Commonwealth
OF
 MASSACHUSETTS

TRAFFIC RECORDS ASSESSMENT

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National Highway Traffic
Safety Administration
Technical Assessment Team

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TABLE OF CONTENTS

EXECUTIVE SUMMARY ........................................................................................................... 1

ACKNOWLEDGEMENTS ........................................................................................................... 7

INTRODUCTION ....................................................................................................................... 10

SECTION 1: TRAFFIC RECORDS SYSTEM MANAGEMENT .................................................. 11
  1-A: Traffic Records Coordinating Committee ................................................................. 12
  1-B: Strategic Planning ................................................................................................. 18
  1-C: Data Integration .................................................................................................... 22
  1-D: Data Uses and Program Management .................................................................... 26

SECTION 2: TRAFFIC RECORDS SYSTEM COMPONENTS .................................................. 31
  2-A: Crash Data Component ...................................................................................... 34
  2-B: Roadway Data Component ............................................................................... 47
  2-C: Driver Data Component .................................................................................... 52
  2-D: Vehicle Data Component ................................................................................... 58
  2-E: Citation/Adjudication Data Component .............................................................. 61
  2-F: Statewide Injury Surveillance System (SWISS) Data Component ....................... 69

APPENDIX A: SELECTED REFERENCES ............................................................................. 79

APPENDIX B: ABBREVIATIONS AND ACRONYMS .............................................................. 87

TEAM CREDENTIALS ........................................................................................................... 89
EXECUTIVE SUMMARY

Upon request by the Highway Safety Division (HSD) of the Massachusetts Executive Office of Public Safety and Security (EOPSS), the National Highway Traffic Safety Administration (NHTSA) assembled a team to conduct a traffic records assessment. Concurrently the HSD carried out the necessary logistical and administrative steps in preparation for the onsite assessment. A team of professionals with backgrounds and expertise in the several component areas of traffic records data systems (crash, driver, vehicle, roadway, citation, adjudication, and injury surveillance data systems) conducted the assessment March 16 to 20, 2009.

The scope of this assessment covered all of the components of a traffic records system. The purpose was to determine whether the traffic records system in Massachusetts is capable of supporting management’s needs to identify the Commonwealth’s safety problems, to manage the countermeasures applied to reduce or eliminate those problems, and to evaluate those programs for their effectiveness.

Background
A similar assessment in 2005 produced a Traffic Records Assessment Report that offered a number of recommendations to improve the Commonwealth’s traffic records system. A June 2008 update of the 2005 Assessment Report provides the status of the original report’s recommendations. Some progress was noted in several areas. The Traffic Records Coordinating Committee (TRCC) was formalized via a memorandum of understanding (MOU) between TRCC member agencies and the agencies who maintain the key traffic records information systems. The Massachusetts Highway Department (MassHighway) has established a Web-based Crash Mapping Tool to allow State and regional planning agencies to identify crash locations at the community level. The crash records system is now accepting electronically transmitted records via an interface that has been developed for agencies to transmit their records directly from their Records Management Systems (RMSs) to the Registry of Motor Vehicles (RMV). The recently appointed director of the HSD has taken on the role of promoting traffic records improvement and serves as the TRCC chair. However some major issues remain and are discussed in the summary below and the full report that follows.

Crash Records
The statewide Crash Data System (CDS) is maintained by the RMV and is populated by crash reports sent to the RMV both electronically and on hard copy forms. While users have good access to RMV data and rely on it for their programming and planning needs, the State nevertheless is facing serious challenges in its attempts to provide crash data to users throughout the highway safety community. The current condition of the crash file renders it very unreliable as a source of data to drive decisions in program planning and policy-setting by the State’s highway safety managers.

The CDS cannot be considered to meaningfully represent the crash experience in Massachusetts for several reasons. Several large agencies (in particular Boston and Springfield) do not send reports for a vast majority of their crashes. For example, according to crash statistics Boston only submitted 92 crash reports in 2007. Although there is a statutory requirement for all agencies to report crashes to RMV, there is no penalty for non-compliance. Some agencies send in reports
with many blank data fields. Compounding the problem further is the lack of edits being applied at RMV during data entry. Even those agencies sending reports electronically do not apply edits prior to submission. Although about 88 agencies are sending reports electronically, many of the agencies are sending data from their Records Management Systems (RMSs) as entered from paper forms, rather than the data being collected via field data collection applications on laptops in the police vehicles. If used, such applications could provide for editing at time of entry. Another practice that further diminishes the quality of the entire crash file is the reliance on operator reports. In the absence of a police report for a crash, information from an operator report is entered into the system time permitting.

Nevertheless the State is to be commended for its recognition of the potential value of electronic data collection and its benefits not only in the increased quality of data, but the time and cost savings to the law enforcement agencies. The HSD plans to meet in the near future to begin laying out a plan and schedule for expanding local agency installation of the electronic data transmission interface. To realize the full benefits of electronic data collection and transmission, major changes in policies and procedures are required at law enforcement agencies and the RMV.

Citation and Adjudication Records
Massachusetts unlike many States has excellent citation data. The RMV is the responsible agency for printing and distributing all ticket books (Massachusetts Uniform Citation Books) to the law enforcement agencies throughout the State.

Upon issuance of a civil citation by a law enforcement officer, a copy is sent both to the Merit Rating Board (MRB) at the RMV for entry into the driver record. For civil infractions a final disposition is applied automatically when the fine is paid or when the findings from a hearing are applied to the citation by the MRB. A final disposition is also applied if the violator fails to pay the citation or request a clerk-magistrate hearing. Upon issuance of a criminal citation by a law enforcement officer two copies are sent to the District Court. The District Court forwards a copy of the criminal citation without disposition data to the MRB. In criminal cases the final dispositions are applied when received from the courts (fifty-eight of the sixty-two District Courts send the dispositions electronically via the MassCOURTS case management system). It is interesting to note that, again unlike most States, the MRB receives all dispositions regardless of the judicial finding (guilty, dismissed, etc.). Consequently, the MRB is capable of identifying all actions taken on any citation (civil or criminal) throughout the life cycle of that citation and is capable of accounting for all civil and criminal citations from the time they are printed, distributed to law enforcement, issued to an offender, adjudicated in the court, and posted in the driver history record. This is a resource unavailable in most States for conducting analyses to determine the effectiveness of enforcement of the State’s traffic laws and to ensure the integrity of citation processing.

While electronic processing is in use between the courts and RMV, no similar process exists between law enforcement and the courts. No law enforcement agencies have the capability to issue citations electronically for transfer to the courts. The Administrative Office of the Trial Courts (AOTC) as well as the MRB and law enforcement all indicated a great deal of interest in
bringing about electronic ticketing. It appears that establishing a project team, under the auspices of the TRCC, with representatives from the above entities would be well received and could provide some immediate near-term benefits.

Roadway Information
The system upgrade to the crash file in 2001 helped to resolve about half of the location coding problems previously experienced with multiple names for the same street. The system was designed to collect more accurate information using “pick lists” for street names and through an error resolution process at the RMV. However, the “pick lists” used by local police in their RMSs and that used in the crash file at RMV have different names in the pick list due to different sources for street names.

State, regional, and local planners and engineers and safety personnel need access to the entire crash report for a more detailed analysis of crash data through the information in the report narrative and collision diagram. Electronically transmitted reports do include this information, but it is extremely difficult to retrieve this information from hard copy forms.

Driver and Vehicle Records
Problems were found by the State Auditor last July with driver histories in the RMV resulting in failures to suspend or revoke licenses. The MRB inputs criminal citations and convictions for the RMV and took immediate action, working with the RMV and the courts to establish electronic submissions of criminal disposition data from the District Courts to solve the problem. As of the beginning of this year most criminal dispositions from District Courts are electronic, and efforts are underway to extend that capability to the other courts. Thus a very positive development was achieved in a short time frame to correct a serious problem. Exploring this development revealed that the MRB is providing important, timely, and useful citation data to law enforcement and the courts and could be a rich source of traffic safety information.

The motor vehicle functions of the RMV have taken advantage of the electronic interactive applications available to them: the National Motor Vehicle Title Information System, the Electronic Lien and Title system, and the Business Partner Electronic Vehicle Registration.

Injury Surveillance System Components
Massachusetts has several components of a statewide injury surveillance system. The Division of Health Care Finance and Policy (DHCFP) compiles statewide hospital discharge, emergency department (ED), and outpatient services databases. The Department of Public Health (DPH) Injury Surveillance Program has just begun collecting data in a statewide trauma registry and is preparing to capture statewide emergency medical services (EMS) data by September of 2009. DPH also maintains a statewide death certificate database.

The Injury Surveillance Program has access to all of these databases and has the ability to deterministically link injury episodes across data sets. The Injury Prevention Program uses these data for a number of injury prevention programs and reports. Data in the statewide injury surveillance system has been compiled into the Massachusetts Community Health Information Profile (MassCHIP). Many of these data sets have also been integrated with the statewide crash file through the Massachusetts Crash Outcome Data Evaluation System (CODES) project.
A wealth of traffic safety information for traffic safety research is available in the DHCFP hospital data and DPH trauma registry, EMS, and death record data. However, due to access restrictions and other obstacles the full potential of these systems has not been realized.

**Traffic Records Coordinating Committee (TRCC)**
As noted above, the State has made progress since the 2005 assessment in formalizing its TRCC with a Charter, Mission Statement and an official list of voting members. The Committee is chaired by the Director of the Highway Safety Division. Meetings are held bi-monthly. One area that needs to be addressed is the absence of an Executive Level group, although the Executive Leadership group for the State’s Strategic Highway Safety Plan informally fills that role. Another is the notable absence of active participation from the judiciary. It is acknowledged that they have been invited but have declined. However, a member of the AOTC has expressed an interest in participating in the planning of any projects that would be of benefit to the judiciary, particularly to develop any initiatives related to electronic ticketing.

**Strategic Planning**
The current Strategic Plan is primarily a compilation of Section 408 grant submissions. However, the Highway Safety Division is in the process of preparing a Traffic Records Business Plan which will cover all Commonwealth information technology initiatives for traffic safety information. The Business Plan, along with the deficiencies identified in this Assessment, is intended to be the source of information for the projects to be included in the application for Section 408 funding.

Following are the major recommendations for improvements to the State’s traffic records system. The references indicate the sections of the report from which the recommendations are drawn.

**MAJOR RECOMMENDATIONS**

**Traffic Records System Management**

- Establish the Executive Level of the TRCC to ensure full support and authorization of the TRCC and its members by the executives of the agencies in whose area of responsibility the components of the traffic records system fall. (Section 1-A)

- Refocus the TRCC on the global strategic direction of the traffic records system, rather than on the oversight of 408 grant spending. (Section 1-A)

- Establish performance measures in the design of proposed projects that will measure data quality improvements. (Section 1-B)

- Promote users’ access to and use of the traffic records system to build support for data improvement, especially as it relates to crash data collection by law enforcement. (Section 1-C)
Crash Records

- Establish crash reporting improvement as a top priority of the TRCC and the member agencies. (Section 2-A)

- Develop a comprehensive plan to improve crash data to acceptable levels by the end of 2010 (or sooner) and obtain Executive level endorsement of the plan, up to and including the Governor, if necessary, to ensure that all law enforcement agencies meet their reporting requirements under the law. (Section 2-A)

- Include in the plan a timeline to gradually eliminate the need for operator reports in the CDS. A 5-year timeline with options to accelerate that is recommended. (Section 2-A)

- Expand the edit checks in CDS for manual data entry to a set that is operationally meaningful, establishes a high standard for data quality, and meets with the approval of the TRCC members. (Section 2-A)

- Establish a formal quality control program with operationally meaningful measurements, a tracking system that ensures reports containing serious errors are returned to the law enforcement agency for correction, and are subsequently returned to RMV in a timely fashion. Track all errors and use the information to develop additional content for crash reporting training and refresher training. (Section 2-A)

- Ensure that crash report images (including the narrative and diagram) are available for all crashes to all legitimate users of the crash data, especially those who rely on accurate location information. Scanning of paper forms, and creation/storage of pdfs from electronic crash reports would allow users in law enforcement and engineering agencies, in particular, to access the detailed information they need from the narratives and diagrams. (Section 2-A)

Citation and Adjudication Records

- Charge the TRCC with establishing a working group of the appropriate stakeholders to plan for the implementation of e-citations in the State. (Section 2-E)

Roadway Information

- Implement an imaging system to capture each crash report for use by safety engineers and law enforcement to study crash locations for countermeasure development. (Section 2-B)

- Develop a naming convention and training program to be applied to the “pick list” for identifying street names for crash report location. (Section 2-B)
Injury Surveillance System Components

- Integrate the statewide crash database into MassCHIP. *Section 2-F*
- Ensure that Highway Safety Division program managers and analysts understand how to access MassCHIP. *Section 2-F*
- Partner with CODES to make available a linked crash and citation database for use by MassHighway and the Highway Safety Division. *Section 2-F*
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INTRODUCTION

A complete traffic records system is necessary for planning (problem identification), operational management or control, and evaluation of a State’s highway safety activities. Each State, in cooperation with its political subdivisions, should establish and implement a complete traffic records system. The statewide program should include, or provide for, information for the entire State. This type of program is basic to the implementation of all highway safety countermeasures and is the key ingredient to their effective and efficient management.

As stated in the National Agenda for the Improvement of Highway Safety Information Systems, a product of the National Safety Council’s Association of Transportation Safety Information Professionals (formerly the Traffic Records Committee):

“Highway safety information systems provide the information which is critical to the development of policies and programs that maintain the safety and the operation of the nation’s roadway transportation network.”

A traffic records system is generally defined as a virtual system of independent real systems which collectively form the information base for the management of the highway and traffic safety activities of a State and its local subdivisions.

Assessment Background

The Traffic Records Assessment is a technical assistance tool that the National Highway Traffic Safety Administration (NHTSA), the Federal Motor Carrier Safety Administration (FMCSA) and the Federal Highway Administration (FHWA) offer to State offices of highway safety to allow management to review the State’s traffic records program. NHTSA has published a Traffic Records Program Assessment Advisory which establishes criteria to guide State development and use of its highway safety information resources. The Traffic Records Assessment is a process for giving the State a snapshot of its status relative to that Advisory.

This assessment report documents the State’s traffic records activities as compared to the provisions in the Advisory, notes a State’s traffic records strengths and accomplishments, and offers suggestions where improvements can be made.

Report Contents

In this report, the text following the “Advisory” excerpt heading was drawn from the Traffic Records Program Assessment Advisory. The “Advisory” excerpt portion is in italics to distinguish it from the “Status and Recommendations” related to that section which immediately follows. The status and recommendations represent the assessment team’s understanding of the State’s traffic records system and their suggestions for improvement. The findings are based entirely on the documents provided prior to and during the assessment, together with the information gathered through the face-to-face discussions with the listed State officials. Recommendations for improvements in the State’s records program are based on the assessment team’s judgment.
Advisory Excerpt: Management of a State TRS requires coordination and cooperation. The data that make up a TRS reside in a variety of operational systems that are created and maintained to meet primary needs in areas other than highway safety. Ownership of these databases usually resides with multiple agencies, and the collectors and users of the data span the entire State and beyond.

The development and management of traffic safety programs should be a systematic process with the goal of reducing the number and severity of traffic crashes. This data-driven process should ensure that all opportunities to improve highway safety are identified and considered for implementation. Furthermore, the effectiveness of highway safety programs should be evaluated. These evaluation results should be used to facilitate the implementation of the most effective highway safety strategies and programs. This process should be achieved through the following initiatives.
I-A: Traffic Records Coordinating Committee

Advisory Excerpt: The National Highway Traffic Safety Administration’s (NHTSA) 2004 Initiatives to Address Improving Traffic Safety Data Integrated Project Team report (hereafter referred to as the Data IPT Report) includes guidance on establishing a successful Traffic Records Coordinating Committee (TRCC). The following include recommendations from the Data IPT Report and additional items of an advisory nature:

- Establish a two-tiered TRCC. There should be an executive and a working-level TRCC. The executive-level TRCC should be composed of agency directors who set the vision and mission for the working-level TRCC. The Executive TRCC should review and approve actions proposed by the Working TRCC. The Working TRCC should be composed of representatives for all stakeholders and have responsibilities, defined by the Executive TRCC, for oversight and coordination of the TRS. Together, the two tiers of the TRCC should be responsible for developing, maintaining, and tracking accomplishments related to the State’s Strategic Plan for Traffic Records Improvement.

- Ensure Membership is Representative. TRCCs should be representative of all stakeholders, and each stakeholder representative must have support from their top management. When departments are considering changes to their systems, all TRCC members should be notified and departments should consider how to accommodate the needs of all the TRCC agencies.

- Authorize Members. The Working TRCC should have formal standing, recognition, and support of the administrators of participating agencies. This support will help the TRCC succeed in overcoming the institutional barriers, lack of focus, and lack of resources that prevent collaboration and progress in integrating highway safety data. The exact role and powers of the TRCC should be made explicit in its charter. Legislators, the governor, and top management of participating agencies should give authority to the TRCC members to make policy decisions and commit their agencies’ resources to solve problems and approve the State’s strategic plan for traffic records. The most important responsibility of the TRCC should be to provide the leadership necessary to ensure that available funds are sufficient to match stated needs. Despite challenges stemming from collective decision making by members from different agencies with competing priorities, TRCC members should speak with “one voice.” The TRCC should have guidelines to determine who speaks for the TRCC and how its recommendations should be communicated.

- Appoint an Administrator/Manager. A single point of contact for managing a data improvement project is necessary to ensure leadership. The TRCC should designate a traffic records administrator or manager and provide sufficient time and resources to do the job. This person should be responsible for coordinating and scheduling the TRCC, in addition to tracking the progress of implementing the State’s traffic records strategic plan. Uniform criteria should be established for monitoring progress. NHTSA can facilitate training for the TRCC administrator/manager regarding traffic record systems, program management, and data analysis.

- Schedule Regular Meetings. The TRCC should establish a schedule of regular meetings, not only to discuss data coordination issues and make progress on the strategic plan, but also to share success stories to aid in overcoming fears of implementation. The meetings should take place as required to deal with the State’s traffic records issues and to provide meaningful coordination among the stakeholders. The TRCC should gain broader support by marketing the benefits of improved highway safety data. An example to provide data and analytical expertise to local government officials, legislators, decision makers, community groups, and all other stakeholders. TRCC meetings should include strategy sessions for such marketing plans.

- Oversee Quality Control/Improvement. The TRCC should have oversight responsibility for quality control and quality improvement programs affecting all traffic records data. Regularly scheduled presentations of quality control metrics should be part of the TRCC meeting agenda and the TRCC should promote projects to address the data quality problems that are presented.

- Oversee Training for TRS Data Improvement. The TRCC should have oversight responsibility for encouraging and monitoring the success of training programs implemented specifically to improve TRS data quality. Regularly scheduled presentations of training needs and training participation should be part of the TRCC meeting agenda, and the TRCC should promote projects to conduct training needs assessments and address the identified training needs.
Establish a Two-Tiered TRCC
The Traffic Records Coordinating Committee (TRCC) is the means by which communication is facilitated and perpetuated between the various users and collectors of data and owners and custodians of the data systems which make up a State’s traffic records system. Massachusetts has a working level TRCC that is active and meets six to eight times each year. The working group members represent most facets of traffic records which include driver and vehicle, crash, injury surveillance, roadway, and citation and adjudication data. The State agencies that manage the data systems involved are represented or have participated on the working level TRCC.

It is apparent that the group has a positive relationship, but there remain concerns about data sharing and ownership and control of the computer systems. Some of the concerns that have been raised about the data and systems are best addressed at the executive level. It is recommended that the TRCC have two tiers of membership. The tier that has yet to be permanently established in Massachusetts is the agency director or executive level.

The TRCC has developed a strategic plan and it reviews applications for grant funding and oversees progress. That strategy must involve a vision for the State’s traffic records future. Whether it’s more electronic field data collection, development of integration strategies or commitment to improved data quality and timeliness, the vision should be an integral part of all planning that occurs. Further, a prioritized list of potential projects should be developed in conjunction with that vision. Having project plans at the ready makes it easier to take advantage of grant funding or State funding that might be or become available.

The development of a global vision is more equitably and effectively accomplished outside of the arena of funding requests. A set of strategic objectives for the State is the first priority, followed by a list of projects that would assist in accomplishing those goals. Those objectives and project plans could be assigned to a review panel subcommittee for prioritization and free the TRCC members to discuss more fundamental issues such as data sharing and quality control in the current systems.

Awareness of planned projects helps agencies to formulate policy and plans that encompass the planned changes and traffic records vision. In that regard, the current plan to award a contract for a “Statewide E-Citation and Traffic Records System Business Plan Development” (hereafter referred to as the “Business Plan”) should be altered to defer the systems improvement tasks until the TRCC has completed two tasks:

1) Finalize project priorities for all components of the Traffic Records System, and,
2) Produce an updated Strategic Plan for Traffic Records Improvement.

