2014
Crash Data Audit

AN INVESTIGATION OF POLICE CRASH REPORTS TO ESTABLISH AND ASSESS CURRENT OBSTACLES AND FUTURE PERFORMANCE MEASURES AND MONITORING

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SUBMITTED BY

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EXECUTIVE SUMMARY

Each year in Massachusetts, motor vehicle crashes result in hundreds of fatalities and thousands of injuries. These numbers represent an outstanding toll, not only in terms of lives lost, but also due to the financial burden put upon Massachusetts residents. Facing a reality of fewer resources, highway safety professionals need a strategic approach to programming.

To reduce traffic crashes, high quality crash data is needed. This information helps transportation safety stakeholders to identify problems, develop and implement countermeasures, and evaluate outcomes. Therefore, the timely, accurate, complete, consistent, and accessible crash data produced from crash reports is critical for saving lives and preventing injuries associated with motor vehicle crashes. This data helps decision-makers to understand the nature, causes, and injury outcomes of varying crashes, so they can design strategies and interventions that will reduce crashes and their consequences. Crash prevention programming is only possible because of the data collected by police on crash reports. This valuable data is utilized by federal and state partners.

With Traffic Safety Information System Improvement Grant (405c) funds, awarded by the Traffic Records Coordinating Committee (TRCC) and the Executive Office of Public Safety and Security (EOPSS) Highway Safety Division (HSD), the University of Massachusetts Traffic Safety Research Program (UMassSafe) conducted a quality control review by means of a crash data audit (CDA). The CDA investigated police crash reports in order to establish and assess current obstacles and future performance measures, and monitor criteria and findings to develop a Police Crash Report Data Quality Improvement Plan (DQ Improvement Plan).

PROJECT OBJECTIVES

The overarching goal of the project was to improve the accuracy, completeness, timeliness, and consistency of police-collected crash data, along with the overall quantity and quality of data collected, by identifying existing issues and concerns. In order to more effectively identify problems and evaluate program effectiveness, the objectives were:

Accuracy

- To assess and establish accuracy rates of police crash report fields, to be used as performance measures for assessing progress over time; and
- To identify a minimum of five police crash report fields with discrepancies or incomplete data, with recommendations for correction.

Completeness

- To assess and establish completeness rates of police crash report fields, to be used as performance measures for assessing progress over time; and
- To identify a minimum of five police crash report fields with incomplete or invalid data, with recommendations for correction.

CRASH DATA AUDIT PROCESS

The CDA was a quantitative review of a random representative sample of crash reports, including paper reports submitted by local police, electronic reports submitted by local police, and electronic reports submitted by State Police. The CDA focused on the areas of concern listed below (recommendations within the DQ Improvement Plan are outlined for these areas as well).

- Areas of concern that could be addressed by modifications to the crash report form, including design or wording changes to improve usability, and accuracy of data recorded;
- Areas of concern that could be addressed with improvements to data collection and entry systems used by State and local police; and
- Areas of concern that could be addressed through guidance, technical assistance, and training of police.

A panel of experts in crash data collection and reporting, and/or crash data analysis, performed a manual review of each crash report in the sample. These reviewers worked in teams of two to review a subset of crashes in the sample for accuracy, which in the context of this audit referred to internal consistency and completeness of the data. Sufficient internal consistency indicated that the report's description of the crash, the vehicles, and the people involved, contained no contradictory information. Sufficient completeness indicated that the appropriate data fields were utilized and that the report contained the minimum information required. For a report to have the minimum information required fields had to have valid responses/values and the narrative and diagram had to be completed. The level of detail associated with these sections was reviewed individually by the reviewers.

CRASH DATA AUDIT FINDINGS

The audit of a sample of police-completed crash reports that were submitted by local and State Police (both in paper format and electronically) provided interesting information that may be used as guidance for future efforts aimed at improving the quality of Massachusetts crash data. The most notable findings are outlined below, divided into the following sections: 1) crash level, 2) location level, 3) vehicle level, 4) non-motorist level, 5) driver level, and 6) passenger level.

Crash Level Findings

- *Latitude* and *Longitude* were fields often left incomplete by local police (paper and electronic reports). This field was completed more often on State Police reports, but it was often 0.00 or an irrelevant location.
- *Time of C*rash was often found to be invalid due to the use of the standard (AM/PM) format, instead of the required military time. Most often, this was true for State Police electronic reports.
- Although the *Speed Limit* field was completed by State Police often, it was left empty by local police more than 50 percent of the time.

- The *Traffic Device Functioning* Code presented challenges for all police types, due to a value being entered for the Traffic Device Functioning Code when 'No Device' was selected in the preceding field, *Traffic Control Device Type*.

