Stakeholders Relevant to a Potential Birmingham Deployment

The early stages of the project used a snowballing technique to identify all the individuals who had knowledge, interest, and decision-making responsibility in areas related to a potential integrated deployment. This continued until there was little marginal return or the individuals began to name people who had already been contacted.

Recruiting the stakeholders was done with personal contact (either by telephone or through on-site visits) and invitations to informational meetings.

Appendix C provides two lists of individuals: 1) a list of all individuals contacted during the process, and 2) those who completed a personal, in-depth interview.

Activity #3: Identified Enablers and Barriers to Deployment

This activity involved a qualitative factor analysis of the information from the literature search, observations from the national conferences and meetings, and the inputs from the stakeholder participants collected at meetings and through interviews.

An "Interview Protocol" was developed to specify the process and provide guidelines for the in-depth interviews. Graduate assistants used The "Discussion Guide" to conduct the interviews. Both of these documents are provided in Appendix D.

Activity #4: Established a Stakeholder Development Strategy and Process to Examine the Institutional Issues Relevant to a Deployment

This was a major activity that set up the organizational structure and process that enabled many of the other activities to be completed.

As the institutional issues emerged in the early phase of the feasibility study, the need for a stakeholder development process became evident. Without an effective means by which to coordinate the interests of the wide variety of stakeholders, implementation of the project would prove to be difficult if not impossible. Recognizing the challenges to participation, we established a process characterized as iterative (within and across task forces), assumption testing (e.g., surfacing key assumptions, critically examining), educational (e.g., sharing information, touring other stakeholders' facilities), and generative (e.g., creating new ideas, building on existing models). The focus was on process – assuming the experts in the stakeholder organizations were the ones who could appropriately fill in the content. The foundation of the facilitated process was the belief that full cooperation among stakeholders is both possible and desirable.

Activity #5: Created a Shared Vision and a Conceptual Model of the System

What became immediately clear in the meetings and discussions was the need for a conceptual model to represent a shared vision of the integrated system. This became a focal point for (a) understanding the motivations of each stakeholder; (b) assessing different needs; (c) identifying overlapping interests; and (d) providing a framework for facilitating cooperation.

The model is shown and discussed in the findings section of this report. The process to create the model was the stakeholder development process described above.

Activity #6: Developed a Set of Recommendations for Moving Toward a Deployment

The recommendations for moving forward were collected, cataloged, circulated for comments, and then assembled and shared with the participant stakeholders.

Activity #7: Drafted Two Manuscripts for Dissemination of the Results

Following the traditional approaches to academic research, we drafted two manuscripts for potential publication.

4.0 Project Findings and Results

The discussion of the results of the study are organized into five areas: 1) enablers for an integrated system, 2) barriers to deployment, 3) stakeholder development strategy, 4) conceptual system model, and 5) ideas identified by the participants.

4.1 Enablers for an Integrated System

Developments in the market, political, and technological arenas enable the potential to deploy the visionary system described in the opening paragraphs of this report. While the developments in each of these areas are interrelated in complex ways, we discuss them each in turn to clarify the relevant issues.

Market Enablers

An important motivator for any integration effort is the market demand for the services. In this case, the market involves the agencies and organizations that rely on data for critical decision-making – in addition to the citizens who would directly benefit from the integration of traffic management and emergency response. It is clear that concern for highway safety is intensifying and that crash response and traffic management systems are increasingly justified because of their social and economic benefits. Therefore, the key market enabler is the rapidly increasing number of wireless subscribers across the country.

While voice services encouraged the growth of the past decade, high-speed data and video services will boost future demand. This will be fueled by the FCC's objective of creating more wireless spectrum so carriers can further develop wireless broadband services. Predictions are that fixed broadband wireless revenues will increase at a 418% compound annual rate over the next five years. Thus, wireless is expected to surpass wireline as the dominant method of telecommunications worldwide by 2008. Private sector investment and government interest and support will encourage the further development of wireless applications, which in turn will impact the potential for ITS technologies.

Political Enablers

Two major political enablers have a profound effect on the potential for a fully integrated traffic management and emergency response system. First, the federal government is encouraging research and deployment of integrated ITS applications through the Joint Programs Office/ITS Public Safety Program. The second enabler, discussed earlier, concerns changes in wireless telephone service legislation that significantly impact the potential of location technologies for various applications.

Technological Enablers

With increasing usage of cellular phones, and the impending E9-1-1 upgrades, recent technological developments in wireless technologies open the door to the collection and sharing of critical traffic and incident data for enhanced integration of ITS projects. Two developments in particular, cell phones as "data probes" and Automatic Collision Notification (ACN), hold much promise for near-term deployment of systems that would greatly benefit both the traffic management and emergency response communities.

Telecommunication providers have developed at least two ways to obtain location data for E9-1-1 systems. The first relies on the signal sent periodically when a wireless phone activates to indicate location to the wireless carrier for incoming calls ("I'm here"). The second is the signal sent out from the cellular phone during a call. These signals, not simply the relatively infrequent E9-1-1 calls, provide the data sources for ITS purposes.

Position location and tracking can be determined by several alternative means including time delay of arrival (TDOA), angle of arrival (AOA), and pattern recognition. Field trials by providers of E9-1-1 location technologies demonstrate the systems can provide latitude and longitude for individual phones as well as velocity and direction for aggregates of wireless phones, i.e., real-time traffic information. Encouraged by these developments, transportation experts continue to assess the opportunities and to address the technological challenges for cell phone users to serve as "data probes" for traffic management and emergency response.

Once deployed, an E9-1-1 location platform establishes the potential for other important applications for state and local government agencies and for commercial entities. Specifically, traffic managers can measure the velocity and direction of travel on all roadways in an area – not just those where hardware-based cameras and sensors operate. Moreover, the system creates opportunities for Automatic Vehicle Location (AVL) for municipal and commercial vehicles, as well as the availability of real-time traffic information from commercial traffic data services.

In addition to providing data for traffic management and routing purposes, wireless technology is capable of improving incident management through Automatic Collision Notification (ACN) devices installed in vehicles. The ACN device automatically senses a crash and immediately relays the "crash pulse" along with other information on severity and location to the E9-1-1 dispatcher. The benefits of such a system include faster emergency response, a more appropriate response, lower death rate and permanently disabling injuries, and better vehicle design.

More than a dozen commercial in-vehicle devices are available today in original equipment from the automobile manufacturers. They provide services such as accident notification, antitheft, remote door unlocking, and roadside assistance. The accident notification capability of these first generation ACN devices activates in the case of a frontal crash in which the airbag is deployed. A third-party service center is then automatically contacted and the local PSAP verbally notified of the incident.

Several completed and ongoing operational tests of the next generation of ACN systems are developing and demonstrating more advanced functions and capabilities. These include hardware and software display capabilities, intelligent routing of emergency data to responders, and delivery of data from equipped vehicles to PSAPs using existing 9-1-1 systems.

Clearly, the developments of wireless applications for vehicles as data probes and ACN provide the core technologies on which an integrated traffic management and emergency response system would operate and they offer a number of advantages to traditional wireline solutions. They allow improved capacity and reliability, offer greater flexibility, better coverage for more users, and improved performance. In addition, most wireless systems can be deployed in less time and at a lower cost than the traditional wireline alternatives and are capable of rapid activation in emergency situations.

4.2 Barriers to Deployment

While the developments discussed above establish important groundwork for the deployment of an integrated traffic management and emergency response system, there remain significant barriers. These include issues related to the market, political, and technological arenas, with the addition of complex and ubiquitous institutional barriers. We discuss the market, political, and technological barriers below. The section that follows describes the pilot study initiated to identify and address the institutional issues.

<u>Market Barriers</u>

Although the potential exists to make E9-1-1 deployment an attractive business opportunity for developing new services, the market is embryonic and ill-defined. The emerging opportunities beyond E9-1-1 include the use of wireless phones as data probes to provide a stream of real-time traffic information, selling traffic and other location-based services to subscribers (E4-1-1), using wireless AVL devices for fleet management, and selling additional safety devices such as those for automatic crash notification. These products and services, however, are only now being developed and tested for commercial applications. Thus, the accident notification capability on the market today is quite limited when compared to the potential of more sophisticated ACN devices. Moreover, these systems are only available on original equipment and the cost adds $700 or more to the price of the vehicle because of the combination of wireless telephone technology, Global Positioning System (GPS), and in-vehicle sensors required.