The Business Plan will result in a broader vision for the traffic records system, but it should not proceed to tasks that affect components of that system until a Strategic Plan is in place. The Strategic Planning exercise is the recommended method for the TRCC to coordinate future improvements to the traffic records system. At the same time, it helps keep the information technology sections of the various departments involved in planning for integration and linkage.
potentials as the project plans are eventually funded and implemented. Planning for integration of systems is always simpler and less costly than retrofitting systems for linkages once they are built and being used and policies and procedures for system use have been developed and institutionalized.

**Ensure Membership is Representative**
If all stakeholders of the traffic records community are involved and aware of planned changes in any single component of the system, conflicts are less likely to occur. Planning for changes to existing systems or new systems should take into account the needs of the entire system of traffic records, while assuring that the needs of the primary owner and users of the system are fully met. Involvement of all stakeholder agencies in statewide system planning assures that no individual group or agency is caught off guard or their implementation of system changes is delayed.

It appears that most stakeholder groups are represented in the current TRCC. Although the judiciary has participated in past meetings, they are not currently actively involved. There are however, areas in which better communication appears to be needed to improve the collection, dissemination and use of data. One such area involves the failure of local police agencies to send crash reports to the State as statutorily mandated. Various strategies to encourage local police to forward their reports could include increasing local law enforcement membership on the TRCC. This may require some revision to how the TRCC operates or is structured – for example, law enforcement agencies may prefer active involvement in TRCC subcommittees designed to specifically address enforcement-related issues rather than attendance at the larger group meetings. Additionally, provision of available crash and citation data to police and assistance with analysis of countermeasure effectiveness might allow law enforcement officers to see the value of their traffic safety efforts and their direct impacts on crash rates, which may in turn act as a catalyst for more reporting and more effective data collection.

**Authorize Members**
While there is no evidence of lack of support of the TRCC or its members by upper level management, formalization of the standing, roles and powers of the TRCC helps both to educate the executives of the involved departments and give them more information about their role as it relates to support of the efforts of the group. Since the Charter has been addressed as a matter of concern by the legal representatives of the various stakeholder agencies, there is certainly room for increased dialogue between agencies about the individual powers of each involved agency, the requirement for consensus of all involved agencies and the need for the group to speak with a single voice.

**Appoint an Administrator/Manager**
The TRCC chairperson is the Director of the Highway Safety Division within the Executive Office of Public Safety and Security. In this role, she has the responsibility of assuring that meetings continue and subcommittees are formed to address specific projects. As the chair of the TRCC, the administrator has the responsibility of being the traffic records champion for the State, helping to facilitate data sharing, communication and providing the enthusiasm needed to keep projects running smoothly. It is the administrator’s job to assign responsibility for key projects and to check on progress on a regular basis. It is not, however, the chair’s responsibility to steer the ship alone. The traffic records community must operate as a team and support one
another and capitulate when priorities other than their own become primary. The willingness to step aside for others is an outgrowth of the understanding of the interplay of the various system components and the value of the data outputs of each of those components.

One of the means by which to facilitate that understanding is for all data owners and collectors to provide to the TRCC members a short overview of their work and their use of the various data that they maintain. The questions and dialogue that result from such presentations build the foundation for a firm understanding on the part of all participants not only of the data that are collected, but of their value to the various programs within the traffic records system. Knowledge of specific data elements collected by each system can serve to provide opportunities for linkages where common data elements are collected in multiple components of the TRS. This interaction also provides a platform for data-sharing requests and an opportunity to present further needs for data that perhaps aren’t currently being collected but might be readily available.

The TRCC should have a catalog of the available data, contact information for its owners and a list of the software and platforms on which they reside. Data dictionaries and schema, as available, should also reside in this inventory, to facilitate expansion or replacement of systems where integration or linkages might be deemed desirable.

**Schedule Regular Meetings**

TRCC meetings are being held regularly, approximately once every two months. The agenda reportedly deals primarily with the funding of projects from Federal 408 Traffic Record Improvement Grants. Several TRCC members expressed an opinion that grant application review by the TRCC is time-consuming and reduces the time available to address data quality issues. At this point in time, it may be more valuable to remove the funding discussions and application reviews to either a subcommittee or an outside review panel, in order that the more global needs of the State in the traffic records arena may be discussed and a strategic vision developed. Other members noted that the focus of the TRCC is crash data, to the exclusion of other important data systems.

Identification of the most pressing problems and evaluation of the cost/benefit of various ways in which those problems can be addressed is a worthwhile exercise for the TRCC and would add a more global perspective to traffic safety policy formulation than can occur simply by reviewing individually devised and submitted requests for funding. The TRCC made a good start at prioritizing projects in December 2007, but these priorities need to be finalized and presented as part of an updated Strategic Plan for Traffic Records Improvement.

The TRCC can operate as a marketing team for the data collected, and thus provide for broader usage and potentially additional support for funding. Review of recent legislation and evaluation of its success at accomplishing its stated objective or lack thereof is helpful to legislators in terms of determining the impact of their efforts. A review of the operating under the influence of alcohol recidivism rates for drivers who have been mandated to use ignition interlock devices is an example of an evaluation that would be helpful and could showcase the value of traffic records data.
**Oversee Quality Control/Improvement**

Some of the concerns that have been voiced during this assessment include the lack of quality control in some of the data systems, including lack of data edits in the crash system and inability to locate crashes effectively. The manner in which the point of impact in crashes is identified causes a great deal of additional work by engineers, data entry operators and planning organizations.

The RMV validates all Massachusetts license and registration numbers that are submitted on paper and electronic forms. The following information is filled in the fields at the time of validation: sex, License Class, operator and owner name, address, city, state, zip code, insurance company, vehicle year, and vehicle make.

The roadway fields are drop down lists that have not been updated since 2001. Most of the other fields are validated using look up tables in the Crash Data System. There are edits in the crash data system that will not let a crash be saved unless the information is entered, such as police agency type, operator name, and time of crash.

A pilot project to test the efficacy of hand held GPS devices might be a small project that could be undertaken to determine the cost/benefit of such a location tool for crash reports. More consistent use of the data field to list GPS coordinates of the crash records system is desirable. It appears that the system is already able to accept these data, but that the reporting of GPS coordinates is inconsistent, at best. Any change to the crash report at this juncture would be a major undertaking and would require coordination that could best be provided by the TRCC. Reportedly, twenty-two separate crash data collection software products are used in the State of Massachusetts. At this point, revision of the crash report calls for revision of the various software products as well as the data collection middleware at the Registry of Motor Vehicles (RMV). Coordination is essential to provide for adequate time to make reasonable transitions when software revisions are involved. Training for new forms and software can be a shared responsibility of TRCC members who contributed to form changes including RMV employees and law enforcement.

**Oversee Training for TRS Data Improvement**

During the course of this assessment, training has been discussed as a concern on several levels. In terms of data quality, understanding the use of a data field in a report by the person completing the report may mean the difference between useful and useless data. Such situations are often brought to the attention of the TRCC members which may suggest review of areas where training can be enhanced, where refresher training may be warranted or where new training needs to be developed in order to improve data collection.

Data users are in a unique position to recognize and bring attention to data errors and potentials for data edits. Additionally, training on systems and forms designed by TRCC or subcommittee members can be successfully conducted by TRCC members, in that they are in a unique position to explain the rationale for inclusion of data or edits to those whose job it is to collect data and complete forms.
The TRCC can be a means to facilitate training and information sharing among members and larger constituencies within the traffic records community which may benefit from the expertise of others. Concerns about the use of data can also be mitigated by training related to data privacy and the laws related to the use and disclosure of the data.

A training needs assessment could provide information about the individual committee members’ desire for training and point out those issues most often cited as areas of concern. The TRCC could work with appropriate entities to develop curricula or provide short training sessions on data collection, use, and sharing. If necessary, a data users subcommittee could direct such activities.

**Recommendations**

- Establish the Executive Level of the TRCC to ensure full support and authorization of the TRCC and its members by the executives of the agencies in whose area of responsibility the components of the traffic records system fall.

- Refocus the TRCC on the global strategic direction of the traffic records system, rather than on the oversight of 408 grant spending.

- Alter the pending Business Plan to emphasize the overall management and vision for the Traffic Records System. Defer to the Strategic Plan any of the Business Plan components that directly affect traffic records system components.

- Add TRCC members as necessary to ensure that all stakeholders are represented, including injury prevention partners, advocacy groups, and street-level law enforcement personnel.

- Develop and/or share an inventory of the systems and data that are collected within the State, to include data dictionaries, platforms, operating systems and standards. A similar inventory of law enforcement equipment/capability and field reporting software could help to facilitate the design of electronic systems that are functional for the greatest percentage of police personnel possible.
1-B: Strategic Planning

Advisory Excerpt: The TRS should operate in a fashion that supports the traffic safety planning process. The planning process should be driven by a strategic plan that helps State and local data owners identify and support their overall traffic safety program needs and addresses the changing needs for information over time. Detailed guidance for strategic planning is included in the NHTSA Strategic Planning Guide and the FHWA Strategic Highway Safety Plan documents. The strategic plan should address activities such as:

- **Assign Responsibility for the Strategic Plan.**
  The strategic plan should be created and approved under the direction of the TRCC. The TRCC should continuously monitor and update the plan, to address any deficiencies in its highway traffic records system.

- **Ensure Continuous Planning.**
  The application of new technology in all data operational phases (i.e., data collection, linkage, processing, retrieval, and analysis) should be continuously reviewed and assessed. The strategic plan should address the adoption and integration of new technology as this facilitates improving TRS components.

- **Move to Sustainable Systems.**
  The strategic plan should include consideration of the budget for lifecycle maintenance and self-sufficiency to ensure that the TRS continues to function even in the absence of grant funds.

- **Meet Local Needs.**
  The strategic plan should encourage the development of local and statewide data systems that are responsive to the needs of all stakeholders.

- **Promote Data Sharing.**
  The strategic plan should promote identification of data sharing opportunities and the integration among federal, State, and local data systems. This will help to eliminate duplication of data and data entry, assuring timely, accurate, and complete traffic safety information.

- **Promote Data Linkage.**
  Data should be integrated to provide linkage between components of the TRS. Examples of valuable linkages for highway and traffic safety decision making include crash data with roadway characteristics, location, and traffic counts; crash data with driver and vehicle data; and crash data with adjudication data, healthcare treatment and outcome data (e.g., Crash Outcome Data Evaluation System [CODES]).

- **Coordinate with Federal Partners.**
  The strategic plan’s budget-related items should include coordination between the State and the various federal programs available to fund system improvements. The data collection, management, and analysis items in the strategic plan should include coordination of the State’s systems with various federal systems (e.g., the Fatality Analysis Reporting System [FARS], the Problem Driver Pointer System [PDPS] of the National Driver Registry [NDR], the Motor Carrier Management Information System [MCMIS], and the Commercial Driver License Information System [CDLIS]).

- **Incorporate Uniform Data Standards.**
  The strategic plan should include elements that recognize and schedule incorporation of uniform data elements, definitions, and design standards in accordance with national standards and guidelines. Current examples of these standards and guidelines include:
    - Model Minimum Uniform Crash Criteria (MMUCC)
    - American National Standards Institute (ANSI) -D20.1 and ANSI-D16.1
    - National Governors Association (NGA)
    - Global Justice XML Data Model (GJXDM)
• National Center for State Courts, Technology Services, Traffic Court Case Management Systems Functional Requirement Standards

• Guidelines for Impaired Driving Records Information Systems

• National Emergency Medical Service Information System (NEMSIS) Data Dictionary.

☐ Plan to Meet Changing Requirements.
To help the State meet future highway safety challenges, the strategic plan should include a periodic review of data needs at the local, State, and federal levels. It should be updated to include tasks to meet those needs as they are identified.

☐ Support Strategic Highway Safety Planning and Program Management.
The strategic plan should include elements designed to ensure that the State captures program baseline, performance, and evaluation data in response to changing traffic safety program initiatives. Additional elements should be present for establishing and updating countermeasure activities (e.g., crash reduction factors used in project selection and evaluation).

☐ Strategic Planning of Training and Quality Control.
The strategic plan should incorporate activities for identifying and addressing data quality problems, especially as these relate to training needs assessments and training implementation.
1-B: Strategic Planning Status

Assign Responsibility for the Strategic Plan
The most recent strategic plan was prepared during 2004 and summarized in an April 26, 2005 report. The Massachusetts Strategic Plan for Traffic Records Improvement was prepared by Data Nexus of College Station, Texas with the active participation of the traffic records community of Massachusetts. Information in the accompanying Traffic Records Improvement Program Reporting System (TRIPRS) worksheets indicates the existence of a technical Traffic Records Coordinating Committee (TRCC). The TRIPRS also attests to the Committee’s responsibility to approve and make changes to the final plan.

A systems audit was an initial phase of the planning process and documented the records deficiencies to be addressed by the strategic plan.

Ensure Continuous Planning
The Plan was reviewed and updated annually with the most recent revision in November of 2008. The TRCC was an active participant with the chair of the TRCC who is the Director of the Highway Safety Division (HSD) providing direction and staff resources.

Move to Sustainable Systems
The current Plan is primarily a compilation of Section 408 grant submissions. The projects submitted in the TRIPRS give no indication of funding sources other than the grant funds requested (either 408 or FMCSA) and in some instances a matching state in-kind soft match. It does not suggest a commitment to self-sufficiency to ensure that these projects would continue to function even without grant funds.

All funding sources must be part of the project description included in the TRIPRS. An affirmation attesting to the development, implementation, and maintenance of the systems proposed or modified should be evident.

Meet Local Needs
Traffic records system initiatives in the current Plan are focused on the electronic collection and submission of crash and citation data by local law enforcement agencies. The method to accurately locate crash occurrences on the public road system is a current problem that requires immediate attention. Additionally, the needs of safety officials for detailed information of crash dynamics that are most typically included in the police crash report should be addressed.

Promote Data Sharing and Data Linkage
Three projects in the current Section 408 application promote the data sharing of traffic safety information among the Commonwealth’s safety stakeholders. The Traffic Records Business Plan is a system-wide project that emphasizes integration of and access to traffic safety datasets. Two other project submissions, the Crash Data Website Development and Implementation and the Statewide Information Sharing System, have as their basic objective the provision for sharing of and access to traffic safety data.

Coordinate with Federal Partners
The TRCC membership includes State and local safety officials and safety partners from the U.S. Department of Transportation. The federal members provide guidance to the TRCC in developing the Strategic Plan.

**Incorporate Uniform Data Standards**
The Model Minimum Uniform Crash Criteria (MMUCC), the American National Standards Institute (ANSI) – D20.1 and ANSI- D16.1, and the National Emergency Medical Service Information System (NEMSIS) Data Dictionary are used in appropriate systems as standards and as guidelines. Also, the Highway Performance Monitoring System is a guideline for data in the Road Inventory File.

**Support Strategic Highway Safety Planning and Program Management**
Through collaboration with the agencies responsible for the State’s Strategic Highway Safety Plan, (the chair of the TRCC is a member of the Strategic Highway Safety Plan steering committee), the Traffic Records Strategic Plan is a coordinated planning effort to provide improved highway safety information for transportation and public safety officials throughout the State.

**Strategic Planning of Training and Quality Control**
There are indicators in the Section 408 submission of performance measures for the projects listed. These measures need to be more precise and designed to show a baseline or benchmark to quantitatively measure improvements from the benchmark measure.

**Recommendations**

- Establish performance measures in the design of proposed projects that will measure data quality improvements.
1-C: Data Integration

Advisory Excerpt: The Data IPT Report recommends that States integrate data and expand their linkage opportunities to track traffic safety events among data files. Integrated data should enable driver license and vehicle registration files to be updated with current violations, prevent the wrong driver from being licensed, or keep an unsafe vehicle from being registered. Integration should ensure that all administrative actions are available at the time of the driver’s sentencing. Data linkage is an efficient strategy for expanding the data available, while avoiding the expense and delay of new data collection.

State TRCCs should develop working relationships with the health care community to ensure that the causation, crash, emergency medical services, hospital, and other injury-related data linked during the event can be merged statewide. They should also link to other data such as vehicle insurance, death certificates, medical examiner reports, etc., to support analysis of State-specific public health needs.

Linkage with location-based information such as roadway inventory databases and traffic volume databases at the State level can help identify the kinds of roadway features that experience problems, allowing States to better address these needs through their various maintenance and capital improvement programs. Data integration should be addressed through the following:

- **Create and Maintain a Traffic Records System Inventory.**
  The TRS documentation should show the data elements and their definitions and locations within the various component systems. Ancillary documentation should be available that gives details of the data collection methods, edit/ error checking related to each data element, and any known problems or limitations with use of a particular data element. The system inventory should be maintained centrally, ideally in a data clearinghouse, and kept up-to-date through periodic reviews with the custodial agencies. Funding for system development and improvement should include a review of existing systems’ contents and capabilities.

- **Support Centralized Access to Linked Data.**
  The traffic records user community should be able to access the major component data files of the TRS through a single portal. To support this access, the State should promote an enterprise architecture and database, and develop a traffic records clearinghouse to serve as the gateway for users. The databases in the clearinghouse should be linked in ways that support highway safety analysis. At a minimum, this would include linkage by location, involved persons, and events.

- **Meet Federal Reporting Requirements.**
  The TRS, where possible, should link to or provide electronic upload files to federal data systems such as FARS, MCMIS/SafetyNet, Highway Performance Monitoring System (HPMS), and others.

- **Support Electronic Data Sharing.**
  The TRS should support standard methods for transporting data between systems. At a minimum, these should include a documented file structure and data definitions for information to be transferred to statewide databases. Standard information transfer formats and protocols, such as XML format and FTP, should be supported.

- **Adhere to State and Federal Privacy and Security Standards.**
  The TRS should make linked data as accessible as possible while safeguarding private information in accordance with State and federal laws. This includes security of information transferred via the Internet or other means.
There are several examples of data integration in the Massachusetts Traffic Records System. Since the last Assessment, the most notable data integration improvement has been in the successful development of an automated set of algorithms for adding location codes to the crash data. Historically, about 25% of crashes could be matched to a location in the statewide roadway inventory file. Prior to 2006 when the crash locator tool was implemented, only about 60 percent of crashes could be located to a point. Now, using the automated tool, combined with manual review, MassHighway has achieved an 83% match rate. In pilot tests when the automated tool was supplemented with a review of the unmatched cases by regional planning agencies, the match rate improves to approximately 90 percent. There are still some acknowledged shortcomings in the location data collected on crash report forms, and some of the problems in the field relate to out-of-date information in the roadway location list provided by MassHighway, but in general, users of the crash and roadway data are experiencing a major improvement in their ability to analyze crashes associated with roadway information such as roadway type, geometry, shoulder, lane width, curve and other inventory information.

In the previous Assessment, the major data integration effort among traffic records data sources was the data warehouse at the Traffic Safety Research Program in the University of Massachusetts Transportation Center. That project was initially designed to provide all traffic records users with a single source from which to obtain data on crashes, roadways, drivers, vehicles and medical outcome information. Analytic tools were planned that would give users an easy-to-use interface through which they could design and run custom queries as well as obtain data in standard reports already defined in the system. Unfortunately, the University of Massachusetts Traffic Safety Research Program data warehouse did not serve a sufficiently large user community and the analysis tools were generally reported to be too difficult for many in the intended audience. As a result, the data warehouse was underutilized and, under a subsequent contract with a different vendor, the project was eventually stopped.

The University of Massachusetts Traffic Safety Research Program continues to use the various linked datasets and to obtain updates to the various State databases in their system as part of their ongoing responsibilities under the NHTSA-funded Crash Outcome Data Evaluation System (CODES) grant. The University of Massachusetts Traffic Safety Research Program maintains storage of linked data and will conduct analyses for clients on a fee-for-service basis.

There are at least two other data warehouses in the Commonwealth. The Department of Public Health (DPH) maintains a set of linked data files based on several components of the injury surveillance system, including Emergency Department Outpatient data, Outpatient Services data, Hospital Discharge data, and Vital Records/Death Certificate data. These data sets and the capabilities of the linked files are described more fully in Section 2 of this report.

A law enforcement data warehouse, the Statewide Information Sharing System (SWISS) is under construction as part of the Criminal Justice Information System (CJIS). At present, the system includes incident reports submitted by several law enforcement agencies. The vision is to expand the SWISS to include citations, crash reports, incident reports, and contact data. The SWISS is being viewed as a potential replacement for the current method of electronic data
transfer of crash reports between the law enforcement agencies and the statewide Crash Data System (CDS) at the Registry of Motor Vehicles (RMV). Under SWISS, data transfers would be forced to match a strict protocol and might thus include some level of error checking not currently possible with the ftp data transfer system in place now at RMV. Once the SWISS data warehouse is more complete, it may be possible to support at least law enforcement users with some analytic tools and access to statewide data.

**Create and Maintain a Traffic Records System Inventory**
The traffic records system inventory created as part of the original traffic records data warehouse is out of date. The Highway Safety Division (HSD) has recently contracted with a vendor to develop an overall business plan for Traffic Records. That project includes development of a comprehensive inventory of systems and data flows.