- *Roadway Intersection Type* was found to be unacceptable more often for local police (paper and electronic), which may have been due to the higher variety of intersection types on local roads patrolled by local police, as compared to interstates and state routes patrolled by State Police.

- The *First Harmful Event Location* field had a 6 percent rate of inconsistent/incomplete information.

- While *Weather C*onditions were often completed in an acceptable manner, State Police had a slightly higher incidence of leaving the field empty, while local police had a higher rate of inconsistencies between this field and other fields on the crash report.

- The *Road Contributing Circumstances* field, a new crash report field, was left empty about 5 percent of the time. This was only examined for police departments using the new crash report, which excluded State Police.

- The *First Harmful Event* field was found to be incomplete more often for local police (paper and electronic) than State Police, but was inconsistent with other information on the crash report for both police types.

Location Information Findings

For 89 percent of reports reviewed, the *Crash Diagram* was rated as adequate. Additionally, approximately 87 percent of reports contained a north arrow. Auditors were unable to determine whether the existing north arrow was being used correctly. Other challenges included a missing *Roadway* name or a general lack of specificity. Also, some crashes (most often submitted by local police) were found to have occurred on a private way or in a parking lot, and should not have been reported to the Massachusetts Department of Transportation (MassDOT) Registry of Motor Vehicles (RMV) Division. Auditors explained that some officers responding to crashes that occurred in a parking lot may have completed a crash report to be helpful for insurance or store liability purposes. Even in these situations, the report could be filed at the police department, instead of being submitted to the RMV.

A later review, conducted by UMassSafe, identified 25 crashes that occurred on a private way that should not have been reported. The majority of these crashes occurred in the local police (electronically submitted) sample, which was likely due more to varying police department policies on reportable crashes, and less because of vendor differences.

The Intersection Method was the method of location that had the highest percentage of crashes that could be adequately geolocated (81 percent). The rates of successful geolocation were much higher for local police than State Police. However, State Police rarely used this location method (n=20). The *Direction* was often missing on reports using the *Intersection* Method. In almost 32 percent of these cases, the *Narrative* and/or *Diagram* provided additional information that was helpful for geolocating the crash. The common inconsistency on local police reports was whether the crash occurred in an

intersection or in close proximity to an intersection. State Police auditors indicated that even if two intersecting roadways were entered into the State Police Record Management System, called RAMS in the 'At Intersection' section, it is populated and transferred to the RMV in the 'Not at Intersection' section. The way RAMS is designed, the officers likely do not realize that their default is 'Not at Intersection'.

Auditors deemed the Address Method to be inadequate when either the road name was given, but not the address number, or if the Intersection Method would have been more appropriate. The Address Method was used effectively by local police, meaning that the crashes were able to be geolocated, 78 percent of the time. Conversely, when State Police used the Address Method, crashes could only be geolocated 14 percent of the time. However, State Police rarely used this location method (n=13). As described earlier, for State Police reported crashes that should have used the Intersection Method, some may have been populated and/or transferred to the RMV using the Address Method. The *Narrative* and/or *Diagram* provided additional information that was used to locate the crash in 38 percent of the sample reviewed.

The Mile Marker Method of locating a crash was only used by State Police. Although auditors found this method to be adequate 73 percent of the time, after further review by UMassSafe, it was determined that none of these crash reports had the *Distance from Mile Marker* filled in, and only 63 percent had the *Route Direction* filled in, making it difficult to determine the precise location of the crash. Furthermore, the Mile Marker Method had the lowest percentage (22 percent) of reports containing additional information in the *Narrative* and/or *Diagram* that would help in the geolocation of the crash.

Even though mile markers are self-explanatory, and don't leave much room for error (exactly why they are preferred), discussion with officers helped to explain the potential for problems. Officers suggested that when they're situated on the side of a busy roadway, they are focused on collecting the pertinent people/vehicle information, and plan to complete the remaining pieces (including location) after they have left the crash scene.

The Exit Ramp Method was only used by State Police, with less than 28 percent of reports within the sample having adequate information to geolocate the crash. The *Route Direction* of the roadway (connected to the ramp) was provided on only 49 percent of the reports reviewed. Another issue with this location method was that the *Distance* of the crash location from the exit ramp was only provided on about 5 percent of reports. Furthermore, only 31 percent of the reports audited in this sample had additional information in the *Narrative* and/or *Diagram*.

Auditors determined that there is a lack of instruction and training on how to use this field properly. Often, an exit will be listed as the location by the officer because it is the nearest landmark, but the crash being described actually occurred in the travel lane of the highway. Additionally, there is confusion around how to properly use the distance field, and from where to measure. The greatest impact on the usability of this data is the lack of information in the *Direction* field. Without this piece, people using the data could be looking at a ramp that is different from where the crash occurred. For example, the northbound and southbound directions of a highway both have an 'Exit 4', but they are in different

locations, connect to different sections of the cross-road, and could have completely different landscape attributes and roadway designs.