Widespread deployment of ACN will take place in either of two ways: 1) through a limited market by way of the fleet of OEM automobiles, or 2) through retrofitting vehicles in the mass market. Certainly, the large-scale promotional programs of the OEMs will do much to educate consumers and create demand. However, in any case, the cost of the device must be driven downward and marketing strategies must be developed to tap a currently vague market base. Thus, while there is much consumer excitement surrounding the availability of these devices – and cutting-edge technologies are being developed – broad commercialization is hindered by lingering business and market issues.

<u>Political Barriers</u>

While FCC Order 94-102 and the Wireless Communications and Public Safety Act of 1999 seemed to put in place the necessary legislative mandates, wireless carriers resisted by continued delays and challenges.

Not all carriers have reacted positively to the new rules, suggesting compliance with the current legislation may be a problem. While some carriers have completed extensive technology testing and made detailed technology selections in compliance with the E9-1-1 Phase II requirements, others are "dragging their feet." In fact, some in the industry are seeking to change the recent FCC rulings. For example, Nextel, while committing to a handset-based technology, also requested a waiver to allow it an extra year to deploy location-capable handsets. As part of its waiver request, Nextel also offered to create a $25 million fund to help PSAPs upgrade their facilities to accept and process Phase II location information. There is concern over the granting of such waivers, which ultimately could delay the ability of the PSAPs to identify the location of 9-1-1 calls, essential for the rapid and accurate dispatch of emergency personnel. Thus, disputes over cost recovery and other issues have hindered meeting the mandate in many areas. Many have claimed that the wireless carriers view the E9-1-1 rules as a major regulatory burden rather than a business and market opportunity.

Technological Barriers

A relatively high level of resources has been devoted to hardware-based tools for collecting traffic data. To date, most transportation management agencies have concentrated their efforts on detection and monitoring equipment on major freeways and commuter routes. While the procedures have evolved from manual counts to road sensors to video, these hardware-based technologies present a number of problems. The data, even though useful, is quite limited in scope, and finding sources for funding even these limited systems has been challenging.

Furthermore, stand-alone detection technologies – required for extensive coverage of a roadway network – are expensive, lack consistent reliability, are subject to wear and tear, and therefore, result in additional maintenance and replacement costs. For example, transportation management centers (TMCs) report as many as 40 % of pavement-emplaced sensors are nonfunctional at any particular time. This high percentage is attributable to the amount of damage inflicted to the pavement surface by large vehicles and weather events.

Given the lack of consistent reliability from these traditional sensors, the need for improved traffic data-gathering instruments is evident. Unfortunately, TMCs that made an enormous commitment to hardware-based systems may be reluctant to embrace new wireless technologies.

Interoperability and inadequate equipment and/or software are two other technological barriers to deployment. Many of the 5,550 PSAPs lack the technological capacity to accept and process data provided by an integrated system. Thus, even those wireless carriers aggressively pursuing E9-1-1 deployment will encounter various infrastructure- and technology-related difficulties.

Institutional Barriers

While it is possible to discuss the market, political, and technological barriers to deployment in an organized and logical manner, the institutional barriers are another story. The institutional barriers clearly cross over to each of the other areas. For example, the reluctance of TMCs to embrace wireless technologies is as much a cultural and "turf" issue as it is an issue of technical interoperability.

Some progress has been made to document these issues across various deployments. For example, in a study by the International Association of Chiefs of Police, both individual (self-preservation and turf protection, feelings of uncertainty, and threat to personal competence) and organizational issues (separation of power across jurisdictions, tenuous federal-state-local relationships, and political factors) were identified. These and other issues remain ill-defined, however, with little guidance available for either identifying the issues or dealing with those issues to achieve a successful deployment.

One thing is clear, however: market, political, and technological challenges must be addressed in parallel to the institutional and organizational issues. The remainder of this report focuses on the identification of the institutional issues and strategies for dealing with the challenges.

4.3 Stakeholder Development Strategy

In this section, we describe each aspect of the process and illustrate with examples from the Birmingham, Alabama pilot study.

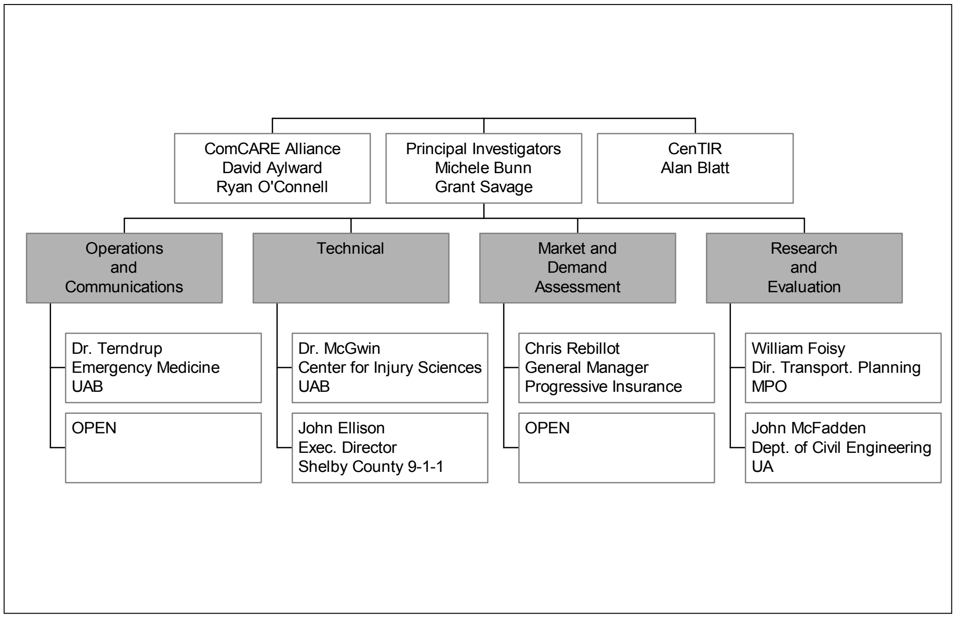
<u>Iterative</u>

The iterative aspect of the stakeholder development process concerns the way in which the various stakeholders come together and then proceed in a give-and-take manner to work toward a shared system vision. We first worked to identify the major groups of stakeholders that had an interest in, or could benefit from, the integrated system. These were:

- Traffic Managers
- 9-1-1 Operators
- Medical Providers
- Police/Fire
- Pre-Hospital (EMS, Trauma)
- Local, State, and Federal Departments of Transportation
- Commercial End-Users and Suppliers
- Education/Research Community
- Industry Trade Associations
- Nonprofit Organizations
- Regional Planning Organizations

To establish an iterative communication process among stakeholders that was both efficient and effective, we created an overarching organizational entity and four task forces. The "Tiger Team" consisted of the principal investigators, members of the partner organizations (ComCARE and CenTIR) and co-chairs from the four task forces (shown below in Figure 2). This organizational structure provided a forum through which the various stakeholders involved in the project could voice their opinions and learn about the concerns of others. The process iterated within and across the task forces and Tiger Team to identify and test key assumptions about the system, educate the participant stakeholders, and generate a shared vision of the integrated system.

Figure 2: "Tiger Team" Structure and Membership



Assumption Testing

There appeared a natural tendency for stakeholders to focus on long-held assumptions based on their own functional areas. While it may seem efficient and "comfortable" to convene meetings of specialized stakeholders according to their areas of expertise (i.e., traffic management and emergency response), these stakeholders already have organizations and mechanisms for sharing information.

A long stream of literature in management research documents the existence of different cultures within and across organizations that develop around technical specialty areas. Members of these different cultures share common interests, expertise, motivations, and even language. These are commonly referred to as functional "silos." Thus, in an effort to focus on common interests rather than specialty distinctions, we organized the project around a set of themes that emerged from earlier discussions with stakeholders. The four themes, along with brief definitions, are listed below:

Operations and Communications Task Force:

Define what the system must do in terms of output, understand the needs of each stakeholder category, educate other stakeholders on the needs of each, and consider how to coordinate the various stakeholder interests.