**Support Centralized Access to Linked Data**
It was reported that the existing tool developed for the data warehouse at the University of Massachusetts Traffic Safety Research Program was not useful for MassHighway and the regional planning agencies in that it was only town level information and not helpful in evaluating needs of infrastructure fixes. The new vision is to create a new set of tools, preferably web-based that would allow users with only minimal data analysis skills to produce valid data tables. It has not yet been decided what form those tools will take, but a user needs assessment is planned which will help to guide the development of a user interface that will meet the goals of simplicity and analytic power. It is also worth noting that the DPH maintains the MassCHIP online query tool which could, at the very least, serve as a model for how to provide web-based access to analysis tools.

**Meet Federal Reporting Requirements**
The Massachusetts Traffic Records System is, in general, meeting its obligations to report data to various systems in the USDOT and the Centers for Disease Control. FARS analysts reported that they meet the NHTSA reporting requirements, but it was clear that improvements in notification and reporting by police agencies would help to overcome the difficulties they face in finding out about fatal crashes in a timely fashion. The Massachusetts State Police are responsible for reporting commercial motor vehicle crash and inspection data in SAFETYNET. The FMCSA conducted an audit of crash reporting timeliness, accuracy and completeness. The results showed that there were some data fields on the crash reports that were not filled out 100% of the time and that the level of accuracy of the data indicated a need for training law enforcement officers specifically in how to complete a report of a crash involving a commercial vehicle. The Office of Transportation Planning of EOT maintains a reasonably complete reporting system for roadway sections included in the Highway Performance Monitoring System. Data for other segments not on the HPMS may be considerably less up to date. Hospitals are reporting trauma data to the National Trauma Data Bank as a condition of their certification as trauma centers. In addition, the NEMSIS national data elements will be collected in the newly implemented Massachusetts Trip Information System (MATRIS) designed to collect EMS patient care (run report) data.
**Support Electronic Data Sharing**
There are a number of electronic data sharing and data transfer processes ongoing in Massachusetts. Some 88 law enforcement agencies are transmitting crash data through an ftp portal to the RMV. This is likely to be replaced soon by a more secure data transfer process set up by the CJIS into the SWISS data warehouse. It is also hoped that the number of agencies submitting crash data electronically will increase dramatically once the CJIS process is set up.

Crash data are shared electronically with MassHighway for the purpose of location coding. The resulting data are pushed back to the RMV and then incorporated into the year end closed files which are made available to all. Additionally, associated roadway inventory data are available to users as a download.

Medical data are all transferred electronically. The MATRIS and trauma registry data are new systems that are in testing, but are being implemented as completely electronic data sharing applications. The more mature medical datasets also are shared electronically.

Courts update the driver history file with electronically submitted case disposition information.

One of the primary projects discussed during the interviews was the move toward electronic citation issuance. The e-Citation project would share data between the local agencies and courts and RMV via the CJIS data warehouse: SWISS.

**Adhere to State and Federal Privacy and Security Standards**
The agencies with custodial responsibilities for the various traffic records system components take privacy and security very seriously. Close attention is paid to the limits on data sharing and use as prescribed by law. Access to medical data, in particular, is tightly controlled by DPH and the Division of Health Care Financer and Policy through their data protection committees.

**Recommendations**
- Resurrect and expand the Traffic Safety data warehouse so that users have access to merged crash, roadway, driver, citation/adjudication, vehicle, crash outcome, and medical information.
- Update the traffic records system inventory and data flow diagrams as a resource for users.
- Promote users’ access to and use of the traffic records system in order to build support for data improvement, especially as it relates to crash data collection by law enforcement.
Advisory Excerpt: Data availability and quality directly affect the effectiveness of informed decision making about sound research, programs, and policies. Accurate, comprehensive, and standardized data should be provided in a timely manner to allow the agency or decision-making entities at the State or local levels to:

- **Conduct Problem Identification.**
  Problem identification is the process of determining the locations and causes of crashes and their outcomes and of selecting those sites and issues that represent the best opportunity for highway safety improvements. States should be able to conduct problem identification activities with their traffic records system.

- **Develop Countermeasure Programs and Program Management Procedures.**
  States select and evaluate strategies for preventing crashes and improving crash outcomes. This requires that decision makers can select cost-effective countermeasures and that safety improvement programs and funds should be managed based on data-driven decision making.

- **Perform Program Evaluation.**
  States should be capable of measuring progress in reducing crash frequency and severity. Ideally, the effectiveness of individual programs and countermeasures should be evaluated and the results used to refine development and management processes.

- **Support Safety-Related Policies and Planning.**
  The States are responsible for developing SHSPs. These data should be available to support this and other policy and planning efforts such as development of agency-specific traffic safety policies, traffic records strategic planning, safety conscious planning, and others.

- **Access Analytic Resources.**
  Data users, and decision makers in particular, should have access to resources including skilled analytic personnel and easy to use software tools to support their needs. These tools should be specifically designed to meet needs such as addressing legislative issues (barriers as well as new initiatives), program and countermeasure development, management, and evaluation, as well as meeting all reporting requirements.

- **Provide Public Access to Data.**
  The TRS should be designed to give the public or general non-government user reasonable access to data files, analytic results, and resources, but still meet State and federal privacy and security standards.

- **Promote Data Use and Improvement.**
  The TRS should be viewed as more than just a collection of data repositories, and rather as a set of processes, methods, and component systems. Knowledge of how these data should be collected and managed, along with where the bottlenecks and quality problems arise, is critical to users understanding proper ways to apply the data. This knowledge should also aid in identifying areas where improvement is possible.
1-D: Data Uses and Program Management Status

Conduct Problem Identification
“The mission of the Highway Safety Division (HSD) is to reduce fatalities, injuries and economic losses resulting from motor vehicle crashes on the roadways of the Commonwealth of Massachusetts. HSD is part of the Office of Grants & Research under the Massachusetts Executive Office of Public Safety and Security (EOPSS). We administer the federally-funded highway grant programs of the EOPSS.” – Welcome statement from HSD web site

Project descriptions and grant opportunities are named and details can be accessed. The crash data link opens a set of tables with gross summaries of information from the Fatality Analysis Reporting System (FARS) and the Registry of Motor Vehicles (RMV) for the years 2004, 2005, and 2006.

MassHighway performs problem identification, applies countermeasures, manages projects, and evaluates them in management of the road system. These are discussed in another section. The focus of this section is on the HSD.

HSD previously had staff to analyze the crash data file but currently does not have in-house analysis capability. Information is obtained by requesting information from other resources. Grantees are also required to provide data and analyses. HSD does not now have either the data resources or in-house skills necessary to undertake problem identification.

Develop Countermeasure Programs and Program Management Procedures
Countermeasures typically address program areas recommended by the National Highway Traffic Safety Administration. These are reflected on the HSD web site.

Perform Program Evaluation
As with the establishment of the countermeasure programs, HSD will assist in their grant projects with program evaluation where possible: determining reductions in crashes and/or severity of injuries, and improvements in restraint and helmet usage. Since these areas depend on information from the crash file, the limited scope of the FARS data and the lack of timely Massachusetts crash data hamper the non-roadway oriented highway safety efforts for project development, management, and evaluation.

There is an extremely useful and timely data and analysis resource that appears to have been overlooked: Massachusetts has, in effect, a comprehensive and complete statewide citation file that is very timely. It resides in the RMV, and the Merit Rating Board (MRB) creates and manages it. It is the core of the driver histories.

Knowing the details of citations (location, offenses or violations, frequencies, etc.) comes close in its importance to knowing the details of crashes. Many citations are associated with crashes; just as many crashes are associated with citations.

The MRB is already producing summaries of citations for its own purposes, for RMV management, for courts, and for enforcement agencies. These show types of violations and
frequencies of the type by towns and cities. Reports identify conviction rates by courts. Reports can specify how many court cases did not result in a conviction and what the non-conviction dispositions were.

Both civil infractions and criminal charges are identified and can be stratified. The information can even determine alcohol involvement and how many alcohol charges are reduced (and to what).

The majority of the MRB information is now received within a few days of the writing of a citation, and the entries are posted immediately. Even the majority of court dispositions are received by MRB overnight with criminal dispositions received electronically from 58 of the 62 District Courts.

Capping the opportunity, the MRB data for the driver histories includes crash information reported only by insurers who pay claims for crashes that may not be reported otherwise. The information is tightly edited and maintained with an error rate of two percent.

Finally, the MRB is responding to a wide variety of requests from enforcement agencies that recognize the value of this information. The MRB is willing to provide both routine reports of the type they are already producing and will customize reports for other requests.

The HSD would be well served to explore the data and services available from the MRB since both are under the Massachusetts Executive Office of Public Safety and Security.

The Highway Safety Division hosts up to five listening sessions with the safety stakeholders in the State during its annual highway safety planning process. A portion of this meeting is dedicated to a review of recent trend analysis and discussion of data needs and resources. Also, the TRCC serves as a venue for discussing data resources among its member agencies.

It is intended that the traffic records system be capable of promptly responding to legislative requests with reliable data. The HSD uses traffic records data to evaluate the impact of legislative initiatives.

Access Analytic Resources
As noted in Section 1C, the original concept behind the traffic records data warehouse was to supply users with analytic resources designed for their level of expertise. The HSD is working with a contractor to design an easy-to-use web-based query tool for general users of the traffic records data. This new tool is not yet designed. Other analytic resources include fee-for-service providers such as UMassSAFE, and several State agencies’ data analytic groups that can generate reports on an ad hoc basis.

The DPH will run analyses upon request subject to approval of data protection committees. DPH also makes available an online query tool, MassCHIP, that gives approved users the ability to access canned reports and a query tool to generate custom reports. The DPH has, on occasion, obtained data from the crash database and could, in theory, provide access to a linked file
containing crash and medical data if such a project were approved. Because of the need for prior approval and creation of a user login ID and password, the review team was not able to explore use of the MassCHIP query builder. It remains to be seen, therefore, whether that tool, with the addition of access to crash and other non-medical traffic records data sources could serve the broad range of needs of the Massachusetts traffic safety community.

Some analytic resources that existed at the time of the last Assessment are no longer available in Massachusetts. In the past, the Governor’s Highway Safety Bureau (now the HSD) had the capability (or contract support) to generate community-level safety reviews as part of their annual Problem Identification process. In addition, the HSD produced (also under contract) a Crash Facts report that gave basic data describing the crash experience of the State.

**Provide Public Access to Data**
Currently there is no means for the public to obtain statewide crash statistics. The Crash Outcome Data Evaluation System (CODES) project at the University of Massachusetts Traffic Safety Research Program does not have funding or staff to handle requests from the public. The Registry of Motor Vehicles (RMV) will provide an Excel file of crash records on a city or town level, but tabulation of results is left to the individual requestor. For tabulated crash information the public must turn to local agencies for information which appear to be capable and willing to respond to such requests.

**Promote Data Use and Improvement**
The TRCC provides an avenue both for acknowledging and marketing the available data in the State, and also for facilitating the communication between those who own and those who need the data. Open discussions during TRCC meetings can provide opportunities for data users to discuss their projects and seek out any source of the needed data. This communication further facilitates the discussion of potential studies by researchers and further serves to discover the experience and expertise of those who have either used or collected data that may apply to the proposed effort.

Open communication and ready availability of user-friendly data are the two most potent means by which to promote their use. Consequently, data use tends to help promote their improvement, because lack of data quality will be obvious to a researcher who is trying to gain insight from the data. The traffic records champion plays a vital part in keeping open the communication lines and in facilitating the data-sharing arrangements between data owners and users.

**Recommendations**

- Exploit the data opportunities and analysis options using citation information available from the MRB. Share this information with localities and other agencies of the Commonwealth.

- Produce annual Problem Identification reports and summaries, including an annual Crash Facts report, community-centered and program-centered data analyses for HSD use, and the use of the traffic safety community. Examples of well-designed Crash Facts reports can be obtained through the Association of Transportation Safety Information...
Professionals (ATSIP) or through the NHTSA regional office.

- Develop the planned easy-to-use web-based query tool that will enable users and the public to access canned reports and generate ad-hoc custom reports using traffic records data. As part of this user-centered development, review the design features, usability and user acceptance of existing tools, including the one developed for the traffic records data warehouse by the University of Massachusetts Traffic Safety Research Program, and the MassCHIP online query tool maintained by DPH.
SECTION 2: TRAFFIC RECORDS SYSTEM COMPONENTS

Advisory Excerpt: At the time of passage of the Highway Safety Act of 1966, State centralized TRS generally contained basic files on crashes, drivers, vehicles, and roadways. Some States added data on traffic safety-related education, either as a separate file or as a subset of the Driver File. As traffic safety programs matured, many States incorporated EMS and Citation/Conviction Files for use in safety programs. Additionally, some States and localities maintain a Safety Management File that consists of summary data from the central files that can be used for problem identification and safety planning.

As the capabilities of computer hardware and software systems increased and the availability of powerful systems has expanded to the local level, many States have adopted a more distributed model of data processing. For this reason, the model of a TRS needs to incorporate a view of information and information flow, as opposed to focusing only on the files in which that information resides.

Under this more distributed model, it does not matter whether data for a given system component are housed in a single database on a single computer or spread throughout the State on multiple local systems. What matters is whether the information is available to users, in a form they can use, and that these data are of sufficient quality to support its intended uses. Thus, it is important to look at information sources. These information sources have been grouped to form the major components of a TRS:

- Crash Information
- Roadway Information
- Driver Information
- Vehicle Information
- Citation/Adjudication Information
- Statewide Injury Surveillance Information

Together, these components provide information about places, property, and people involved in crashes and about the factors that may have contributed to the crash or traffic stop. The system should also contain information that may be used to judge the relative magnitude of problems identified through analysis of data in the TRS. This includes demographic data (social statistics about the general population such as geographic area of residence, age, gender, ethnicity, etc.) to account for differences in exposure (normalization) and data for benefit/cost and cost effectiveness determinations. Performance level data should be included to support countermeasure management.

A frequently used overview of the contents of a TRS is the Haddon Matrix, named after its developer, William Haddon, the first NHTSA Administrator. It provides a valuable framework for viewing the primary effects of Human, Vehicle, and Environmental factors and their influence before, during, and after a crash event. Table 1 is based on the Haddon Matrix.

### Table 1: Expanded Haddon Matrix
With Example Highway Safety Categories

<table>
<thead>
<tr>
<th>Human</th>
<th>Vehicle</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, Gender, Experience, Alcohol/Drugs, Physiological Condition, Psychological Condition, Familiarity with Road &amp; Vehicle, Distraction, Conviction &amp; Crash History, License Status, Speed</td>
<td>Crash Avoidance, Vehicle Type, Size &amp; Weight, Safety Condition, Defects, Brakes, Tires, Vehicle Age, Safety Features Installed, Registration</td>
<td>Visibility, Weather/Season, Lighting, Divided Highways, Signalization, Geographic Location, Roadway Class, Surface, Cross-Section, Alignment, etc., Structures, Traffic Control Devices, Signs, Delineations, and Markings, Roadside Appurtenances, Buildups, Driveways, etc., Volume of Traffic, Work Zone, etc.</td>
</tr>
</tbody>
</table>
The Haddon Matrix has proven to be a meaningful way to examine primary effects of contributing factors on crash frequency and severity. It helps decision makers to consider countermeasures designed to address specific contributing factors. In recent years, with availability of more detailed data analyses, awareness has grown about the interactions among contributing factors. A good example of such interactions would be weather and drivers’ skill or experience levels. To make the contribution of interaction effects more obvious, the matrix in Table 2 can be used to supplement the Haddon Matrix.

Table 1: Examples of the Interactions among Crash Characteristics

<table>
<thead>
<tr>
<th>Human</th>
<th>Vehicle</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>· Road Rage</td>
<td>· Familiarity with Vehicle &amp; Training</td>
<td>· Crash Avoidance</td>
</tr>
<tr>
<td>· Ped/Bike Behavior &amp; Driver Behavior</td>
<td>· License Class &amp; Vehicle Type</td>
<td>· Vehicle Type</td>
</tr>
<tr>
<td>· Driver Age &amp; Passenger Age &amp; Number</td>
<td>· Rollover Propensity &amp; Driver Actions</td>
<td>· Familiarity with Roadway</td>
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<tr>
<td></td>
<td>· Vehicle Ergonomics &amp; Person Size</td>
<td>· Experience with Weather Conditions</td>
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<td></td>
<td>· Vehicle Size Weight Mismatch</td>
<td>· Rollover Propensity &amp; Road Configuration</td>
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<tr>
<td></td>
<td>· Under-Ride/Over-Ride</td>
<td>· Roadway Debris &amp; Vehicle Size Weight</td>
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<tr>
<td></td>
<td>· Shared Roads, No-Zone</td>
<td>· Vehicle Type &amp; Weather Conditions</td>
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<tr>
<td></td>
<td>· Tire Inflation &amp; Rollover Propensity</td>
<td>· Vehicle Condition &amp; Weather Conditions</td>
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Taken together, these views of traffic safety factors offer a way of thinking about highway safety issues that is both conceptually robust and practical. For the purposes of this Advisory, the most important aspect of the TRS is that it
supports high-quality decision making to improve highway safety. The remainder of this section of the Advisory presents details about the various components of the TRS.
Advisory Excerpt:

- **Description and Contents**
  The Crash Data Component should document the time, location, environment, and characteristics (e.g., sequence of events, rollover, etc.) of a crash. Through links to other TRS components, the Crash Data Component should identify the roadways, vehicles, and people (e.g., drivers, occupants, pedestrians) involved in the crash. These data should help to document the consequences of the crash (e.g., fatalities, injuries, property damage, and violations charged), support the analysis of crashes in general, and the analysis of crashes within specific categories defined by:
  - person characteristics (e.g., age or gender)
  - location characteristics (e.g., roadway type or specific intersections)
  - vehicle characteristics (e.g., condition and legal status)
  - the interaction of various components (e.g., time of day, day of week, weather, driver actions, pedestrian actions, etc.)

The Crash Data Component of the TRS contains basic information about every reportable (as defined by State statute) motor vehicle crash on any public roadway in the State.

- **Applicable Guidelines**
  Details of various data elements to be collected are described in a number of publications. The MMUCC provides a guideline for a suggested minimum set of data elements to be collected for each crash. Additional information should be collected for crashes involving an injury or fatality to meet the tracking and analysis requirements for the State and other systems (e.g., the FARS, SafetyNet).

- **Data Dictionary**
  Crash data should be collected using a uniform crash report form that, where applicable, has been designed and implemented to support electronic field data collection. Law enforcement personnel should receive adequate training at the academy and during periodic refreshers, to ensure that they know the purpose and uses for the data as well as how to complete each field on the form accurately.

  Information from the quality control program should be used to develop and improve the content of training. The training manual on crash reporting should be available to all law enforcement personnel. The instructions in the manual should match the edit checks that are performed on the crash data prior to its being added to the statewide crash database. The edit checks should be documented and sufficient to flag common and serious errors in the data. For example, these errors include missing or out of range values in single fields and logical inconsistencies between the data recorded in multiple fields (e.g., time of day is midnight and the lighting condition is coded as daylight). All data element definitions and all system edits should be shared with collectors, managers, and users in the form of a data dictionary that is consistent with the training manual and the crash report form.

- **Process Flow**
  The steps from initial crash event to final entry into the statewide crash data system should be documented in process flow diagrams. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the reports are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include procedures for error correction and error handling (i.e., returning reports to the originating officer/department, correction, resubmission, etc.). Process flow diagrams should show all major steps whether accomplished by staff or automated systems and should clearly distinguish between the two.

- **Interface with Other Components**
  The Crash Data Component has interfaces, using common linking variables shown in Table 3, to other TRS components to support the following functions:
- Driver and vehicle data should be used to verify and validate the person and vehicle information during data entry and to flag records for possible updating in the driver or vehicle files when a discrepancy is identified. Key variables such as driver license number, vehicle identification number (VIN), license plate number, name, address, and date of birth should be available to support matching of records among the files. The Driver Data Component should also enable access to drivers’ histories of crashes and convictions for traffic violations.

- Crash data should be linked to roadway inventory and other roadway characteristics based upon location information and other automated and manual coding methods. This linkage supports location-based analysis of crash frequency and severity as well as crash rate calculations based on location-specific traffic counts.

- Law enforcement personnel should be able to link crash, contact, incident, citation, and alcohol/drug test results through their own department’s records and/or a secure law enforcement information network. For agencies with computer-aided dispatch and/or a records management system, the crash data should be linked to other data through incident, dispatch, and/or crash numbers and by names and locations to support analysis at the local level.

- Linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and overall costs of treatment. Key variables for direct linkage include names of injured persons or EMS run report number. Key variables for probabilistic linkage include the crash date and time, crash location, person characteristics such as date of birth and gender, EMS run report number, and other particulars of the crash.

### Table 3: Common Linking Variables between Crash And Other Data Components of a Traffic Records System

| Crash Linkages to Other Law Enforcement and Court Files | - Incident Number  
| - Location (street address, description, coordinates, etc.)  
| - Personal ID (name, address, DL number, etc.) |
| Crash Linkages to Roadway Information | - Location Coding (linear referencing system, reference post, coordinates, local street codes) |
| Crash Linkages to Driver and Vehicle Information | - Driver License Number  
| - Vehicle Identification Number  
| - Personal Identifiers (name, address, date of birth, etc.) |
| Crash Linkages to Statewide Injury Surveillance System Information | - Personal Identifiers (where allowed by law)  
| - Crash Date, Time, Location  
| - EMS Run Report Number  
| - Unique Patient ID Number |

Furthermore, there should be data transfer and sharing linkages between State and local crash databases. The State crash data system should support the electronic transfer of crash data from a variety of law enforcement agencies’ (LEAs) records management systems. The State’s crash data system management should publish the specifications and editing requirements for generating the outputs from the various agency systems that can be processed into the official State crash data system.

**Quality Control Program**

The crash data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the Crash Data Component should be assured based on a formal program of error/edit checking as the data are entered into the statewide system. In addition, the custodial agency and the TRCC frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The crash data managers should receive periodic data quality reports. There should be procedures for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the crash report instruction manual, edit checks, and data dictionary. Example measurements are presented in Table 4.
Table 2: Examples of Quality Control Measurements for Crash Data

<table>
<thead>
<tr>
<th>Quality Control</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Timeliness**  | - # days from crash event to receipt for data entry on statewide database  
|                 | - # days for manual data entry  
|                 | - # days for upload of electronic data  
|                 | - Average # of days to enter crashes into the system  
|                 | - Average # of days of backlogged crash reports to be entered |
| **Accuracy**    | - % of crashes “locatable” using roadway location coding method  
|                 | - % VINs that are valid (e.g., match to vehicle records that are validated with VIN checking software)  
|                 | - % of interstate motor carriers “matched” in MCMIS  
|                 | - % crash reports with uncorrected errors  
|                 | - % crash reports returned to local agency for correction |
| **Completeness** | - % LEAs with an unexplained drop in reporting one year to the next  
|                 | - % LEAs with expected number of crashes each month  
|                 | - % FARS/MCMIS match  
|                 | - % FARS/State Crash fatality match |
| **Consistency** | - % time that an unknown code is used in fields with that possible value  
|                 | - % logical error checks that fail  
|                 | - % compliance with MMUCC guidelines |

The measures in Table 4 are examples of high-level management indicators of quality. The crash file managers should have access to a greater number of measures and be prepared to present a standard set of summary measures to the TRCC on a periodic schedule, such as monthly or quarterly.
2-A: Crash Data Component Status

The Massachusetts crash data component is created from a mix of two primary data sources: the Motor Vehicle Crash Police Report (revised 10/2005) and the Motor Vehicle Crash Operator Report (revised 05/2002). The two sources of crash data are collected from law enforcement officers and drivers, respectively, with preference given to police reports of crashes for creation of the official record. Operator reports, submitted by involved drivers, are entered into the official record if the officer report is missing or lacks complete data. Both the police and operator reports are capable of documenting the time, location, environment and characteristics of individual crashes.

Reports of 140,000 crashes are received annually by the Registry of Motor Vehicles (RMV) and entered into the Crash Data System (CDS) – an Oracle database with a Visual Basic 5 front end data entry interface. There are presently two ways for data to be added to the CDS. The most common (approximately 80 percent of records in 2007) is through completion of a paper crash report form and manual data entry by clerks in the RMV. The remaining 20 percent of crash reports are received electronically through a file transfer protocol portal set up by the RMV with individual law enforcement agencies operating one of four currently supported Records Management Systems (RMSs). Recent information suggests that the proportion of reports received electronically increased to about 37% for 2008.

The reporting criteria for police and operator reports are identical:

- Any crash involving damage to any one vehicle or property exceeding $1000, or any injury or fatality, and
- Taking place on a public road.

By design, then, the Massachusetts crash component should include complete redundancy between police reports and operator reports, with the crash event documented by one police report and an additional operator report from each surviving driver involved in the crash. The reality is far from this ideal and shows signs of degradation since the 2005 Traffic Records Assessment. The present situation is such that the following “ground truths” describing the Massachusetts crash records must be acknowledged:

1) There are systematic data gaps such that statistical aggregations of crash data to produce a statewide picture of the crash experience for Massachusetts are inaccurate, at best, and misleading at worst.

2) The historic over-reliance on inherently biased operator reports has grown over the years since the last Assessment leaving Massachusetts with an ever-larger portion of its crash data derived from a source that has a vested interest in providing incomplete and self-expiating information.
3) The lack of formal quality control in the data collection and data entry processes has been exacerbated, rather than relieved, by the growth of electronic data collection systems in law enforcement agencies leading to unknown, and perhaps unknowable, additional gaps in the data (missing records) as well as a major loss of control over the quality of data in the system.

There are initiatives under discussion that might address some aspects of the current poor situation; however, the primary source of data quality problems – a lack of proper attention by law enforcement agencies and the Registry of Motor Vehicles to the requirement to report crashes, and maintain a high-quality data set – is not being adequately addressed. The conclusion to be drawn is that the Massachusetts crash data component will continue to degrade unless immediate attention is paid to the systemic problems that continue to plague the system.

The RMV Senior staff including the Registrar attended a Chiefs of Police meeting to discuss the importance of the data, electronic submission, and the underreporting of the crash reports to the RMV. The Chiefs at the meeting indicated they were not involved with the revision of the form back in 2001 and complain about the layout and the increase of fields. The number of departments submitting crash reports did not increase after the meeting.

In order to highlight the most pressing needs for improvement in the crash data component, the Quality Control Program subsection of the Advisory Section 2A has been moved forward in the sequence and expanded to include all of the issues documented during the interviews. Following this documentation of the Quality Control Program issues, the remainder of the Advisory components are addressed in their normal sequence.

**Quality Control Program**
Massachusetts lacks a formal quality control program aimed at documenting the timeliness, accuracy, and completeness of the crash data component. Some data quality metrics do exist, as were reported to the Assessment team and as included in the most recent Section 408 grant submission. These metrics are not, however:

1) reported on a regular basis to the TRCC for review and oversight by that body,

2) reported to users to ensure that those who make use of the data are aware of its limitations.

The reverse appears to be the case. The people who use the data are the ones who report the quality problems that they personally encounter, and the TRCC and RMV know about these problems mostly from the complaints of users rather than any proactive management or oversight of the crash data. Many of the problems are outside the ability of the RMV to improve or control.

The pre-assessment questionnaire answers from the crash data management team did include some data quality metrics. The following table was provided in the response.
It was clear during the interviews that many of the requested measures (or operationally similar measures) could be calculated for the crash data component. In fact, crash reporting indicators specific to each law enforcement agency were provided at the interview which showed the average age of crash reports received from each law enforcement agency, and the annual number of crashes reported from each agency for the past several years. The fact that these reports can be produced demonstrates that the system does support data quality measurement. It was not clear whether or not the measures are used to prompt discussions with law enforcement agencies, or whether those discussions, when they happen, have much effect. The members of the TRCC reported, however, not seeing data quality metrics on a regular basis.

The lack of a formal quality control measurement program for crash data means that the managers of the system cannot accurately gauge the effects of several systemic, programmatic, and process flow problems with the system. The reports of problems are thus largely anecdotal, or at least difficult to quantify accurately, but are serious enough from an operational point of view to warrant further attention. These issues are documented below:

**Systematic under-reporting of crashes by police**
Municipal law enforcement agencies throughout the State do not consistently follow the reporting requirements set down in State statute. Chapter 90, Section 29 is unambiguous in assigning the duty to report *all* above-threshold crash events on the prescribed form. Many agencies meet this requirement, but too many do not, and the problem is inconsistency both within agencies (evidence was cited of some officers deciding not to report even clearly reportable crashes, despite their agency’s normal policy), and at the agency wide level (with
evidence of more than one large municipal agency failing to provide the required reports). The problem is not new in Massachusetts. What is “new” is the extent of the drop-off in reporting by some departments, most notably Boston PD, which reported a total of 92 crashes in 2007, out of an estimate of between 10,000 and 15,000 reportable crashes – in other words, up to 10 percent of the total annual crashes for the Commonwealth, from one city alone. Since the problem is not isolated to Boston PD, but extends to other cities, large and small, the potential for a much larger percentage of the true crash data to be missing must be a virtual certainty.

This kind of systematic gap is the worst possible situation for those hoping to use the data to form a picture of the Massachusetts crash experience. It means that aggregate data for the State are simply wrong. The effects of this failure to report will have ripple effects for years – until sufficient time with reasonably complete reporting by all law enforcement agencies has passed.

It also means that when the problem is eventually solved, the State will experience a major discontinuity in its crash statistics that will have to be annotated so that users do not naively try to compare the new, higher quality data with the poor quality data reported in years past.

Starting now, were Massachusetts able to fix this problem immediately, one could expect to have stable comparable data for multi-year analysis some time in 2012. Every year that passes is another year of historical data that must be put forward with caveats about its unsuitability for comparative analysis (before/after studies) or trend analysis.

**Error handling is minimal**

Crash reports are only minimally checked for errors as part of the data entry process. The system allows operators to save incomplete records without any warning or flag to the clerk or supervisors. It is true that there’s no evidence that this kind of problem is happening at all, let alone frequently. However, the lack of extensive edit checks during data entry means that managers of the crash data can’t be certain of the data quality for records entered manually in the system. Only the registration, license, and location fields are validated for errors in the Crash Data System. The other fields use look up tables. Some of the edits include: date of crash can not be in future, can’t enter a year that has been closed, and driver name is required. A report was developed to monitor the CMV crashes that did not go into the Truck/Bus queue to be uploaded into Safetynet.

This situation is not unique to Massachusetts, although Massachusetts appears to have fewer data entry edit checks than most States’ manual crash data entry operations. In many States with data entry quality concerns, a move to electronic data collection systems in law enforcement, and electronic data transfer from law enforcement to the central crash database is seen as the best solution. In order for this solution to be effective, however, the field data collection system must, itself, have extensive edit checks. In addition, the State generally requires that the incoming electronic data pass a series of edit checks before they are entered into the crash data component. The implementation of the Web Service planned for spring 2009 will give the RMV additional monitoring capabilities for those agencies submitting reports through that system.
Neither is true of the field component of electronic crash data capture in Massachusetts. The electronic field data collection systems used by law enforcement do not, in general, have very many edit checks built into the crash reporting process. There is some quality improvement because the data for some of the fields are constrained by pick lists and data-out-of-range checks. But validation checks that would trap errors in logical consistency among the data fields are not implemented. The problem appears to be one of the vendors (and perhaps the law enforcement agencies) resisting what they consider too many edits.

In addition, the RMV has imposed only minimal requirements for electronic data to pass before they are transferred into the CDS. Seven fields are required to be completed on the crash report. As long as there are data in each of those seven fields, the report is accepted and becomes part of CDS with no further checking. In short, the electronic data, rather than guaranteeing a data quality improvement could actually contribute to an overall degradation of quality in the CDS.

As with the manual data entry situation, this is not to say that the worst case scenario has played out – i.e., that agencies have started submitting largely blank crash reports with just the minimum seven data elements. It does, however, point to a very large data quality “exposure” issue that is going uncontrolled and unmeasured. And, as mentioned above, rather than reaping the quality benefits usually associated with electronic data capture, Massachusetts has set a policy and procedure that leaves it unable to document any quality gains, thus potentially yielding a major drop in quality instead.

With the development of the Web Service, the RMV expects to have the tools to monitor and report data quality to the departments submitting electronically. The edit check requirements for electronic data will increase with the implementation of the Web Service. When departments continue to make the same errors over and over again they will be notified by the RMV.

**Location coding loophole**
MassHighway invested in a successful effort to automate the process for attaching location codes to crash reports. This is based on an imposed set of standards for location data on crash reports, coupled with an extensive set of location matching algorithms that can take the street names as supplied on the crash report and, over 80 percent of the time, return a match to a physical location in the State’s roadway inventory and GIS. This is a major improvement since the last Assessment. However, it became clear in talking to users of the data that there are some serious shortcomings in the processes used to code location information on crash reports, often by the most technologically advanced agencies. As the use of crash reporting software and technology grows the following problem is likely to get worse, rather than improve. The problem arises when agencies with a Records Management System (RMS) use their Computer Aided Dispatch (CAD) to capture the location of calls/incidents. That location is stored (by some RMSs) as the default location data for the incident, and that information is then automatically added to any reports about that incident, including crash reports. It is likely that the officer at the scene would have a more precise location that should be used on the crash report in place of the original CAD-supplied one. However, it became clear in the interviews that the default location is often accepted rather than over-type with the correct, more precise information.
The result is that the new automated process at MassHighway will accurately assign a location code to the crash that matches what the CAD recorded. The proportion of crashes affected by this problem is, essentially, unknown. Further, the true proportion may be unknowable because the only way to detect the problem is through review of the narrative and diagram. At present, if the electronically collected report is submitted on paper to RMV, only the data are entered into CDS, not the narrative and diagram. If the report “locates” using the MassHighway system, there would be no reason to suspect a problem until (and unless) someone pulled the original crash report form to review the location information captured in the narrative and diagram. In addition, paper reports are destroyed after 3 years. In short, the true location information may be irretrievably lost. Again, there is no quality metric used to track this problem and, perhaps, it may not be possible to produce such a metric.

Operator Report Processing – A convenience sample

Users reported other data quality problems, most notably a very long lag time for finalizing the crash report database each year. The delay is attributed to two ongoing problems: late submissions of crash reports from law enforcement agencies and a delayed background task process for entering operator reports. The latter problem is of the greatest concern. It was reported that between 30,000 and 70,000 operator reports are entered into CDS annually. The difference in the number entered is determined by the time available for report entry. In other words, whether an operator report is entered or not depends on whether the data entry clerks have time to enter them throughout the year.

In 2006, the process of entering all operator crash reports changed. Due to loss of staff, the RMV was unable to enter all operator reports by the time a year was closed. It was discussed with MassHighway ways to enter all Boston and Springfield operator reports since those departments do not submit the police crash form. 2005 was the only year that over 73,000 reports where entered. For years 2002-2007 operator crash reports entered ranged from 38,423 to 47,562.

Unfortunately, this can have an impact both on the overall number of crashes reported by CDS in a year, and on the overall quality of the data in the system. Because operator reports are not as complete as police reports, the larger the proportion of crashes represented by operator reports, the lower the overall quality of the data is in the system – more of the records will be partial. On the other hand, if the police did not submit a report, then the lack of time to enter operator reports may mean that some crashes are just missing from the system altogether. Both results are undesirable.

The RMV is hoping to address some of these concerns with a project aimed at promoting electronic crash data transfer from law enforcement. The project will move away from the current ftp-supported data transfer to a more secure transfer via the Criminal Justice Information System (CJIS). CJIS is establishing a law enforcement data warehouse, the Statewide Information Sharing System (SWISS) that would house incident reports, crash reports and citation data in one central location. The RMV would be able to capture the data from CJIS and enter it into CDS without having to use the ftp transfer facility. Because law enforcement agencies already have an interface to CJIS, this move would allow RMV to get more of their data electronically, and avoid the labor-intensive process of establishing interfaces with each
individual law enforcement agency – an ongoing process that will take years to complete at the current pace.

There is some difference of opinion about whether the CJIS data warehouse will also perform edit checks on the crash data, or if that function will still be part of the RMV process for bringing the data into CDS. Because the project is in the preliminary stages, it is difficult to see exactly how the data quality benefits needed for crash data reporting will be realized using CJIS. One possibility is that the CJIS data transfers would have some level of built-in edit checking because each field would have to meet the established NIEMS data definition for that particular data item. Imposition of at least minimal control at this level would ensure that the data were at least of the correct type (numeric, alpha, date, time, etc.) and of the prescribed field length (e.g., 4 digit year).

It is also not clear that the move to CJIS reporting would automatically solve the under-reporting problem. It is true that it would be easier for a non-compliant law enforcement agency to report their crash data to CJIS than it currently is for them to report the data to RMV either manually or via ftp. However, the larger problem – that the agencies simply aren’t writing crash reports as required – will not be solved by this move. Agencies that aren’t using the statewide mandated crash report form, such as Boston PD, are going to have a difficult time reporting to any system that checks their submission for proper data formatting in each field of the official form.

The rest of this section continues with the remaining portions of the Advisory in their original sequence.

**Applicable Guidelines**
The crash report form was designed with reference to ANSI D-16.1 and the MMUCC guidelines. The current form is 81% MMUCC compliant, as reported by the RMV. A crash report form revision project is under consideration for 2010.

**Data Dictionary**
A minimal crash system data dictionary exists, providing a list of data fields and values. The associated issues related to training (a training manual) and documented edit checks are not implemented to the level that would meet the letter of the Advisory. Law enforcement officers do receive initial training on crash reporting in the academy, but refresher training, even when the new form was implemented, has not happened on a statewide basis. Some agencies do provide refresher training on crash reporting, but it appears that most do not. Documentation of edit checks for fields on the crash report was not provided. Evidence from the interviews suggests that edit checks are minimal and not uniformly applied.

Link to Data Dictionary
http://www.nhtsa-tsis.net/crashforms/Pages/state/ma/MA_CrashDataDictionary_sub_06_09_2006.pdf
**Process Flow**
A process flow diagram for the crash data component was supplied. The process flow was documented as part of two separate audits of crash reporting; one sponsored by FMCSA and another done soon after the 2005 implementation of the new crash report form.

A process flow for field data collection systems does not exist. Through the interview process it was clear that the standard practice for most law enforcement officers using field data collection software is to take notes at the scene and complete the crash report elsewhere at a later time. This is not in line with best practices throughout the country which generally call for the officer to complete the report at the scene while the involved parties are present and so that the scene can be examined and the location information can be refined as needed. The practice of taking notes and filling out the form later can work if the officer is very familiar with the crash report form’s requirements and so keeps very detailed notes as required to support completion of the form. In many cases, however, the combination of absence from the scene and the passage of time means that the quality of the information that is eventually entered on the crash report is diminished. Field data collection systems that support the officer and make completion of the form as easy as possible can help to encourage completion of the form as close to the time and scene of the crash as possible.

**Interface with Other Components**
As mentioned earlier, the crash and roadway inventory data are linked using a location coding tool developed under contract by MassHighway. This tool is very successful, especially when used in conjunction with a second pass through the data by local and regional engineering and planning groups although this is only being tested in some regional planning agencies and is not yet in use throughout the state. Somewhat in excess of 90 percent of all crashes are eventually coded with a location that matches the department’s GIS and roadway inventory but this has not yet been pushed back to the statewide system so that it can be made available. Presently, some regional planning agencies geocode crashes for their own use. An enhancement to the MassHighway program is being developed so that the geocoded crashes by the regional planning agencies can be pushed back into the statewide system and made available as part of the dataset. That allows for analyses of roadway features, locations, and safety as well as use of powerful mapping tools merging the data with multiple layers of information.

Merged datasets combining crash and driver data and crash and medical data have been created, more than once. The Crash Outcome Data Evaluation System (CODES) project is one example of the ability to merge the data from crash reports with various sources of medical data. This is a probabilistic linkage that relies on matching several variables among the various files.

Crash, contact and incident data are linked in some law enforcement agencies’ RMS databases. In addition, the CJIS SWISS data warehouse is designed to support joint storage of these datasets and may afford the opportunity to link them as well. Citation data may also be linkable through this mechanism as it is already linkable in most agency RMSs.

The crash data also may be linked to driver license and vehicle registration data. Some linkage is accomplished now to enable data validation of this information during data entry at RMV.
Further linkage may be possible in the future to give that same validation capability to law enforcement officers in the field while they are filling out crash reports or completing citations.

**Recommendations**

- Establish crash reporting improvement as a top priority of the TRCC and the member agencies.

- Develop a comprehensive plan to improve crash data to acceptable levels by the end of 2010 (or sooner) and obtain Executive level endorsement of the plan, up to and including the Governor, if necessary, to ensure that all law enforcement agencies meet their reporting requirements under the law.

- Include in the plan a timeline to gradually eliminate the need for operator reports in the CDS. A 5-year timeline with options to accelerate that is recommended.

- Couple the elimination of the need for operator reports with a recommended legislative change to eliminate the reporting requirement – at least for the purposes of crash data collection. Because the operator report is not used for proof of financial responsibility or driver control purposes, once it is no longer needed for use as a substitute for missing law enforcement crash reports, eliminate the operator report.

- Explore the use of non-sworn or private sector personnel as report-takers in property damage only and minor injury crashes.

- Work with law enforcement agencies extensively and on a constant basis to ensure that they meet their legal requirements to report crashes. Use of personnel with law enforcement experience and credibility at the officer level is imperative.

- Expand the edit checks in CDS for manual data entry to a set that is operationally meaningful, establishes a high standard for data quality, and meets with the approval of the TRCC members.

- Expand the edit checks for electronic data capture and data transmission into CDS to match the expanded set applied to manual data entry.

- Document the complete suite of edit checks and include those in initial and refresher training on crash reporting for law enforcement officers.

- Establish a formal quality control program with operationally meaningful measurements, a tracking system that ensures reports containing serious errors are returned to the law enforcement agency for correction, and are subsequently returned to RMV in a timely fashion. Track all errors and use the information to develop additional content for crash reporting training and refresher training.
Ensure that the TRCC exercises its oversight role with respect to crash data quality by presenting quality control data on a regular basis in the TRCC meetings, and monitoring the status of all issues and projects related to crash data quality.