Technical Task Force:

Understand the data needs of each stakeholder category, spell out data and system requirements, and identify and discuss technology issues surrounding the deployment.

Market and Demand Task Force:

Identification of market applications of the system, assessment of level of demand on the system from each stakeholder category, development of a blueprint for calculating hard dollar costs and benefits of the integrated system for each of the different stakeholder groups, and estimation of how much each stakeholder would be willing to pay for the system outputs.

Research and Evaluation Task Force:

Catalog a set of research questions to be addressed in the future with system outputs, and identify research interests and areas of expertise among stakeholders.

Each of these task forces blended representatives from diverse stakeholder groups. A fundamental lesson discovered in the feasibility study was the need to focus on themes instead of functional areas as a way to bring forth and discuss the assumptions of various stakeholder groups. This assumption testing process, for example, revealed the interest of the trucking industry in both traffic <u>and</u> emergency data. This came as a surprise to many, illustrating how the interaction among the stakeholders served to open minds to the assumptions and needs of the other stakeholder groups.

<u>Educational</u>

In most efforts of this type, there is no one to take responsibility for the role of educating stakeholders. Either because people do not recognize this as an important role in the process, or because specialized experts are uncomfortable with the role, it is generally not an accepted part of the process. Moreover, many involved in similar projects seem to confuse "sharing information" with "educating." Even the well-intentioned distribution of mounds of documents to participants is therefore ineffectual. Since the principal investigators in the Birmingham pilot study were indeed educators by profession, the role of educating the stakeholders came naturally. Thus, to further interaction and understanding among stakeholders, the stakeholder development process included an educational component.

This did not, however, involve the typical classroom instruction, but other – often subtle – ways of enlightening the participant stakeholders. For example, the location of each of the task force meetings rotated among stakeholder facilities and included an informal overview and tour. Thus, the head of the Alabama Trucking Association and the City of Birmingham traffic manager toured the emergency room at The University of Alabama at Birmingham medical center. Likewise the head of a 9-1-1 operation learned from an insurance company executive why the information from a crash would be valuable to insurance providers. The effects on the process were powerful in terms of developing an understanding of other stakeholder groups.

<u>Generative</u>

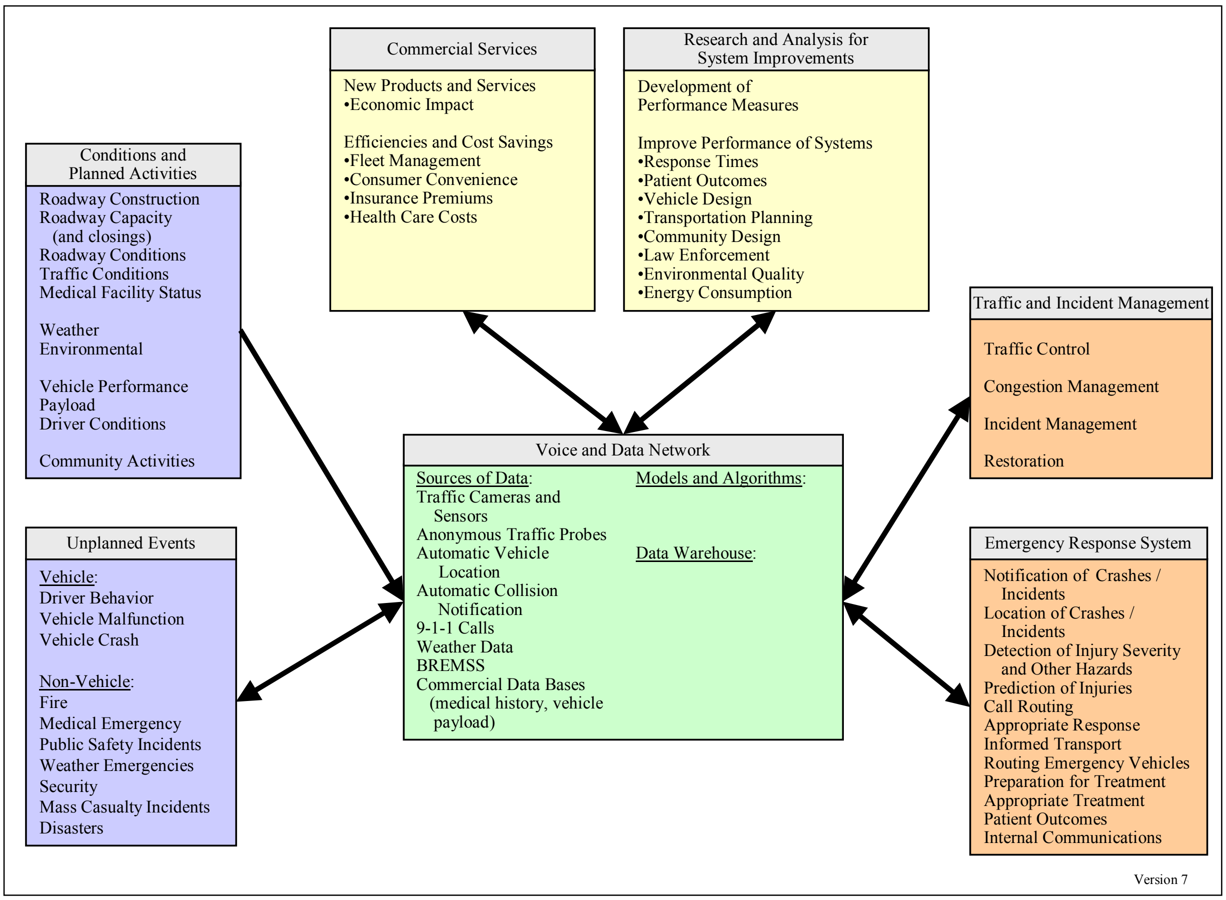
What became immediately clear in the meetings of the task forces and Tiger Team was the need for a conceptual model to represent a shared vision of the integrated system. This became a focal point for (a) understanding the motivations of each stakeholder; (b) assessing different needs; (c) identifying overlapping interests; and (d) providing a framework for facilitating cooperation.

Most importantly, however, there was a need in the early planning stage of a deployment to generate a useful outcome – to give a sense of accomplishment ant establish a pattern of expectations. This outcome is discussed in the next section.

4.4 Conceptual System Model

The conceptual model in Figure 3 was a result of the efforts of the stakeholder development process.

Figure 3: Conceptual System Model



This model provided the first concrete framework to describe the interests of the various stakeholders and to begin work on the specification of a potential deployment. The figure shows two boxes on the left side – "Conditions and Planned Events" and "Unplanned Events" – that are the starting point of the conceptual model. In the center is the "Data Network" that gathers and distributes information on the inputs, actions, and outputs of the system. To the right are the two main raison d'êtres of the system – "Traffic Management" and "Emergency Response System." At the top are two boxes capturing the parallel by-products of the integrated system – "Commercial Services" and "Research and Analysis for System Improvements."

The key benefits identified by stakeholder-participants were hazard elimination, enhanced roadway design, improved traffic flow, reduced travel time, accurate location of E9-1-1 calls, faster emergency response, more appropriate response, lower death rate/injury severity, better vehicle design, and advanced incident management.

4.5 What Next? As Defined by Stakeholder-Participants

The following is a list of ideas generated by the stakeholder-participants with regard to what might be done in moving toward a realization of the system vision they developed:

- Leverage the university resources that are available
- Define our mission
- Vision of how this mission interrelates with other initiatives around the country
- Develop a strategy for accomplishing the mission
- Better understand how other initiatives have gained cooperation from multiple stakeholders
- Develop a plan to get top officials involved in project
- Plan for leveraging what you are doing through public and private partnerships
- Get political buy-in
- Brief elected officials – show how it can accomplish multiple goals
- Recognize that this technology is disruptive and will be resisted
- Put together document of the benefits to educate politicians and general public
- Build on efforts of existing groups (traffic records—Iowa trip)
- Define the state's transportation strategic plan (and public safety)
- Define scope of project(s) and recognize the limits of DOT involvement on integration efforts
- Conduct PSWIN seminars for Alabama
- Involve ADECA
- Recognize commercial carriers' interests
- Seek varied funding sources (other than DOT)
- Educate law enforcement on traffic management and vice versa
- Focus on improving shared communication among DOT, EMS, Police, Fire, 9-1-1
- Focus on integrating and combining funding sources
- Find an "Angel" and "Champion" and leverage joint interests

5.0 Project Conclusions and Recommendations

In this section, we draw from the yearlong work to discuss the institutional issues that need to be addressed and the possible next steps to be taken. Finally, we describe the dissemination of the findings.

5.1 Institutional Issues to be Addressed

Four critical institutional issues emerged from the project: 1) participation, 2) knowledge, 3) costs and funding, and 4) leadership.

1) Participation

Obviously, the deployment of the integrated system envisioned here requires far-reaching cooperation. Because the stakeholders include both public and private sector players, they often perceive themselves as having conflicting objectives. With the inherent lack of knowledge of benefits and costs of the system, stakeholder interests appear vague – even within their own organizations. This uncertainty fosters a reluctance to participate.

2) Knowledge

A deficient base of knowledge in several areas will limit both participation (above) and funding (below). To begin with, the various stakeholders are highly specialized and accustomed to a keen focus on their own area of either traffic or safety management. Even within their narrow specialty areas, the day-to-day pressures severely constrain the time available for experts to enrich their knowledge and depth of understanding of new and emerging products and services.

Those who have been involved with ITS projects are busy working to quantify the benefits of these ITS expenditures. It is increasingly evident that the lack of measured benefits remains a problem in trying to educate others on the merits of ITS projects. Without explicit quantification of the benefits and/or cost savings, it will be hard to justify additional expenditures – even if those involved understand the efficiencies of the newer wireless technologies.

Finally, there is a dramatic shortage of market research on both public and private sector applications for creating significant revenue streams from location data beyond E9-1-1. With wireless carriers taking a regulatory approach, and others viewing the FCC order as something related only to PSAP operations, there is a need to identify the applications and conduct market studies to quantify the potential economic advantages of an integrated traffic management and emergency response system.

3) System Costs and Funding

The extent of the broad-reaching benefits of the system envisioned here also means that costs are fragmented and, therefore, difficult to quantify. Many stakeholder organizations do not track expenses in a way that can be analyzed relative to an integrated system. Moreover, quantifying the potential opportunity for achieving additional benefits by spending more resources is a constructive idea, yet difficult in practice. With the dispersed benefits and costs, and ongoing debate over cost recovery, the investment responsibility remains unclear.

Public funding to pay for the studies needed to assess the system as well as for the system implementation itself is currently insufficient. It took years for funding to channel into ITS projects related to road construction projects. While these funds are now flowing into an increasing number of ITS projects, they remain focused on hardware-based solutions rather than wireless technologies.

4) Leadership

Leadership and organization for a program to deploy the system is also in short supply. No model of deployment exists today to facilitate the emergence of a leader. Logic would dictate both the wireless carriers and the DOTs as the drivers of such a system. As noted, however, wireless carriers have not been focused on market opportunities, and DOTs are overwhelmed with the justification of their ongoing hardware-based ITS efforts and the need to "market" these concepts to senior government officials and to the public. This results in inadequate stakeholder involvement for developing the support of using wireless technologies for traffic management and emergency response.

5.2 Next Steps

The stakeholders concluded a "two-pronged approach" is needed to move towards a deployment of an integrated traffic management and emergency response system. The comprehensive system envisioned by the participants will require significant leadership and funding – an effort that will take much time and cooperation. That effort will continue. Meanwhile, the stakeholders are seeking a smaller, ongoing success that will keep the momentum of the project moving along.

Leverage Funding Opportunities

The following is a list of sources recommended to provide the funding for various aspects of the integrated systems:

- UTCA
- ALDOT Bureau of Research and Development
- The University of Alabama Congressional Earmark
- Alabama State Legislature
- CMAQ (Congestion Mitigation and Air Quality Program)
- ITS Public Safety Program (FHWA)
- National Highway Traffic Safety Administration (NHTSA)
- National Cooperative Highway Research Program (TRB)
- National Institutes of Health (NIH)
- Federal Emergency Management Agency (FEMA)
- Department of Defense (DOD)

Develop Ongoing Successes

Two ideas were developed to initiate ongoing successes for the longer-term program:

- Identification of Success Factors for Integrated Programs
    - This project will be pursued by the principal investigators in a UTCA-funded project in 2001.

- State Emergency Response Database

- A proposal spearheaded by Dr. David Brown (Director of the Computing and Information Division, College of Engineering, The University of Alabama) is under consideration at ALDOT. The project would conduct the first phase of a geographical information system – a critical element and foundation for an integrated traffic management and emergency response system.

5.3 Dissemination of Findings

Many of the project findings are to be disseminated in at least two published articles.

The first, "Stakeholder Development Strategy for Integrating Traffic Management and Emergency Response Systems," is coauthored with a graduate assistant, Betsy Holloway, and a colleague in civil engineering, John McFadden. The paper is targeted to both ITS and public safety professionals. The proposed outlet is *ITS Journal*'s special issue on UTC research projects.

The second, "Stakeholder Model of Multisector Innovation" is coauthored by the two co-principal investigators and Betsy Holloway for submission to the *Journal of Marketing*. This article is targeted at marketing and management scholars.

5.4 Concluding Comments

To date, no area of the country has yet implemented a traffic management and safety system as described in this pilot study. Three things are needed to move the vision toward deployment. First, one or more organizations must take the leadership role – backed by funding – to drive it forward. Second, the demand for both government and commercial applications must be quantified. Third, research and demonstration projects based on the logic emerging from the market demand for system services should be funded by government/private partnerships.

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Appendix B: Chronology of Key Project Events

Date	Event or Activity
2-4-00	Preliminary Planning Meeting (Statewide meeting to bring together an initial set of relevant stakeholders; 32 attendees)
2-25-00	Tiger Team Meeting
3-3-00	Tiger Team Meeting
3-8-00	Task Force #1 Meeting (Operations / Communication)
3-9-00	Task Force #2 Meeting (Technical)
3-10-00	Task Force #3 Meeting (Market / Demand Assessment)
3-10-00	Task Force #4 Meeting (Research / Evaluation)
3-17-00	Tiger Team Meeting
3-22-00	Task Force #1 Meeting (Operations / Communication)
3-23-00	Task Force #2 Meeting (Technical)
3-24-00	Task Force #3 Meeting (Market / Demand Assessment)
4-6-00	Tiger Team Meeting
4-12-00	Project Update and Next Steps (Joint meeting of all task forces)
4-30 to 5-2-00	Attended ITS America Conference in Boston, MA
6-06 to 6-07-00	Attended NYS Emergency Call Locator Partnership Conference in Syracuse, NY
6-26-00	UTCA poster presentation at the site dedication for Shelby Hall
7-20-00	Submitted proposal to ALDOT Bureau of Research and Development
7-24-00	Meeting and presentation at FHWA/ITS Joint Program office in Washington, D.C.
7-31-00	Submitted manuscript for review at Transportation Review Board
8-08-00	Site visit to Veridian Engineering, Buffalo, NY

9-20 to 9-22-00	Informational Trip to Washington, D.C. (For representative stakeholders from Alabama, state and federal government officials, and commercial suppliers; 28 attendees)
11-7-00	ALDOT/EMS Coordination Meeting (Jointly sponsored by FHWA and UTCA; 19 attendees)
11-15-00	Proposal Submitted to Metropolitan Planning Organization – Birmingham Regional Planning Commission for Congestion Mitigation and Air Quality Improvement (CMAQ) Program; "Improving Traffic Flow and Air Quality Through Integrated Traffic Management and Emergency Response"
11-14 to 11-16-00	Attended Public Safety and Transportation Technologies Conference in Washington, D.C.; Jointly sponsored by USDOT and ITS America
12-10-00	Submission of Congressional Earmark Funding Request to The University of Alabama Officials; "Integrated Transportation and Emergency Response System"