Encourage law enforcement agencies to develop acceptable field data collection practices so that officers are completing crash reports as near as possible to the time and place where the crash occurred.

Establish a set of required edit checks for field data collection software that matches those implemented in CDS and the data transfer processing of electronically submitted crash data.

Institute a certification process for field data collection systems such that law enforcement agencies know which vendors’ systems meet the State’s requirements for electronic capture and submission of crash data.

Document the quality of the crash data and share that information with users of the data.

Ensure that crash report images (including the narrative and diagram) are available for all crashes to all legitimate users of the crash data, especially those who rely on accurate location information. Scanning of paper forms, and creation/storage of pdfs from electronic crash reports would allow users in law enforcement and engineering agencies, in particular, to access the detailed information they need from the narratives and diagrams.
2-B: Roadway Data Component

Advisory Excerpt:

- **Description and Contents.**
  Roadway information includes roadway location, identification, and classification, as well as a description of a road’s total physical characteristics and usage. These attributes should be tied to a location reference system. Linked safety and roadway information are valuable components that support a State’s construction and maintenance program development. This roadway information should be available for all public roadways, including local roads.

  The State Department of Transportation (DOT) typically has custodial responsibility for the Roadway Data Component. This component should include various enterprise-related files such as:

  - **Roadway Inventories**
    - Pavement
    - Bridges
    - Intersections

  - **Roadside Appurtenances**
    - Traffic Control Devices (TCD)
    - Guard Rails
    - Barriers

  - **Traffic**
    - Vehicle Miles Traveled (VMT)
    - Travel by Vehicle Type

  - **Other**
    - Geographic Information Systems (GIS)
    - Location Reference System (LRS)
    - Project Inventories

- **Applicable Guidelines**
  The major guideline that pertains to the Roadway Data Component is the HPMS. This provides guidance to the States on standards for sample data collection and reporting for traffic volume counts, inventory, capacity, delay, and pavement management data elements. Guidelines and tools that address roadway data, as well as identifying which of these are expected to have the greatest correlation with crash incidences, should be considered part of this advisory. Examples of these resources are the Highway Safety Manual, Safety Analyst, and the Interactive Highway Safety Design Model. In addition, the American Association of State Highway and Transportation Officials (AASHTO) is developing a series of guides for its Strategic Highway Safety Plan. This multi-year cooperative effort includes guidelines relevant to several TRS components.

- **Data Dictionary**
  Roadway information should be available for all public roads in the State whether under State or local jurisdiction. The contents of the Roadway Data Component should be well documented, including data definitions for each field, edit checks, and data collection guidelines that match the data definitions. Procedures for collection of traffic data and calculation of vehicle miles traveled (VMT) should be documented as well.

- **Process Flow**
  The steps from initial event to final entry onto the statewide roadway data system should be documented in process flow diagrams for each file that are part of the Roadway Data Component. The diagrams should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). Process flow diagrams should show all major steps whether accomplished by staff or with automated systems and clearly distinguish between the two.
Interface with Other Traffic Records System Components
A location reference system should be used to link the various components of roadway information as well as other TRS information sources, especially crash information, for analytical purposes. Compatible location coding methodologies should apply to all roadways, whether State or locally maintained. When using a GIS, translations should be automatic between legacy location codes and geographic coordinates. This process should be well established and documented. Compatible levels of resolution for location coding for crashes and various roadway characteristics should support meaningful analysis of these data.

Quality Control Program
The roadway data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the roadway data should be assured based on a formal program of error and edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency and the TRCC should frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The roadway data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the applicable instruction manuals, edit checks, and roadway data dictionary. Audits and validation checks should be conducted as part of the quality control program to assure the accuracy of specific critical data elements. Example measurements are shown in Table 5.

<table>
<thead>
<tr>
<th>Table 3: Examples of Quality Control Measurements for Roadway Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
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<td></td>
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</tbody>
</table>

The measures in Table 5 are examples of high-level management indicators of quality. The managers of individual roadway files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.
2-B: Roadway Data Component Status

Description and Contents
The Massachusetts Department of Highways (MassHighway) maintains a database of roadway, structures, and other inventory information containing mileage, road characteristics, and conditions for all public roads in the State. Among its many uses are:

- identifying functional classification, jurisdiction, and National Highway System status of all roadways in the State,
- fulfilling Highway Performance Monitoring System (HPMS) reporting requirements to the Federal Highway Administration,
- determining centerline miles of city/town accepted roads used for allocating State Aid Funds to communities, and
- developing safety improvement projects.

The Road Inventory File serves as the foundation of the MassHighway Geographic Information System (GIS). MassHighway has developed an effective GIS for mapping information to specific locations on roadways. MassHighway obtains crash data from the Massachusetts Registry of Motor Vehicles (RMV) that provides the basis along with road inventory data for developing safety improvement projects. MassHighway has developed an automated procedure for processing, standardizing, matching and aggregating the crash data by geographic location using GIS tools and procedures to produce high crash intersection location clusters.

This gives decision makers an improved tool for understanding the geographic distribution of crashes and how crash frequency and crash rates relate to the features of roadways. The GIS-based location of crashes still suffers from inaccuracy of the information recorded on crash reports such that only 83 percent of all crashes can be mapped using the GIS.

The Road Inventory File uses a dynamic segment method to determine location of roadway features. This method uses identifiers of segments with beginning and ending points that are used to determine a road inventory segment identifier. Most updated road features data are obtained from design documents. Every three years Ortho-photography of all public roads is undertaken and used to verify the accuracy and completeness of the road features and characteristics. A Video Log of road features is anticipated to begin in the near future which will be more precise. The Video Log will be conducted on a three-year cycle and should resolve some problems experienced with the accuracy of measurements of features (such as shoulder width inaccuracy that was recently encountered in determining the application of rumble strip installation on public roads).

The system upgrade to the crash file in 2001 helped to resolve about half of the location coding problems previously experienced. The system was designed to collect more accurate information using “pick lists” for street names and through an error resolution process at RMV. However,
the “pick lists” used by local police in their Records Management Systems and used in the crash file at RMV have different names due to different sources for street names.

State, regional, and local planners and engineers, and safety personnel need access to the entire crash report for a more detailed analysis of crash data through the information in the report narrative and collision diagram.

Not all new or updated State and municipal road and roadway attributes data are received by the Executive Office of Transportation in a timely manner, thus resulting in an incomplete annual Roadway Inventory File.

**Applicable Guidelines**
A major guideline for roadway data in MassHighway is the Highway Performance Monitoring System (HPMS). The HPMS data are used extensively in the analysis of highway system condition, performance, and investment needs that make up the biennial Condition and Performance Reports to Congress. HPMS is a nationally unique source of highway system information that is made available to those in the transportation community for highway and transportation planning and other purposes.

Another guideline is the Model Minimum Inventory of Roadway Elements (MMIRE). The goal of MMIRE is to define *critical safety data inventory elements*—those elements needed by State and local agencies to conduct their internal analyses, and those elements required by existing safety analysis tools and resources. At this time the MMIRE guideline is under review but will be considered by MassHighway once it is published as an official guideline.

MMIRE complements the Model Minimum Uniform Crash Criteria (MMUCC) which is the major guideline for crash data elements. MMUCC provides a dataset for describing crashes of motor vehicles in transport that will generate the information necessary to improve highway safety within each State and nationally. A subset of roadway data elements is part of MMUCC and it is strongly recommended that these elements be part of a State’s road inventory file.

**Data Dictionary**
The Road Inventory Year-end Report (2008) includes documentation and descriptions of the data elements in the roadway inventory databases. The data element definitions conform to HPMS.

**Process Flow**
The Federal Highway Administration uses a Continuous Process Improvement (CPI) model to assure a high level quality review for data submitted by States into the HPMS. The CPI model offers various tools and techniques for approaching program oversight and is an integral part of field office work plans. It is not just a review, but a continuous effort, to provide assistance, coordination, support, and interest in data quality.
There was no indication of an existing process flow diagram for the Roadway Inventory File.

**Interface with Other Traffic Records System Components**
Because of the problems concerning the accurate location of traffic crashes, the data are not well integrated with the MassHighway's GIS. This integration would add much more power to the analysis of environmental crash factors because it would link the crash records to the corresponding roadway inventory information and provide convenient mapping capabilities.

**Quality Control Program**
Most updated road features data are obtained from design documents. Every three years Orthophotography of all public roads is undertaken and used to verify the accuracy and completeness of the road features and characteristics.

**Recommendations**

- Implement an imaging system to capture each crash report for use by safety engineers and law enforcement to study crash locations for countermeasure development.

- Develop a naming convention and training program to be applied to the “pick list” for identifying street names for crash report location.

- Assure that the naming conventions developed are incorporated into the MassHighway Road Inventory File.

- Accelerate the implementation of projects that will use electronic capture and storage of digitized location data.
2-C: Driver Data Component

Advisory Excerpt:

- **Description and Contents**
  Driver information should include data about the State’s population of licensed drivers, as well as data about convicted traffic violators who are not licensed in that State. Information about persons licensed by the State should include: personal identification, driver license number, type of license, license status, driver restrictions, convictions for traffic violations in this State and the history of convictions for critical violations in prior States, crash history whether or not cited for a violation, driver improvement or control actions, and driver education data.

  Custodial responsibility for the Driver Data Component usually resides in a State Department or Division of Motor Vehicles. Some commercial vehicle operator-related functions may be handled separately from the primary custodial responsibility for driver data. The structure of driver databases should be typically oriented to individual customers.

- **Applicable Guidelines**
  The ANSI D-20 standard should be used to develop data definitions for traffic records-related information in the driver and vehicle files. Driver information should be maintained to accommodate information obtained through interaction with the NDR via the PDPS and the CDLIS. This enables the State to maintain complete driving histories and prevent drivers from circumventing driver control actions and obtaining multiple licenses. Data exchange for PDPS and CDLIS should be accomplished using the American Association of Motor Vehicle Administrators (AAMVA) Code Dictionary. Security and personal information verification should be in accordance with the provisions of the Real ID act.

- **Data Dictionary**
  At a minimum, driver information should be available for all licensed drivers in the State and for all drivers convicted of a serious traffic violation (regardless of where or whether the person is licensed). The contents of the driver data files should be well documented with data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collecting, reporting and posting of license, conviction, and license sanction information should be documented.

- **Process Flow**
  The steps, from initial event (licensure, traffic violation, etc.) to final entry onto the statewide driver and vehicle data files, should be documented in process flow diagrams for each file that is part of the Driver Data Component. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). The process flow should also document the timing, conditions, and procedures for purging records from the driver files. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two. The steps also should be documented in those States that have administrative authority to suspend licenses based on a DUI arrest independent of the judicial processing of those cases.

- **Interface with Other Traffic Records System Components**
  The Driver Data Component should have interfaces (using common linking variables shown in Table 6) to other TRS components such that the following functions can be supported:

  - Driver component data should be used to verify/validate the person information during data entry in the crash data system and to flag records for possible updating in the driver or vehicle files when a discrepancy is identified. Key variables such as driver license number, name, address, and date of birth should be available to support matching of records among the files. Social Security Numbers should be validated for interstate records exchange.

  - Driver and vehicle owner addresses are useful for geographic analyses in conjunction with crash and roadway data components. Linkage in these cases should be based on conversions of addresses to location codes and/or geographic coordinates in order to match the location coding method used in the roadway data component and in the GIS.

  - Links between driver convictions and citation/adjudication histories are useful in citation tracking, as well as in systems for tracking specific types of violators (DUI [Driving Under the Influence] tracking systems, for example). Even if a citation tracking system is lacking, there is value in being able to link to data from enforcement or court
records on the initial charges in traffic cases. These linkages should be based usually on driver name and driver license number but other identifiers may be used as well. The National Center for State Courts (NCSC) is looking for these identifiers in addition to methods to improve data sharing. “NCSC offers solutions that enhance court operations with the latest technology; collects and interprets the latest data on court operations nationwide; and provides information on proven best practices for improving court operations.” [http://www.ncsconline.org/]

- Linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and crash risk associated with specific driver characteristics (e.g., the driver’s history of violations or crash involvement). Key variables should include names, date of birth, dates, times, and locations of crashes and citations.

<table>
<thead>
<tr>
<th>Table 6: Common Linking Variables between Driver And Other Data Components of a Traffic Records System</th>
</tr>
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<tbody>
<tr>
<td><strong>Driver Linkages to Other Law Enforcement &amp; Court Files</strong></td>
</tr>
<tr>
<td>- Citation Number &amp; Case Number</td>
</tr>
<tr>
<td>- Location (street address, description, coordinates, etc.)</td>
</tr>
<tr>
<td>- Personal ID (name, address, DL number, date of birth, etc.)</td>
</tr>
<tr>
<td><strong>Driver Linkages to Roadway Information</strong></td>
</tr>
<tr>
<td>- Driver Addresses (location code, coordinates)</td>
</tr>
<tr>
<td><strong>Driver Linkages to Crash Information</strong></td>
</tr>
<tr>
<td>- Driver License Number</td>
</tr>
<tr>
<td>- Personal Identifiers (name, address, date of birth, etc.)</td>
</tr>
<tr>
<td><strong>Driver Linkages to Statewide Injury Surveillance System Information</strong></td>
</tr>
<tr>
<td>- Personal Identifiers (where allowed by law)</td>
</tr>
<tr>
<td>- Crash Date, Time, Location</td>
</tr>
</tbody>
</table>

**Quality Control Program**

The driver data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the Driver Data Component should be assured based on a formal program of error/edit checking as data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The driver data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as through training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks to assure the accuracy of specific critical data elements should be conducted as part of the formal quality control program. Example measurements are presented in Table 7.

<table>
<thead>
<tr>
<th>Table 3: Examples of Quality Control Measurements for Driver Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Timeliness</strong></td>
</tr>
<tr>
<td>- Average time to post driver licenses</td>
</tr>
<tr>
<td>- Average time to post convictions after receipt at DMV</td>
</tr>
<tr>
<td>- Average time to forward dispositions from court to DMV</td>
</tr>
<tr>
<td><strong>Accuracy</strong></td>
</tr>
<tr>
<td>- % of duplicate records for individuals</td>
</tr>
<tr>
<td>- % “errors” found during data audits of critical data elements</td>
</tr>
<tr>
<td><strong>Completeness</strong></td>
</tr>
<tr>
<td>- % drivers records checked for drivers moving into the State</td>
</tr>
<tr>
<td>- % of driver records transferred from prior State</td>
</tr>
<tr>
<td><strong>Consistency</strong></td>
</tr>
<tr>
<td>- % of SSN verified online</td>
</tr>
<tr>
<td>- % of immigration documents verified online</td>
</tr>
<tr>
<td>- % violations reported from other States added to driver history</td>
</tr>
</tbody>
</table>

The measures in Table 7 are examples of high-level management indicators of quality. The managers of individual driver files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.
2-C: Driver Data Component Status

Description and Contents
The Massachusetts Registry of Motor Vehicles (RMV) within the Executive Office of Transportation administers the licensing program for commercial and non-commercial drivers and is the custodian of the driver records. The RMV also administers vehicle registration and titling.

The RMV driver functions include identification of drivers and non-drivers who need identification cards, issuance of driver licenses and identification cards, maintenance of driver histories, control of problem drivers, and the administration of driver licensing laws. Licensing personnel are employees of the Registry’s full- and part-time offices throughout the Commonwealth.

Basic Characteristics
The records on commercial drivers are in the same file as those for non-commercial drivers—over five million records in the Automated Licensing and Registration System (ALARS). ALARS also contains the title and non-commercial vehicle registrations and crash records. The driver and vehicle records are maintained in a COBOL IDMS database.

The ALARS driver file access keys are the driver license number, last name and date of birth. The assigned driver license number is structured with an alpha character and eight numerals. Massachusetts driver licenses begin with “S”. Records created for non-licensed drivers or out-of-State drivers begin with “A”. Citations for out-of-State licensed drivers should include the driver license number from the other State, but it was reported that some out-of-State offenders have multiple “A” records. The “X” prefix is used for the identification number for non-drivers and to enable vehicle registrations for those ineligible for a driver license (e.g., a child).

The RMV requires the full legal name, date of birth, gender, address of legal residence, and the driver’s signature. A digital photo is taken and stored. The license has a variety of security features, and its bar code incorporates the photo and digitized signature.

The driver records include learner permits and provisional licenses. A check character in the driver record indicates a driver education course completion.

Data Input and Driver History Information
The RMV creates the licensing records. The Merit Rating Board (MRB) housed with the RMV, however, maintains the RMV driver histories. The MRB does not have separate files of convictions and other types of driver data. The following extracted descriptions are taken from the MRB web site:

“As a State agency within the Executive Office of Public Safety and Security, the Merit Rating Board (MRB) maintains operator driving records consisting of traffic law violations, at-fault and comprehensive insurance claim records, and out-of-State driving records. … (Bold type was applied for emphasis).

“The MRB receives citations for traffic law violations from Massachusetts police departments and courts, and applies each citation to the specified violator’s driving record. The
MRB receives payments, hearing requests, and address changes from violators and applies these updates to individual driving records.

“The MRB receives claims from an insurer, and applies each claim incident to the specified individual’s driving record.

“The MRB receives out-of-State driving records from an insurer, and applies each out-of-State incident to the specified individual’s driving record.”

An article from the *Boston Globe* on March 15, 2009 cited a discovery of deficiencies in “communication between the State court system and the Registry of Motor Vehicles” resulting in problem drivers retaining valid driver licenses that should have been suspended. After a July 2008 State auditor report documented delays in transferring information the courts and the Registry, a “review, conducted by RMV and court officials,” found that the Registry was missing significant records in significant numbers, and driver control actions followed.

The MRB, working with the RMV and the courts, spurred the migration from paper submissions by the District Courts to electronic submissions—now approaching 98 percent electronic. Thus a very positive development was achieved in a short time frame to correct a serious problem.

The RMV is using the Social Security On-line Verification system (SSOLV) to assist in establishing correct identity. Arrangements are in progress to establish a Memorandum of Understanding to enable checking the Secure Alien Verification system for Entitlements (SAVE).

**Driver Control**
There is a point system defined in the Safe Driver Insurance Plan, administered by the MRB, for identifying drivers with histories of offenses that require suspension or revocation of the license. Crash information is recorded on the driver record based on those identified by insurance claims that are reported to the MRB.

The Office of Alcohol Testing of the Massachusetts State Police (MSP) manages breath testing for BAC, and the results from Breathalyzer tests are broadcast to the MSP every 90 minutes. The MSP relays the BAC information each night to the RMV. That enables the RMV to be current with information for the file and to take immediate driver control actions on cases pending receipt of BAC test results.

**Applicable Guidelines**
The AAMVA Code Dictionary (ACD) translates out-of-State convictions. The MRB translates out-of-State offenses to ACD or equivalent codes used by the RMV.

**Data Dictionary and Process Flow**
There is a data dictionary document for the driver file that defines each data field and specifies its values. Process flow diagrams were not presented.
Interface with Other Traffic Records System Components
The driver file and the registration and title files are linked in the RMV’s ALARS. The driver file is accessed during the data entry processing of crash reports to verify the crash file information—another function in the ALARS.

Conviction information submitted by most of the District Courts is almost completely electronic as of the beginning of this year (58 of the 62 courts)—the achievement following the discovery of problems cited above. Efforts are underway to communicate electronically with the Superior Courts and the Boston courts.

The driver license file (not including driver histories) and the vehicle registration file are copied weekly to the Criminal Justice Information System (CJIS) to serve as a source of information for enforcement and backup for the RMV files if the RMV system is down for maintenance or any other reason. CJIS is also in process of being upgraded.

An annual extract of the driver file in a spreadsheet format is provided to the UMassSAFE data warehouse at the University of Massachusetts (Amherst location).

The MRB produces many reports of driver convictions for its own management purposes and in response to requests from State and local enforcement agencies and courts. The MRB will produce a variety of useful reports when they are requested.

Quality Control Program
Data quality metrics/benchmarks for driver license and history data were not prepared for this assessment, but the MRB produces monthly management reports, maintains information on error cases and corrections. Also, the Commercial Driver License Information System produces quality reports.

The following information was provided by the MRB:

<table>
<thead>
<tr>
<th>Quality Control Measurements for Driver History Data Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of driver licenses posted within 24 hours = ______</td>
</tr>
<tr>
<td>% convictions posted with 24 hours of receipt = 79.4% for those dispositions reported to the MRB for criminal traffic citations electronically by the courts since 01/02/2009</td>
</tr>
<tr>
<td>% convictions posted within 2 days of conviction date = 83.2% for those dispositions reported to the MRB for criminal traffic citations electronically by the courts since 01/02/2009</td>
</tr>
<tr>
<td># days convictions received from court = 16 (average for CMVI Hearing Finding Documents reported to the MRB by the courts on paper)</td>
</tr>
</tbody>
</table>

56
Recommendations

- Assist in the efforts to implement electronic communications with all courts and to establish electronic citations.