Appendix C: Project Contacts and Participants

Table C-1: Complete List of Project Contacts

Type of Organization	Contact	Position	Organization and Affilliation	Location
9-1-1	Armstrong, Max	Director	Blount County EMA and 9-1-1	Oneonta, AL
9-1-1	Ellison, John	Executive Director	Shelby County 9-1-1 Center	Pelham, AL
9-1-1	Melcher, John	Director	Houston Texas E-9-1-1 Center (Harris County)	Houston, TX
9-1-1	Toole,	Dispatcher Supervisor	Birmingham 9-1-1 Center, Communications Center	Birmingham, AL
9-1-1	Wilson, Roger	Director	Walker County 9-1-1 Center, 9-1-1Board Member (NENA)	Jasper, AL
Association / Commercial	Bragen, Jim	President	Birmingham Traffic Club, American Cast Iron & Pipe	Birmingham, AL
Association / Commercial	Filgo, Frank	President	Alabama Trucking Association	Montgomery, AL
Association / Commercial	Vandenburg, Cheryl	Administrative Assistant	Horizon 280	Hoover, AL
Association / Commercial	Vonderau, Gene	Director, Safety and Member Services	Alabama Trucking Association	Montgomery, AL
Comercial	Amarosa, Michael	Vice President of Public Affairs	TruePosition, Inc.	New York, NY
Commercial	Blank, Howard	Vice President	US Wireless	Reston, VA
Commercial	Carstensen, Todd	Subscriber Services	General Motors OnStar	Troy, MI
Commercial	Conlisk, Thad	Product Development	Daimler-Chrysler (Mercedes)	Tuscaloosa, AL
Commercial	Cyrus, Robert	Purchasing Managers	Daimler-Chrysler (Mercedes)	Tuscaloosa, AL
Commercial	Daniels, Raymond	Special Projects	Daimler-Chrysler (Mercedes)	Tuscaloosa, AL
Commercial	Dennis, Michael	Partner	IDM Consulting	Denver, CO
Commercial	Dillon, Richard T.	Sales & Marketing Manager	Veridian, Inc., Datumtech Operations	Buffalo, NY
Commercial	Dopart, Kevin	Senior Principal	Mitretek Systems	Washington, D.C.
Commercial	Dunn, Timothy	Sales Representative	Signal Soft Corporation	Boulder, CO
Commercial	Fells, Carston	Special Projects	Daimler-Chrysler (Mercedes), Daimler-Chrysler	Palo Alto, CA
Commercial	Flores, Jesse	Executive Vice President	ATX Technoogies	San Antonio, TX
Commercial	Foxman, Melissa	Director, Industry Relations	SCC Communications Corporation	Washington, D.C.
Commercial	Frank, Jonathan	Sales Representative	US Wireless	Incline Village, NV
Commercial	Fyie, John Patrick	Transportation Division Manager	ARCADIS Geraghty & Miller, Inc.	Chattanooga, TN
Commercial	Gibbs, Ginny	Sales Representative	Compass Services, US Wireless Corporation	Reston, VA
Commercial	Grey, Baron	Manager, Intelligent Transportation Systems	GIS/Trans, Ltd.	Costa Mesa, CA
Commercial	Haviland, Jack	Subscriber Services	General Motors OnStar	Troy, MI
Commercial	Hechinger, Gerhard	Electronics	Daimler-Chrysler (Mercedes)	Tuscaloosa, AL
Commercial	Henderson, Maria	Autograph Product Manager	Progressive Insurance	Houston, TX
Commercial	Johnson, William	Assistant to the President	Alabama Power Company, A Southern Company	Birmingham, AL
Commercial	Kaliski, John	Senior Associate	Cambridge Systematics	Cambridge, MA
Commercial	MacDonald, Bruce	Principal	Strat@com	Bloomfield Hills, MI
Commercial	Manning, Bob	Director of Operations	Metro Networks	Homewood, AL
Commercial	Mintz, Bill	Manager- Methods and Systems- Power Delivery	Alabama Power Company, A Southern Company	Birmingham, AL
Commercial	Mudge, Richard	President	Compass Services, US Wireless Corporation	Reston, VA
Commercial	Nagendran, Uday	Director, Mobile Applications	US Wireless	San Ramon, CA
Commercial	Pokriva, Lee	Head of Engineering	Daimler-Chrysler (Mercedes), Crash Injury Research & Engineering Network	Tuscaloosa, AL
Commercial	Przybylski, Matt	Subscriber Services	General Motors OnStar	Troy, MI

Type of Organization	Contact	Position	Organization and Affilliation	Location
Commercial	Rebillot, Chris	General Manager	Progressive Insurance	Birmingham, AL
Commercial	Rhadigan, Terry	Safety Center	General Motors OnStar	Warren, MI
Commercial	Rifkin, Noah	Strategic Business Development	Veridian, Inc., Calspan Operations	Buffalo, NY
Commercial	Starosielec, Ed	Vice President	Veridian, Inc., Calspan Operations	Buffalo, NY
Commercial	Stortz, Charles	Public Safety Systems Specialist	LOGISYS- Logistic Systems, Inc.	Missoula, MT
Commercial	Stumphauzer, William	Special Projects	IBM	Detroit, MI
Commercial	Suttles, James	Chairman, Alabama Trucking Association	Suttles Truck Leasing	Demopolis, AL
Commercial	Tilt, Douglas	Partner	ARCADIS Geraghty & Miller, Inc.	Atlanta, GA
Commercial	Wallace, Gary	Market Research	ATX Technoogies	San Antonio, TX
Commercial	Waters, Terry	V.P. Western Division	Alabama Power Company, A Southern Company	Tuscaloosa, AL
Commercial	Watt, Edward	Executive Vice President	Volkert & Associates, Inc.	Chattanooga, TN
Commercial	Welborn, Miller	President	Boyd Brothers Trucking/Welborn Transportation	Tuscaloosa, AL
Commercial	Wendell, Eric	Director of Telematics	Daimler-Chrysler (Mercedes)	Wayne, NJ
Commercial	West, Jeff	Senior Claims Manager	Progressive Insurance	Jacksonville, FL
Commercial	Whitmer, Darold	Director of Strategic Sales	SCC Communications Corportation	Washington, D.C.
Commercial	Wilbanks, Lisa	Assistant	Suttles Truck Leasing	Demopolis, AL
Commercial	Wilson, Martin	Electronics	Daimler-Chrysler (Mercedes)	Tuscaloosa, AL
Commericial	Hatcher, Gregory	ITS Project Team Leader	Mitretek Systems	Washington, D.C.
Commericial	Kain, Carl	Principal Electrical Engineer, Wireless Communications & Mobile Computing	Mitretek Systems	McLean, VA
DOT	Ake, George	Project Coordinator	Capital Wireless Integrated Network, University of Maryland	College Park, MD
DOT	Baker, William	ITS Public Safety Coordinator	Federal Highway Administration, ITS Joint Program Office	Washington, D.C.
DOT	Beasley, Connie	Regional Program Manager	National Highway Traffic Safety Administration, Region IV	Atlanta, GA
DOT	Benefield, Waymon	Safety Management Engineer	Alabama Department of Transportation, Bureau of Multimodal Transportation	Montgomery, AL
DOT	Bertsch, Randall	Director of Traffic Operations	SmartTraffic Center, Virginia Department of Transportation	Arlington, VA
DOT	Brown, Jeffery	Research and Development Engineer	Alabama Department of Transportation	Montgomery, AL
DOT	Caudle, Richard	Assistant City Engineer	Hoover Traffic Operations Center	Hoover, AL
DOT	Chu, Jimmy	Transportation Engineer Program Supervisor	SmartTraffic Center, Virginia Department of Transportation	Arlington, VA
DOT	Davis, Brian	Pre-Construction Engineer	Alabama Department of Transportation, Third Division Office	Birmingham, AL
DOT	Elrod, Wesley	Planning and Safety Engineer	Alabama Department of Transportation	Montgomery, AL
DOT	Freitas, Michael	Travel Management Coordinator	Federal Highway Administration	Washington, D.C.
DOT	Garrett, John	Traffic Engineer	Birmingham Traffic Engineering Department	Birmingham, AL
DOT	Glass, Stacey	Civil Engineer Manager	Bureau of Multimodal Transportation, Alabama Department of Transportation	Montgomery, AL
DOT	Griffin, III, David	Traffic Engineer	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Guin, Linda	Safety and Technology Engineer	Federal Highway Administration	Montgomery, AL
DOT	Gurin, Douglas	Social Science Research Analyst	National Highway Traffic Safety Administration	Washington, D.C.
DOT	Harbin, Lionel	Assistant Traffic Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL

Type of Organization	Contact	Position	Organization and Affilliation	Location
DOT	Hartline, Roy	Traffic Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Helman, David	ITS Projects Manager	Federal Highway Administration, Office of Travel Management	Washington, D.C.
DOT	Horsley, James	Division Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Howell, Jon P.	Traffic Signals Supervisor	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Jacobs, Thomas	Project Director	Capital Wireless Integrated Network, University of Maryland	College Park, MD
DOT	Jilla, Bob	Multimodal Transportation Engineer	Alabama Department of Transportation, Bureau of Multimodal Transportation	Montgomery, AL
DOT	Keith, Jim	Engineer	Alabama Department of Transportation	Montgomery, AL
DOT	Lombardo, Louis	Office of Human-Centered Research	United States Department of Transportation, National Highway Traffic Safety Administration	Washington, D.C.
DOT	Long, Rodney	City Engineer	Hoover Traffic Operations Center	Hoover, AL
DOT	McCawley, Ben	Advanced Traffic System Coordinator	AZTech	Phoenix, AZ
DOT	Miles, Wendell	Traffic Management Center- Planning and Envir. Eng	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Northington, Jerry	Assistant Traffic Engineer	Birmingham Traffic Department	Birmingham, AL
DOT	Palmer, Phillip	Construction Section	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Paniati, Jeffrey	Deputy Director	United States Department of Transportation, ITS Joint Office Program	Washington, D.C.
DOT	Ray, George	Transportation Planning Engineer	Alabama Department of Transportation	Montgomery, AL
DOT	Robinson, J.R.	Director	ITS Division, Virginia Department of Transportation	Richmond, VA
DOT	Robinson, Joe	Director of Transportation- City Engineer	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Rowe, Dee	Division Engineer	Alabama Department of Transportation- Tuscaloosa	Tuscaloosa, AL
DOT	Steele, Tom	Public Safety Coordinator	Capital Wireless Integrated Network, University of Maryland	College Park, MD
DOT	Strickland, Lamar	Division Traffic Engineer	Alabama Department of Transportation, Sixth Division Office	Montgomery, AL
DOT	Tang, Amy	NOVA Smart Travel Manager	Northern Virginia District Information Technology, Virginia Department of Transportation	Fairfax, VA
DOT	Van Luchene, Judy	Program Director	Federal Motor Carrier Safety Administration	Montgomery, AL
DOT	Van Luchene, Bill	Engineer	Federal Highway Administration	Montgomery, AL
DOT	Watson, Paul	State Electrical Engineer	Design Bureau, Alabama Department of Transportation	Montgomery, AL
DOT	Wilkerson, Joe	Division Administrator	Federal Highway Administration, Region IV- Alabama Division	Montgomery, AL
Education / Research	Addy, Samuel	Associate Director	The University of Alabama, Center for Business and Economic Research	Tuscaloosa, AL
Education / Research	Bertini, Robert	Research Scientist	Daimler-Chrysler (Mercedes), Traffic & Transportation Research Group	Palo Alto, CA
Education / Research	Billittier, Tony	Director of Medical Research	Center for Transportation Injury Research, Erie County Medical Ctr/ Dept. Emergency Medicine	Buffalo, NY
Education / Research	Blatt, Alan	Director of Engineering Research	Veridian, Inc., Calspan Operations	Buffalo, NY

Type of Organization	Contact	Position	Organization and Affilliation	Location
Education / Research	Brown, David	Director Computing and Information Division	The University of Alabama, College of Engineering	Tuscaloosa, AL
Education / Research	Bunn, Michele D.	Project Director and Co-Principal Investigator	The University of Alabama, College of Commerce and Business Administration	Tuscaloosa, AL
Education / Research	Clevenger, Tanya	Assistant to Loring Rue	University of Alabama at Birmingham, Center for Injury Sciences	Birmingham, AL
Education / Research	Croker, Jr., G. William	Director of Government Relations	University of Alabama at Birmingham	Birmingham, AL
Education / Research	Davidson, Jim	Assistant Professor	University of Alabama at Birmingham, College of Engineering	Birmingham, AL
Education / Research	Denninghoff, Kurt	Assistant Professor, Dept. of Emergency Medicine	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
Education / Research	Ferguson, Carl	Director	The University of Alabama, Center for Business and Economic Research	Tuscaloosa, AL
Education / Research	Fine, Philip	Director/Professor	University of Alabama at Birmingham, Department of Medicine	Birmingham, AL
Education / Research	Fouad, Fouad H.	Associate Director	University of Alabama at Birmingham, University Transportation Center for Alabama	Birmingham, AL
Education / Research	Funke, Doug	Project Director	Veridian, Inc.	Buffalo, NY
Education / Research	Goldman, Jay	Professor	University of Alabama at Birmingham, College of Engineering	Birmingham, AL
Education / Research	Graettinger, Andy	Assistant Professor, Dept. of Civil Engineering	The University of Alabama, College of Engineering	Tuscaloosa, AL
Education / Research	Holloway, Betsy	Research Assistant	The University of Alabama, College of Commerce and Business Administration	Tuscaloosa, AL
Education / Research	Jones, Jr., Steven	Assistant Professor	University of Alabama at Birmingham, Department of Civil and Environmental Engineering	Birmingham, AL
Education / Research	Kennedy, Drew	Business/Contracts Manager for Loring Rue	University of Alabama at Birmingham, Center for Injury Sciences	Birmingham, AL
Education / Research	Lindly, Jay K.	Associate Professor	The University of Alabama, University Transportation Center for Alabama	Tuscaloosa, AL
Education / Research	Markowsky, George	Chair and Professor	University of Maine, Department of Computer Science	Orono, ME
Education / Research	McFadden, John	Assistant Professor	The University of Alabama, College of Engineering	Tuscaloosa, AL
Education / Research	McGwin, Jr., Jerry	Director of Epidemiology unit	University of Alabama at Birmingham, Center for Injury Sciences	Birmingham, AL
Education / Research	Orthner, Helmuth	Professor and Director, M.S. in Health Informatics	University of Alabama at Birmingham, Department of Health Services Administration	Birmingham, AL
Education / Research	Pritchett, Gale	Program Assistant	The University of Alabama, Center for Business and Economic Research	Tuscaloosa, AL
Education / Research	Quinn, Peter	Project Director	Aitken Neuroscience Center	New York, NY
Education / Research	Rue, Loring	Professor and Director	University of Alabama at Birmingham, Center for Injury Sciences	Birmingham, AL
Education / Research	Saucett, Paula	Secretary for Dr. Rue	University of Alabama at Birmingham, Center for Injury Sciences	Birmingham, AL