- Exert influence with the Traffic Records Coordinating Committee to establish electronic field reporting of citations and crashes and to submit them electronically and to place the development at the highest priority level.
2-D: Vehicle Data Component

Advisory Excerpt:

- **Description and Contents**
  Vehicle information includes information on the identification and ownership of vehicles registered in the State. Data should be available regarding vehicle make, model, year of manufacture, body type, and vehicle history (including odometer readings) in order to produce the information needed to support analysis of vehicle-related factors that may contribute to a State’s crash experience. Such analyses would be necessarily restricted to crashes involving in-State registered vehicles only.

  Custodial responsibility for the vehicle data usually resides in a State Department or Division of Motor Vehicles. Some commercial vehicle-related functions may be handled separately from the primary custodial responsibility for all other vehicle data. The structure of vehicle databases is typically oriented to individual “customers.”

- **Applicable Guidelines**
  Title and registration information, including stolen and salvage indicators, should be available and shared with other States. The National Motor Vehicle Title Information System (NMVTIS) facilitates such exchanges. In addition, some States empower auto dealers to transact vehicle registrations and title applications following the Business Partner Electronic Vehicle Registration (BPEVR) guidelines from AAMVA. The International Registration Plan (IRP), a reciprocity agreement among U.S. States and Canadian provinces, administers the registration processes for interstate commercial vehicles.

- **Data Dictionary**
  Vehicle information should be available for all vehicles registered in the State. The contents of the Vehicle Data Component’s files should be well documented, including data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collection, reporting and posting of registration, title, and title brand information should be documented.

- **Process Flow**
  The steps from initial event (registration, title, etc.) to final entry onto the statewide vehicle data files should be documented in process flow diagrams for each file that is part of this component. The diagram should be annotated to show the time required to complete each step and to show alternate flows and timelines depending on whether the data are submitted in hardcopy or electronically to the statewide system. The process flow diagram should include processes for error correction and error handling (i.e., returning reports to the original source for correction, resubmission, etc.). The process flow should also document the timing, conditions, and procedures for purging records from the vehicle files. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and should clearly distinguish between the two.

- **Interface with Other Traffic Records System Components**
  The Vehicle Data Component has interfaces (using common linking variables shown in Table 8) to other TRS components such that the following functions should be supported:

  - Vehicle data should be used to verify/validate the vehicle information during data entry in the crash data system, and to flag records for possible updating in the vehicle files when a discrepancy is identified. Key variables such as VIN, license plate number, names, and addresses should be available to support matching of records among the files.

  - Vehicle owner addresses are useful in geographic analyses in conjunction with crash and roadway data. Linkage in these cases should be based on conversions of addresses to location codes and/or geographic coordinates in order to match the location coding method used in the Roadway Data Component and in the GIS.

  - As with crash data, linkage to injury surveillance data should be possible either directly or through probabilistic linkage in order to support analysis of crash outcomes and crash risk associated with specific driver characteristics (e.g., the driver’s history of violations or crash involvement). Key variables should include names and dates, date of birth, times, and locations of crashes.
Table 8: Common Linking Variables between Vehicle And Other Data Components of a Traffic Records System

| Vehicle Linkages to Other Law Enforcement & Court Files | - Location (street address, description, coordinates, etc.)  
| - Personal ID (name, address, DL number, etc.) |
| Vehicle Linkages to Roadway Information | - Owner Addresses (location code, coordinates) |
| Vehicle Linkages to Crash Information | - Vehicle Identification Number  
| - Personal Identifiers (name, address, date of birth, etc.) |
| Vehicle Linkages to Statewide Injury Surveillance System Information | - Personal Identifiers (where allowed by law)  
| - Crash Date, Time, Location |

Quality Control Program

The vehicle data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the vehicle data should be assured based on a formal program of error/edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The vehicle data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks should be conducted to assure the accuracy of specific critical data elements as part of the formal Quality Control Program. Example measurements are presented in Table 9.

Table 9: Examples of Quality Control Measurements for Vehicle Data

| Timeliness | - Average time for DMV to post title transactions  
| - % title transactions posted within a day of receipt |
| Accuracy | - % of duplicate records for individuals  
| - % errors found during data audits of critical data elements  
| - % VINs successfully validated with VIN checking software |
| Completeness | - % of records with complete owner name and address |

The measures in Table 9 are examples of high-level management indicators of quality. The managers of individual vehicle files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.
2-D: Vehicle Data Component Status

**Description and Contents**
The Massachusetts Registry of Motor Vehicles (RMV) within the Executive Office of Transportation administers vehicle registration and titling.

Applications for registration must include an insurance agent stamp and signature before presentation at one of the RMV’s full service centers. A Manufacturer’s Certificate of Origin or a previous title must also be presented with an odometer reading with the application for title. Six to eight weeks are required for title processing. Upon receipt of the registration document, plates and expiration decals, a vehicle safety inspection is required within seven days. Thereafter, annual safety inspections are required, and odometer readings are recorded in connection with safety inspections and any required emissions inspections.

Application for title must be done within 10 days of the acquisition of a vehicle or trailer unless the type of vehicle is exempt from titling. Information from a State where previously titled may be acquired through the National Motor Vehicle Title Information System (NMVTIS) of the American Association of Motor Vehicle Administrators. Massachusetts is a full participant in NMVTIS enabling immediate electronic transactions with other NMVTIS States.

If a lien is involved, Massachusetts also uses the Electronic Lien and Title (ELT) system. ELT enables direct interactions with lien holder institutions.

**Basic Characteristics**
Vehicle records are maintained in the Automated Licensing and Registration System (ALARS) described in the previous section on driver information. The registrant is identified with a Massachusetts driver license number or an assigned non-driver identification number if the registrant is not a driver. The non-commercial registration document does not have a bar code.

The Business Partner Electronic Vehicle Registration (BPEVR) program is being used, a product of CVR. NADA software is used for VIN verifications.

Law enforcement reports and withdraws stolen vehicle notices through the Criminal Justice Information System (CJIS). A copy of the ALARS vehicle and driver files is provided weekly to CJIS to place on the CJIS server as a backup during RMV system downtimes.

The RMV provides summary information from the vehicle file annually to the UMassSAFE data warehouse at the University of Massachusetts (Amherst).

Information was not available about ALARS data quality procedures.

**Recommendations**

- None
2-E: Citation/Adjudication Data Component

Advisory Excerpt:

- **Description and Contents**
  Information, which identifies arrest and adjudication activity of the State, should be available, including information that tracks a citation from the time of its distribution to a law enforcement officer, through its issuance to an offender, its disposition, and the posting of conviction in the driver history database. Case management systems, law enforcement records systems, and DMV driver history systems should share information to support:
  - citation tracking
  - case tracking
  - disposition reporting
  - specialized tracking systems for specific types of violators (e.g., DUI tracking systems)

Information should be available to identify the type of violation, location, date and time, the enforcement agency, court of jurisdiction, and final disposition. Similar information for warnings and other motor vehicle incidents that would reflect enforcement activity are also useful for highway safety purposes and should be available at the local level.

The information should be used in determining the level of enforcement activity in the State, for accounting and controlling of citation forms, and for detailed monitoring of court activity regarding the disposition of traffic cases.

Custodial responsibility for the multiple systems that make up the Citation/Adjudication Data Component should be shared among local and State agencies, with law enforcement, courts, and the Department of Motor Vehicles (DMV) sharing responsibility for some files (e.g., portions of the citation tracking system). State-level agencies should have responsibility for managing the law enforcement information network (e.g., a criminal justice information agency), for coordinating and promoting court case management technology (e.g., an administrative arm of the State Supreme Court), and for assuring that convictions are forwarded to the DMV and actually posted to the drivers’ histories (e.g., the court records custodian and the DMV).

- **Applicable Guidelines**
  Data definitions should meet the standards for national law enforcement and court systems. Applicable guidelines are defined for law enforcement data in:
  - National Crime Information Center (NCIC)
  - Uniform Crime Reporting (UCR)
  - National Incident-Based Reporting System (NIBRS)
  - National Law Enforcement Telecommunication System (NLETS)
  - Law Enforcement Information Network (LEIN)
  - Traffic Court Case Management Systems Functional Requirement Standards

Applicable guidelines should be defined for court records in the National Center for State Courts (NCSC), and jointly for courts and law enforcement in the GJXDM (with specific Traffic Processing Standards created through a national committee). Tracking systems for citations (i.e., a citation tracking system) and for specific classes of violators (e.g., a DUI tracking system) should meet the specifications for such systems published by NHTSA.

- **Data Dictionary**
  The citation/adjudication data files should be well documented, including data definitions for each field and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures for collection, reporting and posting of license, registration, conviction, and title brand information should be documented.
Law enforcement personnel should receive adequate training at the academy and during periodic refreshers to ensure they know the purpose and uses for the data. Training also should ensure that officers know how to access information on violators and process citations and arrests properly. The training manual should be available to all law enforcement personnel and the instructions should match, as appropriate, the edit checks that are performed on the data prior to its being added to the local records management system and statewide databases. The edit checks should be documented and both common and serious errors in the data should be flagged, including missing or out-of-range values and logical inconsistencies. The data element definitions and system edits should be shared with all collectors, managers, and users in the form of a data dictionary that is consistent with the training manual and the crash report form. Court case management systems and tracking systems (citation tracking and DUI tracking) should be well documented to include definitions of all data elements and corresponding edit checks to ensure accuracy.

Process Flow
The processing of traffic violations, citations, arrests, and court cases should be documented in a series of flow diagrams showing the typical procedures and their average time to completion for each step. The administrative handling of payment in lieu of court appearance should be shown separately from those violations that are not handled administratively. The processes for detecting drugs or collecting blood alcohol concentration (BAC) values through various methods (breath test, blood or urine tests) should also be documented. The processes for tracking DUI cases in a DUI tracking system should also be included in the set of process flow diagrams. Processes for paper and electronic filing and reporting should be shown separately. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two.

Interface with other traffic records system components
NCIC, GJXDM, NIBRS, LEIN, and NLETS guidelines all define methods and data standards for information transfer and sharing at the State and national level. Typically, there are State-level equivalents of the various networks and standards governing the sharing of law enforcement and court-related data. For the purposes of safety analysis at a State and local level, linkage between the Citation/Adjudication Data Component and other components of the TRS is important because it is useful for analyzing the geographic distribution of traffic violations and incidents, as well as monitoring the effectiveness of countermeasures that involve enforcement or court processes. It also enables the creation and updating of adverse driver histories for the purpose of driver control. Key linkages within the TRS for citation/adjudication information are listed in Table 10.

Table 10: Common Linking Variables between Citation/Adjudication and Other Data Components of a Traffic Records System

| Citation/Adjudication Linkages to Other Law Enforcement Files and Tracking Systems | - Computer Aided Dispatch (CAD) Record Number |
| Citation/Adjudication Linkages to Driver/Vehicle Files | - Citation/Arrest/Incident Number, Court Case Number |
| | - Location (street address, description, coordinates, etc.) |
| | - Personal ID (name, address, DL number, etc.) |
| Citation/Adjudication Linkages to Driver/Vehicle Files | - Driver and Owner Names, Driver License Number |
| | - Driver & Owner Addresses (location code, coordinates) |
| | - Vehicle Plate Number, VIN |
| Citation/Adjudication Linkages to Statewide Injury Surveillance System Information | - Personal Identifiers (where allowed by law) |
| | - Crash-Related Citation/Arrest Date, Time, Location |

Quality Control Program
The citation/adjudication data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the citation/adjudication data should be assured based on a formal program of error/edit checking as the data are entered into the statewide system, and procedures should be in place for addressing the detected errors. In addition, the custodial agency (agencies) and the TRCC should frequently work together to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The data managers receive regular, periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback as well as training and changes to the applicable instruction manuals, edit checks, and the driver and vehicle data dictionaries. Audits and validation checks should be conducted to assure the accuracy of specific critical data elements as part of the formal Quality Control Program. Example measurements are presented in Table 11.
Table 11: Examples of Quality Control Measurements for Citation/Adjudication Data

<table>
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| **Timeliness** | - Average time for citations to be sent from LEAs to courts  
                  - Average time for convictions to be sent to DMV |
| **Accuracy**   | - % errors found during data audits of critical data elements  
                  - % violations narratives that match the proper State statute |
| **Completeness** | - % of cases with both original charges and dispositions in citation tracking system |
| **Consistency** | - % traffic citations statewide written on a single uniform citation |

The measures in Table 11 are examples of high-level management indicators of quality. The managers of individual citation/adjudication files should have access to a greater number of measures. The custodial agency should be prepared to present a standard set of summary measures to the TRCC monthly or quarterly.
2-E: Citation/Adjudication Data Component Status

Description and Contents
Traffic violations in Massachusetts may be civil or criminal. Most minor violations are civil in nature and are sent to the Registry of Motor Vehicles for processing and payment, if uncontested. More serious violations are criminal and are handled by the Massachusetts Trial Courts. In general, the trial court is made up of seven departments, which include the District Court and the Boston Municipal Court, either of which could adjudicate a traffic violation. Currently, there are sixty-two district courts and seven Boston Municipal Courts.

The Administrative Office of the Trial Court (AOTC) manages and provides services to the Trial Court. A single court case management system has been in place since February of 2007. The system, MassCOURTS, has integrated identification numbers (assigned by State Police to individuals arrested and fingerprinted) into the court system, which helps court personnel identify defendants, whose biometrics and aliases are now part of the system. Unfortunately, the MassCOURTS system doesn’t currently allow prosecutors to check on pending cases in other courts, nor do prosecutors have on-line access to the driver history records.

Citation Issuance: When a law enforcement officer issues a citation to a traffic violator, he or she uses a uniform citation that is centrally administered and distributed by the Registry of Motor Vehicles (RMV). This central management assures that citation numbers are not duplicated and could be tracked from the point of distribution to an officer, through the adjudication process, all the way through inclusion on the driver history record.

Officers are required by policy to complete audit sheets that include information about the citations in each book, including specifically those that are destroyed or voided. The audit sheets are returned to the RMV.

When a citation is issued for a civil violation, it is sent directly to the RMV and the violator has two options: pay the fine or request a hearing at the court. If a hearing is requested, paperwork is forwarded to the court by the RMV and a hearing is set. Once the case has been adjudicated by the court, the disposition is forwarded to the RMV for inclusion on the driver history.

This is currently a paper-driven system. The citation is a multi-part form completed by the law enforcement officer. The hearing request is another multi-part form, and approximately two hundred per week are generated by the RMV. Once the court receives the request, it generates a date and time of hearing, sending a copy of the form to the violator, another to the RMV and filing another at the court. Once the infraction is adjudicated, the disposition is sent to the RMV, as well, in paper format. The court reported handling 215,741 civil cases last year.

Criminal offenses are handled similarly, with copies of the citations being sent to both the RMV (the Merit Rating Board (MRB), specifically) and to the court. Once criminal violations are adjudicated, the disposition is forwarded electronically to the RMV. The MassCOURTS system interfaces with the RMV.
Obviously, both civil and criminal processes require a great deal of repeated collection and data entry of information. Every point of inclusion of data into a system provides a new opportunity to introduce errors, from the police officer to the RMV official to the court, and back to the RMV. All entities involved in this process indicated willingness to engage in an effort to develop an electronic citation that would provide for a single point of data entry. Most of the pertinent information could be captured on the citation initially using a bar code reader, taking the driver and vehicle information from the license and the registration document. In Massachusetts, the driver’s license contains bar-coded information, but the vehicle registration document does not. There are plans, however, to add bar codes to registration documents in the future.

The AOTC indicates that MassCOURTS will be in a position to receive electronic data from police as soon as they are ready to initiate electronic citation issuance. Currently 58 of the 62 District Courts are using MassCOURTS, with an additional two being added soon.

The driver history file is administered by the MRB and the citation file essentially functions as a complete citation tracking system. A uniform citation form is used by all law enforcement agencies. After being processed either civilly or criminally, the citation is returned to the RMV for inclusion on the driver history. This process provides all the required elements of a citation tracking system. The system includes both the charges filed and those of which the violator is ultimately convicted. Dismissals and plea bargains are indicated on the record as well.

Administrators from the MRB indicated the existence of aggregated data provided through standard or ad hoc reports related to traffic enforcement throughout the State. These data are invaluable to determine the effectiveness of traffic enforcement efforts and their impact on crash rates.

Another type of information that is available in Massachusetts that adds to the potential for a DUI/OUI tracking system is the statewide database of breath alcohol test results. With a single statewide breath testing type of device and a single database of results, the ability to use the MRB file to link with breath test results for a DUI/OUI tracking system is a very real possibility and would provide excellent data with which to determine the effectiveness of the new interlock law.

Massachusetts law allows for administrative license suspensions and revocations for drunk driving and the interface of the RMV system with the Draeger Breath Testing results database allows for efficient and very timely administrative processing of those restraints. Refusal by violators to submit to chemical testing is also captured by the Draeger system which prints the temporary driving permit issued to drivers immediately upon arrest. The database also provides a wealth of information that can be used to determine the most effective means of addressing the problem of persistent drunk driving and likelihood of repeat offending by those with high blood alcohol levels upon first arrest.

All of these data are useful to address an issue that the press continues to discuss, especially following the passage of “Melanie’s Law,” which mandated ignition interlocks for repeat drunk driving offenses. There is a concern about hardship licenses and the fact that they can be issued to put a drunk driver back behind the wheel prior to having served the entire period of
suspension. (Eschbacher, Karen. “Why can’t we keep drunks off our roads?” PatriotLedger.com. 4/1/2006) Studying such issues prior to an analysis by the media gives government agencies the ability to mitigate problems and seek data-driven policies and solutions proactively, instead of simply reacting to negative press.

Applicable Guidelines
Data definitions are standard and meet the requirements of law enforcement and court systems. The Massachusetts Trial Court was reviewed in 2003 by a visiting committee on management of the courts. As a result of that review, the court began and continues to use metrics and goals established by the National Center for State Courts.

The MRB system within the RMV provides all the capability required of a functional citation tracking system. The interface with the blood alcohol results provides most of the data necessary to create a DUI/OUI tracking system as well. The combination of information from the MRB, the courts and the Draeger breath test results should be reviewed for functionality as a DUI/OUI tracking system.

Neither prosecutors nor RMV personnel indicated concern about law enforcement training on processing of those arrested for Operating Under the Influence of alcohol. The State Police Commander in charge of the breath testing expressed no concerns regarding training of officers, generally, regarding OUI processing and there was little concern voiced from anyone about the quality of the citation data.

The MRB personnel did indicate that they have a number of edit checks in their data entry system which provides them the assurance that errors on driver history records are minimized. They indicate that while they do not return individual citations with errors to officers, they clean the data and keep track of errors and report back to either individual police agencies or State Police trainers when there appears to be a need for remedial training on specific issues.

Process Flow
Law enforcement commanders indicated that the OUI process is charted for officers and the issuance of both civil and criminal citations are clear and uniform processes, which can easily be entered into a process flow diagram. Data dictionaries of the MRB system exist and the edit checks are documented.

Since no department is currently issuing electronic citations, no process flows or data dictionaries exist for citation issuance. That function should be addressed as planning for electronic citations continues. Stakeholders from the court, the RMV (MRB) and police all indicated willingness to take part in planning for the development of an electronic citation through the TRCC.

Interface with other traffic records components
The most likely interface for citations and potentially most useful is the crash system. There were indications that the linkage does not exist at the State level. However, the potential for linkage is apparent. Because of the use of the Uniform Citation and the lack of duplicate citation
numbers in the State and because the citation number is included on the crash report form, a link should be relatively simple to create.

With the use of bar-coded information from the drivers’ file, a link to licensed drivers and those with established driving records in the State would also be easy to accomplish, as citations include most of the information in the driver file, including name, date of birth, and driver’s license number, for example. The same linkage should be possible with the vehicle file, due to the capture of the vehicle plate number on the citation.

Location indicators continue to be a concern on records within Massachusetts. Once location coding is standardized or a GPS device is used to determine locations, it will be easier to link other traffic records system components to the citation file as well.

**Quality Control Program**

It is apparent that the quality control measures used by the MRB are effective in developing quality data on the driver history file and within the citation file. There were no reports of concerns or problems with the accuracy of the citation data in the State. The metrics should be shared with the TRCC in an effort to assure that equally effective quality control metrics can be developed for the crash system.

The metrics provided for data quality for Citation/Adjudication data are as follows:

**Timeliness:**
- Average time for citations to be sent from LEA’s to courts – 8 - 10 days
- Average time for convictions to be sent to DMV – 24 hours

**Accuracy:**
- % of errors found in data audits of critical data elements - fewer than 2%
- % of violation narratives that match proper State statute - 100%

**Completeness:**
- % of cases with both original charges and dispositions in Citation tracking system - 100% of those adjudicated

**Consistency:**
- % of traffic citations statewide written on a single uniform citation – 100%

The State has high quality enforcement data that should be marketed and made available to law enforcement personnel. The TRCC should work with the MRB in an effort to provide basic reports by police jurisdiction and training related to analysis of countermeasure effectiveness that can be gleaned from citation data, especially when combined with crash data.

**Recommendations**

- Provide on-line access to the driver history file for court personnel.

- Review the MRB citation file and the Draeger blood alcohol file for the possibility of establishing a DUI/OUI tracking system.

- Market the rich data from the citation file available to users.
Charge the TRCC with establishing a working group of the appropriate stakeholders to plan for the implementation of e-citations in the State.
Advisory Excerpt:

- Description and Contents
  With the growing interest in injury control programs within the traffic safety, public health, and enforcement communities, there are a number of local, state, and federal initiatives that drive the development of a SWISS. These systems typically incorporate pre-hospital (EMS), trauma, emergency department (ED), hospital in-patient/discharge, rehabilitation and morbidity databases to track injury causes, magnitude, costs, and outcomes. Often, these systems rely upon other components of the TRS to provide information on injury mechanisms or events (e.g., traffic crash reports). The custodial responsibility for various files within the SWISS typically is distributed among several agencies and/or offices within a State Department of Health.

This system should allow the documentation of information that tracks magnitude, severity, and types of injuries sustained by persons in motor vehicle related crashes. Although traffic crashes cause only a portion of the injuries within any population, they often represent one of the more significant causes of injuries in terms of frequency and cost to the community. The SWISS should support integration of the injury data with police reported traffic crashes and make this information available for analysis to support research, public policy, and decision making.

The use of these data should be supported through the provision of technical resources to analyze and interpret these data in terms of both the traditional traffic safety data relationships and the specific data relationships unique to the health care community. In turn, the use of the SWISS should be integrated into the injury control programs within traffic safety, and other safety-related programs at the State and local levels.

- Applicable Guidelines
  NHTSA has produced the National Emergency Medical Service Information System (NEMSIS) to serve as a guideline for a uniform pre-hospital dataset. It applies to all EMS runs, not just those related to traffic crashes. The American College of Surgeons (ACS) certifies trauma centers and provides guidelines for trauma registry databases and for a National Trauma Databank. Emergency Department and in-patient data guidelines (UB-92) are available from the US Department of Health and Human Services. The National Center for Health Statistics, within the Centers for Disease Control (CDC), sets ICD-9 codes and E-codes for injury morbidity/mortality. These codes are updated as needed and the ICD-10 codes are expected by the fall of 2007. The CDC also sets standards for reporting to their injury database and for use of the Public Health Information Network for data sharing.

- Data Dictionary
  The contents of the SWISS Data Component’s files should be well documented to include data definitions for each field, and where applicable, edit checks and data collection guidelines that match the data definitions. Procedures should be documented in instruction manuals for collection, reporting, and posting of EMS run data on a uniform run report, uniform data in various hospital and trauma databases, and for tracking morbidity and mortality for each system.

  Training should include (where applicable) data collection, data entry, use of various injury coding systems (ICD and E-codes) as well as injury and trauma severity scoring systems such as the Injury Severity Score (ISS), Revised Trauma Score (RTS), and Abbreviated Injury Score (AIS) scales.

- Process Flow
  The information and processes involved in transport and treatment of victims of crash-related injuries should be documented in a series of flow diagrams showing the typical data collection and management processes and their average time to completion for each step in the data flow process. Processes for paper and electronic filing and reporting should be shown separately. Process flow diagrams should show all major steps whether accomplished by staff or automated systems and clearly distinguish between the two.

- Interface with other Traffic Records System Components
  Data transfer and sharing between local systems and the SWISS should be governed by data definitions, quality control requirements, and data transfer protocols defined by the custodial agencies. Transfer and sharing between SWISS files and the relevant national databases are governed by the data definitions, quality control requirements, and data transfer protocols for those systems (e.g., National Trauma Database).
The CODES project is the primary example of data sharing and integration between SWISS and the other components of a TRS. It can take the form of direct linkage using personal identifiers or probabilistic linkage using other data elements such as incident time, date, date of birth, and locations, responding officer/agency, and others. Key linkages within the TRS for SWISS information are listed in Table 12.

| Linkages Internal to the SWISS data on injury and healthcare treatments/outcomes | - Patient name  
- Patient ID number  
- EMS run report number  
- Social Security Number |
| Linkages between SWISS data and Crash Data | - Personal Identifiers: Name, address, date of birth (direct linkage)  
- CODES linking variables (probabilistic linkage)  
- EMS run report number  
- Crash Report Number |
| Linkages between SWISS data and other (non-Crash) components of the traffic records system | - Name & SSN linked to driver file (direct linkage)  
- Location/address  
- Event & treatment date and time |

**Quality Control Program**

The SWISS data should be timely, accurate, complete, and consistent and these attributes should be tracked based on a set of established quality control metrics. The overall quality of the information in the SWISS Data Component should be assured based on a formal program of error/edit checking as the data are entered into the statewide system and procedures should be in place for addressing the detected errors. In addition, the custodial agency (or agencies) and the TRCC should work together frequently to establish and review the sufficiency of the quality control program and to review the results of the quality control measurements. The data managers should receive periodic data quality reports. There should be procedures in place for sharing the information with data collectors through individual and agency-level feedback, as well as to provide modifications to applicable training and instruction manuals, edit checks, and the SWISS data dictionaries. Audits and validation checks to assure the accuracy of specific critical data elements should be conducted as part of the formal Quality Control Program. Example measurements are presented in Table 13.

| Timeliness | - Average time for EMS run reports to be sent to governing agency  
- % EMS run reports sent to governing agency in the prescribed time  
- Average time from treatment & discharge from ED to record availability in the ED discharge database  
- Average time from patient discharge to record availability in the hospital discharge database  
- Average time from date of incident to record appearing in the trauma registry  
- # days from death to appearance of record on mortality database |
| Accuracy | - % EMS run locations that match statewide location coding  
- % correct ICD-9 and E-codes  
- "errors" found during data audits of critical data elements in EMS, ED, trauma registry, hospital discharge, & mortality databases |
| Completeness | - % of traffic crash-related EMS runs in the EMS database  
- % of ED visits for crash-related injuries recorded in ED discharge database.  
- % of trauma cases represented in the trauma registry  
- % of SCI/TBI cases represented in the SCI/TBI registries |
| Consistency | - % correct ICD-9 and E-codes (see also accuracy)  
- CODES match rate (where applicable)  
- % crash-related deaths with motor vehicle crash in cause of death field on death certificate |
The measures in Table 13 are examples of high-level management indicators of quality. The managers of individual medical data files should have access to a greater number of measures. The custodial agencies should be prepared to present standard sets of summary measures to the TRCC monthly or quarterly.
2-F: Statewide Injury Surveillance System Data Component Status

There are several key components of a statewide injury surveillance system. The components are: emergency medical services, acute care, trauma and rehabilitation facilities, and vital records. Oversight for these entities’ activities may be governed by local, State, and regional authorities. Collection of data from these entities provides a wealth of patient care routing, intervention, and prevention information that can be used to evaluate current treatment modalities and injury prevention activities. A comprehensive statewide injury surveillance system provides crucial healthcare and injury prevention information to local, State, and regional healthcare professionals.

Integrating other statewide injury surveillance system with other State traffic records system components has the ability to benefit both entities. Motor vehicle crash data can supply many of the pre-event and event information for the Haddon Matrix for use in planning injury prevention programs initiated by the public health professionals. Alternatively, providing traffic safety specialists with medical outcomes for motor vehicle crashes enables them to augment their understanding of crash severity beyond the typical five-point scale captured on most crash reports.

Description and Contents
Massachusetts has several components of a statewide injury surveillance system. The Division of Health Care Finance and Policy (DHCFP) compiles statewide hospital discharge, emergency department (ED), and outpatient services databases. The Department of Public Health (DPH) Injury Surveillance Program has just begun collecting data for a statewide trauma registry and is preparing to capture statewide emergency medical services (EMS) data by September of 2009. DPH also maintains a statewide death certificate database. The Injury Surveillance Program has access to all of these databases and has the ability to deterministically link injury episodes across data sets. The Injury Prevention Program uses these data for a number of injury prevention programs and reports.

Data in the statewide injury surveillance system has been compiled into the Massachusetts Community Health Information Profile (MassCHIP). MassCHIP provides access to 28 health status, health outcome, program utilization, and demographic data sets, from which one can generate two types of reports, 1) Instant Topics and 2) Custom Reports, as well as charts and maps. Instant Topics are predefined reports which use MassCHIP’s most current data to supply information on a variety of topic areas for specific geographies. Custom reports are user-defined reports which can be created by downloading the MassCHIP Client and choosing the data set and selectors of interest. The agency overseeing MassCHIP has also received the statewide crash file in the past but has not integrated it into this system because of quality concerns and lack of specific data fields of interest to injury prevention specialists.

Many of the health outcome data sets have also been integrated with the statewide crash file through the Massachusetts Crash Outcome Data Evaluation System (CODES) project.
Applicable Guidelines
Under M.G.L. c. 111C, §3(b)(15), the Department of Public Health (DPH), as lead agency for EMS in the Commonwealth, is charged with requiring the collection and maintenance of standardized patient data and information by ambulance services, which services must ensure their EMTs are collecting on a trip record. The minimum EMS data set is based on the National EMS Information System (NEMIS) Dataset. With the help of 408 funding, DPH has designed MATRIS as the system for collecting EMS trip information. Currently DPH licenses 315 agencies and an estimated 23,000 EMTs at the cadet, basic, intermediate, and paramedic levels. MATRIS is still in the beta testing phase, with official data submission scheduled to begin in September of 2009.

Data Dictionary
The data dictionary is available online at DPH’s website and is NEMSIS compliant. The MATRIS database consists of all NEMSIS national elements with the addition of several State data elements. Once MATRIS is functional, data will be submitted to NEMSIS.

Quality Control
The determination of error and validity checks to be applied to all incoming records is ongoing. A testing phase for assessing data submissions from EMS agencies is planned prior to the official start date.

Process Flow
Information on EMS calls is collected by individual EMS agencies. Agencies using NEMSIS compliant data collection systems will be able to upload their data directly into MATRIS. A website will be provided for smaller agencies to enter data directly into the database. Process flow diagrams were not obtained.

Interface with other Traffic Records System Components
Injury Prevention Program staff are very excited about the prospect of receiving data from MATRIS. Data from MATRIS are planned to be integrated with the hospital, trauma registry, and death certificate databases. Having address information available in MATRIS will provide motor vehicle crash researchers with yet another method for analyzing location and severity of transportation injuries in Massachusetts.

Hospital Discharge, Emergency Department, and Outpatient Data

Applicable Guidelines
Submission of hospital discharge, ED, and outpatient data to the DHCFP is governed by Regulation 114.1 CMR 17.00: Requirement for the Submission of Hospital Case Mix and Charge Data. By State definition these three data sets are mutually exclusive and capture different levels of severity of illness. Patients severe enough to be admitted to the hospital will be captured by the hospital discharge database. Patients treated or observed at the ED and discharged home or transferred will be captured by the ED database. Those patients only receiving outpatient services are captured by the outpatient database. All licensed hospitals
excluding the VA and psychiatric hospitals are required to submit data within 75 days of the end of each quarter regarding all three types of patient encounters. Annually, data are captured from 72 hospitals statewide, and DHCFP receives injury records for an estimated 50,000 hospital admissions, 750,000 ED encounters, and 10,000 outpatient service visits. The hospital data include patient demographics, up to twelve ICD-9-CM codes, present-on-admission codes, a separate E Code field, hospital charges, and payer information. Location information is limited to the patient’s residential zip code.

Data Dictionary
Documentation describing the file layout and elements for each hospital data set is available online at the DHCFP website. Data elements and definitions are based on the uniform billing 2004 data standard (UB04).

A subset of elements is categorized as, ‘Deniable Data Elements.’ Deniable data elements are those which either solely or in combination with other data elements jeopardize patient privacy and which will not be disclosed unless the DHCFP determines that an applicant fulfills the requirements imposed by 114.5 CMR 2.03.

Quality Control
Each quarter, DHCFP receives data from the hospitals and actively edits the data. Each record must pass both critical and non-critical error checks. If a record fails the validation process the submitting hospital must correct the data and resubmit it. Records with any errors are flagged, and hospitals are encouraged to review and resubmit the data. It is estimated that over 95 percent of injury records have an E Code. However, there is a belief that the most appropriate E Code may not always be what is entered.

Process Flow
Hospitals report their data to DHCFP on a quarterly basis for the fiscal year, beginning on October 1st. DHCFP prepares a yearly database available to the public through the DHCFP application process.

All individuals and agencies that request access to or use of one or more of the hospital databases shall submit a written application. The applicant must demonstrate a need for the data and for each deniable data elements which it determines to be necessary to accomplish the applicant’s intended use. Six different versions of the data can be requested depending on the amount of deniable data needed for the request. Level I data include all data except for the deniable elements, while Level VI data contain the normal case mix data plus all deniable data elements. When a request for data is submitted the Data Protection Committee determines whether access to the data will be granted or denied.

Through a data sharing agreement between DHCFP and DPH, the Injury Prevention Program receives all three hospital files. Injury Prevention Program staff compile reports on a number of topics including injuries and motor vehicle crashes. The Injury Prevention Program will also provide data tables and graphs upon request and users of MassCHIP may access the databases online. These databases are also incorporated into the annual report, *Injuries to Massachusetts*.
Residents. This report presents detailed tables and figures regarding all injury hospital contacts and deaths in the Commonwealth with sections focusing on motor vehicle crashes.

Interface with other Traffic Records System Components
All three hospital databases have been integrated with the statewide crash file through the Massachusetts Crash Outcome Data Evaluation System (CODES) project. The utility of this integrated database has been limited by the restrictive data use agreement between CODES and DHCFP. Additionally, funding limitations have greatly reduced the number of data requests that can be handled by CODES.

Members of the Injury Prevention Program do participate in the TRCC and are interested in supplying data to aid in the reduction of motor vehicle crashes. This partnership can greatly improve the level of injury reporting available to motor vehicle crash researchers and analysts.

Trauma Registry

Applicable Guidelines
All hospitals treating trauma patients in Massachusetts are required to submit data to the trauma registry. All hospital admissions, ED encounters, outpatient services, and deaths with a primary cause code of an injury are required to be submitted to the trauma registry. All Massachusetts hospitals, including designated trauma centers and those without a trauma designation, reporting to the hospital databases are required to report to the trauma registry.

Trauma centers are designated at three levels in Massachusetts. While the official designation is a State process, verification is required by the American College of Surgeons (ACS).

Data Dictionary
The trauma registry data dictionary is available online. Designated trauma centers are required to submit an expanded set of data elements compared to hospitals with no trauma designation. Data elements are based on the National Trauma Data Standard released by the National Trauma Data Bank (NTDB). Full address of the location of the EMS call, initial ED vital statistics, and injury outcome information, including Glasgow Coma Score (GCS) and Abbreviated Injury Severity (AIS) score, are available in the trauma registry.

Since trauma registry data are largely generated from the hospital data the dictionary is lacking many of the EMS and scene variables identified by NTDB. However, the trauma registry does capture the EMS run number and when MATRIS begins accepting data these elements will be populated through a linkage between the two databases. Additionally, the Injury Prevention Program is exploring the possibility of retrieving trauma data submitted by hospitals to the NTDB to back populate the State database.

Quality Control
While trauma registry data are submitted through the same mechanism as the hospital data sets above, the trauma registry applies extra validity checks that will reject data. Hospitals are required to review and resubmit data that have been rejected.
The Injury Prevention Program conducts Trauma Data Boot Camps around the State to increase the accuracy of E Coding and improve the collection of data elements such as initial ED vital signs and GCS.

**Process Flow**
Data are submitted by hospitals quarterly. The trauma registry has been operational for nine months and has received about 6,000 records. Once records have completed the quality control checks, they are entered into the trauma registry database. Data from the trauma registry will be used to refine hospital protocols, study the benefits of primary seatbelt laws, and for program development within the State. Trauma registry data will be available upon request. Researchers interested in receiving the trauma registry data must submit an application which will be reviewed by the DPH Data Protection Committee and State Trauma Outcome Committee.

**Interface with other Traffic Records System Components**
The trauma registry is not directly integrated with other components of the traffic records system. However, the Injury Prevention Program plans to integrate it with MATRIS, the hospital and death certificate databases, and other MassCHIP data sources.

**Death Certificates**

**Applicable Guidelines/Data Dictionary**
The Massachusetts Registry of Vital Records and Statistics collects death certificates on all deaths that occur within Massachusetts, as well as those occurring to residents outside of the State.

Death certificate data are coded according to national guidelines set by the National Centers for Health Statistics (NCHS) for collecting death data. Cause-of-death information is classified in accordance with the ICD-10 standard.

**Process Flow**
Death certificates are submitted in both paper and electronic formats to the Registry of Vital Records and Statistics. Each year about 450 motor vehicle crash related deaths are reported. The FARS analyst also receives death notices.

Death certificate data are shared with the Injury Prevention Program and included in many of their reports and presentations.

**Interface with other Traffic Records System Components**
Death certificate data are integrated with other State healthcare data sets through inclusion in MassCHIP and the Massachusetts CODES project.

**Crash Outcome Data Evaluation System (CODES)**
Massachusetts is an active participant in the National Highway Traffic Safety Administration’s (NHTSA) Crash Outcome Data Evaluation System (CODES). The CODES project has integrated many components of a statewide injury surveillance system, including emergency
department, outpatient services, hospital discharge, and death certificate data with the crash
database. CODES has received funding in the past from the Highway Safety Division and State
Police. Current funding is provided by NHTSA for data linkage and CODES Network studies.
Further funding is being provided by MassHighway and FMCSA for special studies.

The use of CODES data is governed by the CODES Board of Directors which consists of data
owners from the Registry of Motor Vehicles (RMV) and DHCFP. Massachusetts CODES also
has an advisory board which consists of data users of the individual data sets routinely linked and
analyzed. CODES data have been used for a number of State and federal projects. Recently,
CODES completed a data audit used to analyze lane departures. CODES data are linked with
SAFETYNET data for the analysis of commercial vehicle crashes. Other research interests
include older and younger drivers. Results of analyses are given in presentations at State and
national meetings, published as journal articles, and available in fact sheets from the CODES

The following table shows the databases and number of records annually linked to the crash file
by Massachusetts CODES. CODES data are stored in a data warehouse accessible by users from
inside the University of Massachusetts Traffic Safety Research Program.

<table>
<thead>
<tr>
<th>Database</th>
<th>Approximate Number of Records per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crash</td>
<td>350,000</td>
</tr>
<tr>
<td>Inpatient</td>
<td>2,300</td>
</tr>
<tr>
<td>Emergency Department</td>
<td>40,000</td>
</tr>
<tr>
<td>Outpatient Observation Stay</td>
<td>600</td>
</tr>
<tr>
<td>Citation</td>
<td>32,000</td>
</tr>
<tr>
<td>Roadway Inventory</td>
<td>295,000</td>
</tr>
<tr>
<td>Death Certificates</td>
<td>400</td>
</tr>
<tr>
<td>Commercial Vehicle Crashes</td>
<td>1,200</td>
</tr>
</tbody>
</table>

*Most recent year of linked data is 2005.

Clearly the CODES data are very rich and have great potential. There is much interest in the
traffic safety community regarding its availability for ad hoc reports and analyses. Current
funding levels at the University of Massachusetts Traffic Safety Research Program do not allow
for a position to handle data requests from outside the organization. Additionally, the linkage
with the data from DHCFP has raised concerns over confidentiality and the release of protected
healthcare information. Currently CODES is developing a data user’s agreement but obtaining
approval from the different State agencies providing data has been a slow process. The lack of
availability of CODES data outside of the University of Massachusetts Traffic Safety Research
Program is a source of aggravation to all parties inside and outside the university. Once the
agreement is approved it is anticipated that data will be provided free of charge to all State
agencies requesting it, including MassHighway and the Highway Safety Division. Researchers
outside of State agencies will be able to apply to use the data and be charged to access it.

Recommendations

☐ Continue to promote and implement MATRIS.
☐ Continue to grow and promote the trauma registry.

☐ Integrate the statewide crash database into MassCHIP.

☐ Improve the quality and promote the usefulness of the crash database as an injury prevention tool.

☐ Ensure that Highway Safety Division program managers and analysts understand how to access MassCHIP.

☐ Complete data sharing agreements so that State agencies will be able to access integrated crash and injury data.

☐ Partner with CODES to make available a linked crash and citation database for use by MassHighway and the Highway Safety Division.
APPENDIX A

SELECTED REFERENCES


<http://www.nlets.org/general.html>.