Type of Organization	Contact	Position	Organization and Affilliation	Location
Education / Research	Savage, Grant	Co-principal Investigator	The University of Alabama, Richard Scrushy/HealthSouth Chair and Professor	Tuscaloosa, AL
Education / Research	Scott, Jay	Project Director	NYS Emergency Call Locator Partnership	Syracuse, NY
Education / Research	Stiteler, Wendy	Telecommunications Assistant	The University of Alabama, Telecommunication Department	Tuscaloosa, AL
Education / Research	Szygenda, Steve	Dean	University of Alabama at Birmingham, College of Engineering	Birmingham, AL
Education / Research	Turner, Daniel S.	Professor and Head	The University of Alabama, University Transportation Center for Alabama	Tuscaloosa, AL
Education / Research	Wallace, Charles	Director- Transportation Research Center	University of Florida, Suncom	Gainesville, FL
Education / Research	Wells, Robert	Assistant Academic Vice President for Research	The University of Alabama	Tuscaloosa, AL
Education / Research	Williams, Brandy	Research Assistant	The University of Alabama, Masters of Business Administration	Tuscaloosa, AL
Education / Research	Williamson, Derek	Assistant Professor, Dept. of Civil Engineering	The University of Alabama	Tuscaloosa, AL
EMS / Trauma	Acker, Joe	Executive Director	Birmingham Regional Emergency Medical Services System	Birmingham, AL
EMS / Trauma	Dierking, Brent	Director of Operation	AMR	Birmingham, AL
EMS / Trauma	Gaylon, Brian	Manager	Northstar Ambulance	Birmingham, AL
EMS / Trauma	McDonnell, Kyle P.	Communications-Safety-Education Officer	RPS Ambulance Service	Alabaster, AL
EMS / Trauma	Minor, Michael	Assistant Director	Birmingham Regional Emergency Medical Services System	Birmingham, AL
EMS/Trauma	Dorn, Cindy	Manager	AMR Midsouth	Birmingham, AL
EMS/Trauma	Langley, Earl	Special Projects Director	State of Alabama Department of Public Health, Division of Emergency Medical Services	Montgomery, AL
EMS/Trauma	Martin, Bruce	Director	National Disaster Medical System	Birmingham, AL
EMS/Trauma	Pierluisi, Guillermo	Medical Director of the Office of EMS	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
EMS/Trauma	Priest, Marlon	Professor, Dept. of Emergency Medicine	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
EMS/Trauma	Terndrup, Thomas	Chair and Professor, Dept. of Emergency Medicine	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
EMS/Trauma	Terry, Katherine	Program CoordinatorII	University of Alabama at Birmingham, Injury Control Research Center	Birmingham, AL
Government	Gilligan, Gerry	Legislative Assistant	Office of Senator Jeff Sessions	Washington, D.C.
Government	Kenley, Mary Alice	District Coordinator		Jasper, AL
Government	McCreary, Patrick	Program Manager-Information Technology Initiative	United States Department of Justice, Office of the Assistant Attorney General	Washington, D.C.
Government	Russell, Cathi	Executive Director	State of Alabama State Safety Coordinating Committee	Montgomery, AL
Media	MacDonald, Ginny	Staff Writer	The Birmingham News	Birmingham, AL
Nonprofit Coalition	Adams, Mark	Executive Director	National Emergency Number Association	Washington, D.C.
Nonprofit Coalition	Aylward, David K.	Executive Director	ComCARE Alliance	Washington, D.C.
Nonprofit Coalition	Greene, Steven	Membership	ITS America	Washington, D.C.
Nonprofit Coalition	Hannah, Jeffrey S.	Assistant Vice-President	ComCARE Alliance, National Strategies, Inc.	Washington, D.C.
Nonprofit Coalition	Hardeman, Cathy	Assistant to the President	AAA	Birmingham, AL
Nonprofit Coalition	Johnson, Mark	Deputy Gen. Counsel-Legislative & Regulatory Aff.	ITS America	Washington, D.C.
Nonprofit Coalition	Najarian, Paul	Director, Telecommunications & Telematics	ITS America	Washington, D.C.

Type of Organization	Contact	Position	Organization and Affilliation	Location
Nonprofit Coalition	O'Connell, Ryan	Outreach Coordinator	ComCARE Alliance	Washington, D.C.
Nonprofit Coalition	Scherr, Marsha	Executive Director	ComCARE Alliance	Washington, D.C.
Nonprofit Coalition	Seitz, Steve	Outreach Coordintor	ComCARE Alliance	Washington, D.C.
Nonprofit Coalition	Smith, Frances	President	AAA	Birmingham, AL
Nonprofit Coalition	Walsh, Deirdre	Research Associate	ComCARE Alliance	Washington, D.C.
Police/Fire	Andrews, C.E.	Assistant Director	Alabama Department of Public Safety	Montgomery, AL
Police/Fire	Berry, Bob	Chief	Hoover Police	Hoover, AL
Police/Fire	Bradley, Tom	Chief	Hoover Fire Department	Hoover, AL
Police/Fire	Bullock, Warren	Consultant	Birmingham Police	Birmingham, AL
Police/Fire	Eaddy, Barbara	Grants Coordinator	Birmingham Police	Birmingham, AL
Police/Fire	Kane, James	Traffic Sergeant	Hoover Police	Hoover, AL
Police/Fire	Miller, Doug	Division Director- Law Enforcement Traffic Safety	Alabama Department of Economic and Community Affairs	Montgomery, AL
Police/Fire	Nathan, Dave	Battalion Chief	Birmingham Fire and Rescue	Birmingham, AL
Police/Fire	Pines, Rhonda	Law Enforcement and Traffic Safety Division	Alabama Department of Economic and Community Affairs	Montgomery, AL
Police/Fire	Saffold, Milton	Staff Member	Alabama Department of Economics and Community Affair	Montgomery, AL
Police/Fire	Sharpton, Scott	GIS Manager	City of Hoover	Hoover, AL
Police/Fire	Summers, James	Inspections Supervisor	Birmingham Police Department, Inspection Unit	Birmingham, AL
Regional Planing	Lucas, Don	Engineer	Horizon 280, Earth Technology	Hoover, AL
Regional Planing	McDonald, Todd	Chief Planner	Shelby County Department of Planning and Development	Pelham, AL
Regional Planing	Stewart, John	Principal Civil Engineer	Gresham Smith and Partners, Horizon 280	Birmingham, AL
Regional Planning	Foisy, William R.	Director of Transportation Planning	Birmingham Regional Planning Commission	Birmingham, AL
Regional Planning	He, Harry	Transportation Planner	Birmingham Regional Planning Commission	Birmingham, AL
Regional Planning	Hunke, David	Traffic Engineer	City of Birmingham	Birmingham, AL
Regional Planning	Ostaseski, Steve	Prinicipal Transportation Planner	Birmingham Regional Planning Commission	Birmingham, AL

Table C-2: Interviewees

Type of Organization	Interviewee	Position	Organization and Affilliation	Location
9-1-1	Armstrong, Max	Director	Blount County EMA and 9-1-1	Oneonta, AL
9-1-1	Ellison, John	Executive Director	Shelby County 9-1-1 Center	Pelham, AL
9-1-1	Melcher, John	Director	Houston Texas E-9-1-1 Center (Harris County)	Houston, TX
Association / Commercial	Vonderau, Gene	Director, Safety and Member Services	Alabama Trucking Association	Montgomery, AL
Commercial	Dennis, Michael	Partner	IDM Consulting	Denver, CO
Commercial	Haviland, Jack	Subscriber Services	General Motors OnStar	Troy, MI
Commercial	Kaliski, John	Senior Associate	Cambridge Systematics	Cambridge, MA
Commercial	MacDonald, Bruce	Principal	Strat@com	Bloomfield Hills, MI
Commercial	Manning, Bob	Director of Operations	Metro Networks	Homewood, AL
Commercial	Mintz, Bill	Manager- Methods and Systems- Power Delivery	Alabama Power Company, A Southern Company	Birmingham, AL
Commercial	Nagendran, Uday	Director, Mobile Applications	US Wireless	San Ramon, CA
Commercial	Przybylski, Matt	Subscriber Services	General Motors OnStar	Troy, MI
Commercial	Rifkin, Noah	Strategic Business Development	Veridian, Inc., Calspan Operations	Buffalo, NY
Commercial	Wallace, Gary	Market Research	ATX Technoogies	San Antonio, TX
Commercial	West, Jeff	Senior Claims Manager	Progressive Insurance	Jacksonville, FL
Commercial	Whitmer, Darold	Director of Strategic Sales	SCC Communications Corportation	Washington, D.C.
DOT	Caudle, Richard	Assistant City Engineer	Hoover Traffic Operations Center	Hoover, AL
DOT	Elrod, Wesley	Planning and Safety Engineer	Alabama Department of Transportation	Montgomery, AL
DOT	Glass, Stacey	Civil Engineer Manager	Bureau of Multimodal Transportation, Alabama Department of Transportation	Montgomery, AL
DOT	Griffin, III, David	Traffic Engineer	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Guin, Linda	Safety and Technology Engineer	Federal Highway Administration	Montgomery, AL
DOT	Harbin, Lionel	Assistant Traffic Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Hartline, Roy	Traffic Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Horsley, James	Division Engineer	Alabama Department of Transportation - Birmingham	Birmingham, AL
DOT	Howell, Jon P.	Traffic Signals Supervisor	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Jilla, Bob	Multimodal Transportation Engineer	Alabama Department of Transportation, Bureau of Multimodal Transportation	Montgomery, AL
DOT	Long, Rodney	City Engineer	Hoover Traffic Operations Center	Hoover, AL
DOT	Northington, Jerry	Assistant Traffic Engineer	Birmingham Traffic Department	Birmingham, AL