## APPENDIX B

### Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAAM</td>
<td>Association for the Advancement of Automotive Medicine</td>
</tr>
<tr>
<td>AAMVA</td>
<td>American Association of Motor Vehicle Administrators</td>
</tr>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>ACS</td>
<td>American College of Surgeons</td>
</tr>
<tr>
<td>AIS</td>
<td>Abbreviated Injury Score</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>ATSIP</td>
<td>Association of Transportation Safety Information Professionals</td>
</tr>
<tr>
<td>BAC</td>
<td>Blood Alcohol Concentration</td>
</tr>
<tr>
<td>BPEVR</td>
<td>Business Partner Electronic Vehicle Registration</td>
</tr>
<tr>
<td>CDC</td>
<td>Center for Disease Control</td>
</tr>
<tr>
<td>CDLIS</td>
<td>Commercial Driver License Information System</td>
</tr>
<tr>
<td>CODES</td>
<td>Crash Outcome Data Evaluation System</td>
</tr>
<tr>
<td>DMV</td>
<td>Department of Motor Vehicles</td>
</tr>
<tr>
<td>DOT</td>
<td>Department of Transportation</td>
</tr>
<tr>
<td>DUI</td>
<td>Driving Under the Influence</td>
</tr>
<tr>
<td>ED</td>
<td>Emergency Department</td>
</tr>
<tr>
<td>EMS</td>
<td>Emergency Medical Service</td>
</tr>
<tr>
<td>FARS</td>
<td>Fatality Analysis Reporting System</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>GES</td>
<td>General Estimates System</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GJXDM</td>
<td>Global Justice XML Data Model</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>HPMS</td>
<td>Highway Performance Monitoring System</td>
</tr>
<tr>
<td>ICD</td>
<td>Injury Coding System</td>
</tr>
<tr>
<td>IRP</td>
<td>International Registration Plan</td>
</tr>
<tr>
<td>ISS</td>
<td>Injury Surveillance Score</td>
</tr>
<tr>
<td>LEIN</td>
<td>Law Enforcement Information Network</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>MCMIS</td>
<td>Motor Carrier Management Information System</td>
</tr>
<tr>
<td>MMUCC</td>
<td>Model Minimum Uniform Crash Criteria</td>
</tr>
<tr>
<td>NCIC</td>
<td>National Crime Information Center</td>
</tr>
<tr>
<td>NCSC</td>
<td>National Center for State Courts</td>
</tr>
<tr>
<td>NDR</td>
<td>National Driver Registry</td>
</tr>
<tr>
<td>NEMSIS</td>
<td>National Emergency Medical Service Information System</td>
</tr>
<tr>
<td>NGA</td>
<td>National Governor’s Association</td>
</tr>
<tr>
<td>NHTSA</td>
<td>National Highway Traffic Safety Administration</td>
</tr>
<tr>
<td>NIBRS</td>
<td>National Incident-Based Reporting System</td>
</tr>
<tr>
<td>NLETS</td>
<td>National Law Enforcement Telecommunication System</td>
</tr>
<tr>
<td>NMVTIS</td>
<td>National Motor Vehicle Title Information System</td>
</tr>
<tr>
<td>PDPS</td>
<td>Problem Driver Pointer System</td>
</tr>
<tr>
<td>RTS</td>
<td>Revised Trauma Score</td>
</tr>
<tr>
<td>SHSP</td>
<td>Strategic Highway Safety Plan</td>
</tr>
<tr>
<td>SWISS</td>
<td>Statewide Injury Surveillance System</td>
</tr>
<tr>
<td>TCD</td>
<td>Traffic Control Devices</td>
</tr>
<tr>
<td>TRCC</td>
<td>Traffic Records Coordinating Committee</td>
</tr>
<tr>
<td>TRS</td>
<td>Traffic Records System</td>
</tr>
<tr>
<td>UCR</td>
<td>Uniform Crime Reporting</td>
</tr>
<tr>
<td>VIN</td>
<td>Vehicle Identification Number</td>
</tr>
<tr>
<td>VMT</td>
<td>Vehicle Miles Traveled</td>
</tr>
</tbody>
</table>
TEAM CREDENTIALS

LAWRENCE J. COOK, Ph.D.

189 W 1050 N
Layton, Utah 84041
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Fax:  (801) 581 – 8686
E-mail: larry.cook@hsc.utah.edu

EDUCATION

06/93 Bachelor of Science, University of Utah, Mathematics
06/96 Masters of Statistics, Department of Mathematics; University of Utah
06/98 Johns Hopkins University, Summer Institute, Principles and Practice of Injury Prevention
05/08 PhD Department of Mathematics and Statistics, Utah State University

PROFESSIONAL EXPERIENCE

03/02 – Present Director of Motor Vehicle Research Intermountain Injury Control Research Center
01/96 – Present Statistician, Intermountain Injury Control Research Center; University of Utah, Department of Pediatrics
09/03 – Present Graduate Teaching Assistant, Utah State University, Department of Mathematics and Statistics
08/94 – 12/00 Associate Instructor, University of Utah, Department of Mathematics
Instructor for Introductory Probability and Statistics Course
08/93 – 07/95 SAS Lab Instructor, University of Utah, Department of Mathematics

PROFESSIONAL MEMBERSHIPS AND ACTIVITIES

2004 – 2005 Program Chair, American Public Health Association Injury Control and Emergency Health Services Section.
2005 – Present Section Councilor, American Public Health Association Injury Control and Emergency Health Services Section
2007 – Present Board Member, Association of Traffic Safety Information Professional
2005 – Present Data Committee Member, American Public Health Association Injury Control and Emergency Health Services Section

1999 – Present Member American Public Health Association

2005 – Present Member American Statistical Association

2001 – Present Data Advisory Board, Utah’s Health: An Annual Review

1996 – Present Coalition for Utah Traffic Safety

PUBLICATIONS


Smith R, Cook LJ, Olson LM, Reading JC, Dean JM: Trends of behavioral risk factors in motor

Vernon DD, Cook LJ, Peterson KJ, Dean JM: Effect of repeal of the national maximum speed
limit law on occurrence of crashes, injury crashes, and fatal crashes on Utah highways. Accident

Knight S, Cook LJ, Olson LM. The fast and the fatal: Street racing fatal crashes in the United

Knight S, Olson LM, Cook LJ, Mann NC, Corneli HM, Dean JM. Against all advice: an analysis

Hyde LK, Cook LJ, Olson LM, Weiss HB, Dean JM. Effect of motor vehicle crashes on adverse

Vernon DD, Diller EM, Cook LJ, Reading JC, Suruda AJ, Dean JM: Evaluating the Crash and
Citation Rates of Utah Drivers Licensed with Medical Conditions, 1992 – 1996. Accident

Skokan EG, Olson LM, Cook LJ, Corneli HM. Snowmobile Injuries in Utah. Academic

Cvijanovich NZ, Cook LJ, Mann NC, Dean JM. Pediatric All-Terrain Vehicle Injuries.

Cook LJ, Olson LM, Dean JM. Probabilistic Record Linkage: Relationships between File Sizes,

Dean JM, Vernon DD, Cook LJ, Nechodom PJ, Reading JC, Suruda A. Probabilistic Linkage of
Computerized Ambulance and Inpatient Hospital Discharge Records: A Potential Tool for

Vernon DD, Diller E, Cook LJ, Reading J, Dean JM. Further Analysis of Drivers Licensed with
HS 809 211.

Cvijanovich NZ, Cook LJ, Mann NC, Dean JM, Graduated Driver Licensing Restrictions.

Knight S, Cook LJ, Nechodom PJ, Olson LM, Reading JC, Dean JM. Shoulder belts in motor
vehicle crashes: a statewide analysis of restraint efficacy. Accident Analysis and Prevention.

Corneli HM, Cook LJ, Dean JM. Adults and Children in severe motor vehicle crashes: A


ROBERT A. SCOPATZ, Ph.D.

Data Nexus, Inc.
P.O. Box 11770
College Station, TX 77842-1770

Director of Research & Consulting Services

SUMMARY
Dr. Scopatz has over 25 years of experience in the design and analysis of research studies using statistical and operations techniques. Over 20 years of his experience has been in traffic safety, traffic records systems, and safety analyses in support of motor carriers, pavement, bridge, and traffic management programs. His expertise includes data analysis methodology, user-interface design, strategic planning, human factors, human/computer interaction, group performance improvement, learning, motivation, customer service evaluation, system performance improvement, and organizational change. Recent work includes development of web-based training in traffic records systems, revision of the NHTSA Traffic Records Program Advisory and Assessment, and research on crash data quality and process improvement. Dr. Scopatz has served as a media expert on issues related to safety impact of unlicensed drivers and other traffic safety issues.

EXPERIENCE
1996 to Present
Data Nexus, Inc.

- Maintains responsibility for strategic planning, data base development, survey design, and data analysis projects
- Participates in design and development of software modules for public safety management and data analysis/reporting, user interface design, and evaluation from a human factors perspective
- Conducts training needs assessments and training course development
- Participates in state-level strategic planning efforts and was recently a panel member for a NHTSA Assessment of Traffic Records in Idaho and Delaware

Recent projects include: revision of the NHTSA Traffic Records Advisory, development of web-based training in Traffic Records data and analysis, Traffic Records Audits and Strategic Plans for Oregon, Wyoming, and Missouri, participation in numerous NHTSA state Traffic Records Assessments, development and implementation of a method for auditing crash report quality used for Federal Motor Carrier Safety Administration (FMCSA) and AAA Foundation for Traffic Safety projects; support for FMCSA's Commercial Vehicle Analysis & Reporting project (CVARS); and the *Unlicensed to Kill: The Sequel* project examining driving without a valid license for the AAA Foundation for Traffic Safety.

1991 to 1996
Star Mountain, Inc

- Maintained responsibility for data analysis, data base development, training evaluation and design, literature reviews, employee knowledge and attitude assessment,
experimental design and technical reporting in support of system performance improvement, Human Factors, and training projects

- Designed and developed a course module on Applied Statistics for the US Air Force School of Aerospace Medicine
- Researched and wrote guidelines for the user interface and online data presentation chapters of a Human Factors Handbook for Advanced Traffic Management System’s control center design
- Performed data collection and analysis evaluating employees’ knowledge of IRS modernization programs
- Researched Human Factors Guidelines for online aiding of computer use
- Conducted a Technical Analysis of the Quality Assurance and Revalidation Program for Navy pilot physiological training devices

Projects included development and evaluation of a model court records system to meet the needs of judges and prosecutors for the National Highway Traffic Safety Administration (NHTSA), development of a NHTSA traffic records analysis training course, strategic planning for Safety Management Systems in several states, and development of a career development system in the Defense Information Systems Agency (DISA).

1985 to 1990

New York City Department of Transportation

Acting Assistant Commissioner

- Directed the agency’s central analytic office
- Automated field data collection for the Pavement Management System by creating a laptop-based condition assessment procedure and geo-coded street index
- Standardized data collection methodologies based on accepted principles of statistical data analysis and valid research techniques
- Revised and published training protocols for the complete array of traffic field surveys
- Developed and managed the agency’s customer service evaluation and improvement program
- Implemented quality control procedures for numeric information
- Developed automated, paperless reporting systems for all agency monthly indicators
- Performed mathematical and statistical analyses to model traffic flow and infrastructure condition over time in support of policy-making for capital expenditures and traffic enforcement programs

Projects included: implementation of an annual condition assessments for surface streets; research and production of a policy statement comparing bridge infrastructure spending strategies' effects on traffic flow, air quality, and economic vitality; a simulation study of parking enforcement's effect on midtown traffic speeds in support of congestion pricing initiatives; and a field video study of intersection traffic control effects on traffic flow.
EDUCATION

Ph.D.  Experimental Psychology  Columbia University  1992
M.A.  Experimental Psychology  Columbia University  1982
B.S.  Psychobiology  University of Southern California  1980

AFFILIATIONS/PROFESSIONAL ASSOCIATIONS

- National Safety Council - Traffic Records Committee; Association of Transportation Information Professionals (ATSIP) (Executive Board and President 2005-2006)
- AASHTO/TRB – Highway Safety Manual content review panel.
- TRB/USDOT – Data Needs for SAFETEA-LU ad-hoc outreach panel.
- Transportation Research Board; Committee on Statistical Methodologies, Statistical Computer Software in Transportation Research (A5011 past member)
- Transportation Research Board; Committee on Safety Data, Analysis and Evaluation (ANB20 – current member)
- State of Florida Safety Management System Committee (past member) and co-developer of the SMS Truck/Bus Subcommittee's Research Agenda
- NCHRP Panel Member: Project 20-05, Synthesis Topic 31-02 "Statistical Methods For Highway Safety Analysis"

SELECTED PUBLICATIONS


*Ohio OVI Tracking System Plan.* Prepared for the Ohio Department of Public Safety:


*NHTSA Traffic Records Assessment* for the states of Colorado, Delaware, Georgia, Idaho, Indiana, Kansas, Kentucky, Massachusetts, Minnesota, Michigan, New Jersey, Ohio, Tennessee, and Virginia with various team members.


Customer Service in Government. Seminar conducted in the Current Topics course for Industrial/Organizational Psychology graduate program, University of Central Florida.


LANGSTON A. (LANG) SPELL

1883 Tower Lakes Blvd.
Lake Wales, FL 33859-4807
E-mail: Lang_Spell@yahoo.com

Independent Consultant

Professional Experience

Mr. Spell entered his professional career in traffic records systems and data exchange over 50 years ago. He is nationally recognized for his work in development of traffic records systems, especially interchange (NDR and CDL) of information amongst various users and the development and promulgation of data standards in information processing.

He served as a member of D16.1 committee. He developed the AAMVA Violations Exchange Code or “ANSI” code (predecessor of the AAMVAnet Code Dictionary or ACD which he also co-developed) while employed with AAMVA and later served as the Accident (Crash) Subcommittee Chairman for the ANSI D-20 Standard, A States Model Motorist Data Base, while employed with the National Highway Traffic Safety Administration.

While employed with NHTSA he created the original reporting forms and file structure for the Fatality Analysis File which was renamed in 1975 as the Fatal Accident Reporting System (FARS) and later renamed again, the Fatality Analysis Reporting System (FARS). He and his staff conducted the training for all of the original analysts.

As an independent consultant, he conducted the NHTSA Uniform Traffic Ticket Study to determine the extent and details of emerging Citation Tracking Systems. He conducted all aspects of the study including on-site State visits and assessments to determine the extent of control being exercised in citation issuance, processing of conviction information through the courts, and recording conviction dispositions in driver history files.

In the private sector, he developed numerous Crash Report forms, instruction manuals for crash reporting, data input procedures, all edits to assure data quality, and reporting and analysis procedures for problem identification. He also developed the EMS Run Report for Kentucky.

He designed the graphical user interface for the Highway Traffic Records Information System for the Virginia Department of Transportation (VDOT) and provided training in the use of the system to the district offices of VDOT.

He was involved in the design and developmental efforts for the Commercial Driver Licensing Information System (CDLIS) and its AAMVAnet environment and was a member of the AAMVAnet “Tiger Team” that made the assessments of selected States to become pilots and eventual founding States in the National Motor Vehicle Title Information System. His background, experience and interested cover the entire spectrum of traffic records systems.
**History**

1992 – “present” Independent Consultant (now essentially retired)

National ConServ, Inc.
(but 1980 to 1983: Independent Consultant)

1974 – 1977 Vice President GENASYS (Systems Division)
(now Keane, Inc.)

1968 – 1974 Chief, Information Systems, NHTSA,
US Department of Transportation

1966 – 1968 Director of Data Systems for the AAMVA

1958 – 1966 Staff Specialist in MVRs (driver histories) for Retail Credit Co.
(now Equifax) Atlanta, GA

**Memberships in Professional Associations (former)**

- Traffic Records Committee, Transportation Research Board
- American National Standards Institute, D-16, D-20, and X3L8 Committees
- Executive Board, Traffic Records Committee, National Safety Council
- Society of Automotive Engineers Committee on Standardization of Vehicle Identification Numbers

**Education**

Boston University .......................................................... S.T.B., 1956
Duke University .............................................................. A.B., 1953
JOAN VECCHI

Senior Director
Motor Vehicle Division, Colorado Department of Revenue
1881 Pierce Street, Suite 100
Lakewood, Colorado 80214-1492
303 205-8388
E-mail: jvecchi@spike.dor.state.co.us

Professional Experience

Joan Vecchi is the Senior Director of the Colorado Motor Vehicle Division, which houses the Driver’s Licensing, Driver Control, Traffic Records, Emissions, Titling & Registrations, Ports of Entry, IRP, Motor Carrier Services, and Motor Vehicle Investigations Sections. She has held the position for 3 years.

Her prior experience includes twelve years as a Police Officer/Sergeant in Denver. During that period, Joan worked as a technician responsible for Department policy and procedures and design of forms and citations. In this capacity, she acted as liaison between the Department and the County Court to assure that citations met the needs of both entities. Joan left the City of Denver to work at the Colorado Department of Revenue in the Office of Program Analysis as a policy/budget analyst. In that capacity, Joan was responsible for developing budget requests and justifications, analyzing the efficiency and effectiveness of various state programs, auditing the performance of existing programs, and implementing new programs. Later, she was assigned to the Liquor Enforcement Division as Enforcement Manager, where she worked with the industry and law enforcement to assure a fair regulatory system while targeting underage consumption and over-service of alcohol. During her tenure with Liquor Enforcement, Joan was acting Director of the Division for a period of eleven months and implemented the tobacco enforcement program in Colorado.

She was co-chair of the Identity Fraud Working Group, which crafted legislation that allowed the use of facial recognition technology on applicants for driver licenses or identification cards. Investigations using facial recognition prevent issuance of more than 100 fraudulent documents each year. Vecchi is currently a member of a national panel seeking to develop identity security standards.

Currently, Joan is involved with a broad-based group study of aging drivers, in an effort to develop a program that addresses the needs of the older driver population, thereby improving highway safety for all the state’s citizens. She has also been the chair of the Colorado State Traffic Records Advisory Committee (STRAC).

Education

Bachelor of Science, Majors in Law Enforcement and Psychology 1977
Master of Arts, Management emphasis in Human Relations and Organizational Behavior 1984
Numerous professional training courses in law enforcement and management subjects
JOHN J. ZOGBY, PRESIDENT

Transportation Safety Management Systems
1227 North High Street
Duncannon, PA 17020
Voice: (717) 834-5363
Email: jzogby@ptd.net

Summary of Experience

Mr. Zogby has over 40 years experience in highway safety engineering and management and motor vehicle and driver licensing administration.

Mr. Zogby's transportation career began in the Bureau of Traffic Engineering in the Pennsylvania Department of Highways, where he was responsible for statewide application of highway signs and markings. He was instrumental in developing the State’s first automated accident record system in 1966. In the late 1960’s, he helped initiate and was project director for the statewide safety improvement program and the State’s in-depth accident investigation function.

Mr. Zogby worked in the private sector in traffic safety research for several years before returning to public service as the Director of the Bureau of Accident Analysis in the Pennsylvania Department of Transportation. He was appointed Deputy Secretary of Transportation for Safety Administration in February of 1979, a position he held for 13 years, until his retirement from public service in December 1991.

Since his retirement from State government, Mr. Zogby has been engaged as a consultant on management and policy issues for federal, State and local government agencies in the area of transportation safety and motor vehicle/driver licensing services.

Professional and Business Experience

Subcontract with GeoDecisions Consulting on a Safety Analysis Management System (SAMS) for the state of Mississippi.

Subcontract with iTRANS Consulting Inc. on NCHRP project 17-18 (05), Integrated Management Process to Reduce Highway Injuries and Fatalities Statewide for the Transportation Research Board.

Contract with the National Academy of Sciences (NAS) to provide AASHTO Strategic Highway Safety Plan - Case Studies (17-18(06)) for the Transportation Research Board.

Subcontractor with ISG, a systems integration consulting company, conducting a reengineering contract with the Pennsylvania Department of Transportation in the area of motor vehicle processes.
Subcontractor with the Pennsylvania State University to research the impact of an education provision in State law governing novice drivers.

Conducted a three-week course on safety management for the Ministry of Communications in the Kingdom of Saudi Arabia.

Subcontractor with a Moroccan Engineering firm to develop a national highway safety plan for the Country of Morocco.

Completed a study for the State of Mississippi, Department of Public Safety, to develop a Strategic Plan for Highway Safety Information.

Contracted by the Federal Highway Administration, Office of Motor Carrier Safety, to help in the final implementation phase of the Commercial Driver License (CDL) program.

Consulted with several States in assessing their Traffic Records capabilities to address highway safety program management needs. In addition, completed Traffic Records Assessments for three Indian Nations in Arizona.

Project director and principal instructor for a Federal Highway Administration (FHWA) contract to develop, implement, and instruct a training program for the Highway Safety Management System.

**Professional Societies and National Committees**

Member Institute of Transportation Engineers (ITE).

Member Emeritus of the Transportation Research Board (TRB) Committee on Transportation Safety Management.

Chair TRB task force on Safety Management status.

Member of the National Safety Council’s Association of Transportation Safety Information Professionals.

Past President of the Mid-Atlantic Section of ITE.

Past Chair of the National Safety Council’s Traffic Records Committee.

Past President of Region 1 of the American Association of Motor Vehicle Administrators.

Chaired the Governing Board of the International Registration Plan.

Chaired a subcommittee of the NGA Working Group on State Motor Carrier Taxation and Regulation.
Completed six-year tenure as Chair of the TRB committee on Planning and Administration for Transportation Safety.

**Community**

President, Duncannon Area Revitalization, Inc.

Pastoral Associate, St. Bernadette Church, Duncannon, PA

**Education**

B.S., Economics, Villanova University

MPA, Penn State University