Type of Organization	Interviewee	Position	Organization and Affilliation	Location
DOT	Robinson, Joe	Director of Transportation- City Engineer	Tuscaloosa Department of Transportation, City of Tuscaloosa	Tuscaloosa, AL
DOT	Rowe, Dee	Division Engineer	Alabama Department of Transportation- Tuscaloosa	Tuscaloosa, AL
DOT	Van Luchene, Bill	Engineer	Federal Highway Administration	Montgomery, AL
Education / Research	Bertini, Robert	Research Scientist	Daimler-Chrysler (Mercedes), Traffic & Transportation Research Group	Palo Alto, CA
Education / Research	Blatt, Alan	Director of Engineering Research	Veridian, Inc., Calspan Operations	Buffalo, NY
Education / Research	Orthner, Helmuth	Professor and Director, M.S. in Health Informatics	University of Alabama at Birmingham, Department of Health Services Administration	Birmingham, AL
Education / Research	Scott, Jay	Project Director	NYS Emergency Call Locator Partnership	Syracuse, NY
Education / Research	Szygenda, Steve	Dean	University of Alabama at Birmingham, College of Engineering	Birmingham, AL
EMS / Trauma	Acker, Joe	Executive Director	Birmingham Regional Emergency Medical Services System	Birmingham, AL
EMS/Trauma	Pierluisi, Guillermo	Medical Director of the Office of EMS	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
EMS/Trauma	Priest, Marlon	Professor, Dept. of Emergency Medicine	University of Alabama at Birmingham, School of Medicine	Birmingham, AL
Police/Fire	Bradley, Tom	Chief	Hoover Fire Department	Hoover, AL
Police/Fire	Kane, James	Traffic Sergeant	Hoover Police	Hoover, AL
Police/Fire	Sharpton, Scott	GIS Manager	City of Hoover	Hoover, AL
Regional Planing	McDonald, Todd	Chief Planner	Shelby County Department of Planning and Development	Pelham, AL
Regional Planing	Stewart, John	Principal Civil Engineer	Gresham Smith and Partners, Horizon 280	Birmingham, AL
Regional Planning	Foisy, William R.	Director of Transportation Planning	Birmingham Regional Planning Commission	Birmingham, AL
Regional Planning	Ostaseski, Steve	Prinicipal Transportation Planner	Birmingham Regional Planning Commission	Birmingham, AL

Appendix D: Materials Related to the In-Depth Interviews

Interview Protocol

Schedule the Interview

- Obtain contact information from database
- Talk to Bunn and Savage to get background information about the person and the organization
- Send e-mail introduction
- Follow up with a telephone call
- Schedule the meeting (date, time, location)
  - Confirm "contact information" (Section 1 of discussion guide)
  - Collect background information (Section 3 of discussion guide)
  - Ask for materials to be sent ahead if appropriate (organization description, program brochures, and etc.)
- Send e-mail confirmation
- Record scheduled meeting on master calendar/list

Conduct the Interview

- Arrive 10 minutes early
- Be prepared with:
  - Business cards
  - Interview Discussion Guide
  - Copies of the System Model
  - Tape recorder
  - Cassette tape
- There are nine sections to the Discussion Guide
- The central focus of the discussion is Sections 4 to 8:
  - 4. Perceptions of ITS (general) and the organization's ITS activities
  - 5. Familiarity with the ITEC system
  - 6. Feedback on the system model
    - Give him/her the copy of the model
    - Record some of the responses onto your copy of the model
  - 7. System benefits and cost
  - 8. Deployment of the system
- Try not to appear as if you are filling out a questionnaire!
- Use the questions in the discussion guide as "probes" – not like a formal survey; that is, refer to the discussion guide only as needed
- Keep track of time and keep the discussion moving along (you could always come back to earlier probes if needed, but make sure you get to the real meat)

Prepare the Interview Report

Type your notes and recollections into the columns of the Discussion Guide in a Word file
Write a subsequent a section on your interpretation of the responses
Write a section describing how the responses:
- Suggests a new construct in the model
- Confirms a construct already in the model
- Specify clearly the indicators on the construct(s)
- Shows the relationship (hypothesis) among two or more constructs

Follow-Up

Call the interviewee back to clarify any information (or points)
Send a letter the next day thanking the interviewee for participating
Record interview as "completed" on master calendar/list

Discussion Guide

1. Meeting and Contact Information

Interview Conducted by: Date:
Interviewee: Title:
Organization:
Begin time: End time: Duration:
Location:

2. Introductions and Warm Up

Introduce yourself and meet others
State the purpose of the interview and your role
Assure interview participant of the confidentiality of the interview

3. Background on Interviewee and Organization

Q: Can you tell us about your organization?
What is the purpose of the organization?
What are the major activities of the organization?
What are the sources of funding or revenue for the organization?
What is the organizational structure? Who reports to whom?
How is the organization governed? Which body or organization oversees this organization?

Q: Can you tell us about your roles and responsibilities in this organization?
How would you describe your job?
What are your key responsibilities?

Q: How do you and others work together?
What is your functional relationship to others in the organization?
What is your functional relationship to others outside the organization?
Are there different groups of people within the organization that share common views?
How does this organization work with other organizations? What is the functional relationship of this organization to others?

4. Perceptions of Intelligent Transportation Systems (ITS)

Q: What is your understanding of ITS? What does it mean, encompass?

Q: When people talk about "integrated" systems, what does that mean?

Q: Is your organization involved in ITS projects?
What are they? What has been your experience?

5. Familiarity with ITEC System, ideas

Q: How familiar are you with the UTCA project that is being conducted by Drs. Bunn and Savage at The University of Alabama?

Q: What has been your involvement in the project to date?

Explain and review the project and progress to date (level of detail depending on prior knowledge)

Q: What is your understanding of Automatic Collision Notification (ACN)?

Explain more if needed

Q: What is your understanding of cell phones as data probes?

Explain more if needed

6. Feedback on System Model

Give the respondent a copy of the system model and explain the system

Q: What portions of this model would directly impact your organization?

Q: Does this model describe the way you would envision an integrated system?

Q: What changes would you make to this model?

Q: Do you think such a system is possible in the future? When?

7. System Benefits and Costs

Q: What do you see as the major benefits of this system to your organization?
Would this system help you to achieve your objectives? How?

Q: What would be the major costs to your organization?

Q: How would others (organizations or people) view the benefits and costs of the system?

8. Deployment of the System

Q: What do you think it would take to deploy such a system in the Birmingham Region of Alabama?

Q: What are the major hurdles/obstacles to full-scale deployment of the integrated system?

Q: Who needs to be involved? (organizations, people)
Which organizations are instrumental?

Q: Who (organizations, people) would be opposed to the system?

Q: Would your organization be willing to cooperate with others to deploy the system? Explain

Q: What would be your involvement in the deployment?

Summary and Wrap Up

Q: Do you have any other thoughts or comments that might be helpful to us?

Q: Can we have some materials?
Business Cards
Documents describing the organization and/or its programs
Organizational charts

Q: Whom else should we be talking to?
Within your organization?
Outside your organization?

Obtain contact information

Q: Would you be interested in receiving a report of the results of this study?

Thank them for their time and participation