Vehicle Level Findings

- The *Hit and Run* field was found to be challenging for both police types, although less so for State Police reported crashes. Officers were confused about which vehicle the Hit and Run box should be checked for, and also how to complete information for the unknown driver/vehicle.

- State Police reports were often found to have the *Towed from* Scene field incomplete. In some instances, the field was left empty because the car in question was parked.

- The *Sequence of Events* field often had only one or two options completed, when other information on the report specified additional events that would have been appropriate to include in this field.

- The *Damaged Area* field was incomplete or inconsistent with other information on the report in more than 6 percent of reports reviewed. Law enforcement auditors indicated that the format for this field was easier on the older crash report.

- For the *Most Harmful Event* field, it appeared that officers found it challenging to single out which event was most harmful.

- *Owner Inf*ormation was incomplete more often when either the owner of the vehicle was a business, or when it was a case of hit and run, and therefore, officers did not have the information and were unclear on how to document the situation.

- Challenges with the *Number of Occ*upants field were often due to having more occupants listed in this field than in the passenger section. Additionally, if the vehicle was involved in a hit and run, it was likely that the officer did not have information regarding the occupants, and was unclear on how to document the situation.

Non-Motorist Level Findings

Due to a very small percentage of crashes involving a non-motorist, these crash reports were specifically analyzed after the audit by UMassSafe staff. Although all non-motorist fields had acceptable findings that were under 95 percent, the small sample size (n=42) could be at fault. The non-motorist field that was most frequently considered unacceptable was *Non-Motorist Safety System Used*, followed by the *Non-Motorist Indicator Box*, *Non-Motorist Action*, and *Non-Motorist Location*.

Driver Level Findings

- The *Driver Distracted By* field was often incomplete. Auditors commented that informal policies varied by department, sometimes requiring that a citation be issued in order to use this field.

- *License Class* was often incomplete across all police submission types, but more often by State Police. This field presented the greatest challenge for law enforcement in cases where there was no license, or an out of state license.

- *Medical Facility*, for both driver and passenger, was often left incomplete, even with the Transport Code indicating that the driver or passenger was transported. Auditors recommended providing a drop-down menu for Medical Facility that would include all such facilities, as well as options for 'not applicable' and 'unknown'.

- The *Safety System Used* field was often incomplete. In instances where this field was completed, auditors commented that the information was often unverified, based only on the information provided by the driver. This field was also challenging for collisions that involved a parked vehicle or a hit and run crash.

- *Responding to Emergency* is a field that was often incomplete for local police (paper and electronic) reported crashes. Law enforcement auditors indicated that when officers leave this field empty, it is an indication that the vehicle was not responding to an emergency.

- The Driver *Transported* field was often incomplete. It appears that many officers leave this field empty when the driver is not transported.

- The Driver *Airbag Status* field was often left blank, even though officers completing the crash report should have been able to determine whether the airbag deployed.

- *Travel Direction* was often incomplete for local police paper submitted reports. Auditors discussed the varying interpretation of this field, unsure if it's the overall road lane travel direction, or the trajectory in which the vehicle was moving. This confusion may contribute to the higher rate of incomplete data for crashes on local roads.

- In reports that had inconsistencies for the *Driver Contributing C*ode, the greatest percentage came from paper submissions by local police, while incomplete information was found more often for State Police reports. Auditors commented that police departments had varying informal policies regarding their use of this field, along with its relationship to the cause of the crash and citations issued.

- The *Driver Ejected, Trapped* and *Injury Status* fields were incomplete in approximately 5 percent of the reports reviewed, most often on paper reports submitted by local police. Law enforcement auditors commented that police might leave this row of fields empty if the air bag was not deployed, or the driver was not trapped. Auditors also discussed the lack of specificity for each injury status option, and suggested more detailed clarification on each of the options.

<u>Passenger Level Findings</u>

- All passenger level fields were incomplete or inconsistent in more than 10 percent of the reports audited. The greatest challenge was for State Police reports, where these fields were left incomplete more than 25 percent of the time. Furthermore, these fields were left incomplete more often when there were no passenger injuries.

General Findings

- Across police types, there was no consensus regarding the appropriate level of detail to include in the narrative section of the crash report.
- Similar to the 2005 CDA, there were overall challenges associated with crashes, where critical information was not available. These instances included collisions with a parked car, where driver information either wasn't relevant or couldn't be easily collected, and hit and run crashes, where the driver information was relevant, but difficult or impossible to obtain.

Results by Vendor Type

Most of the fields described above were also examined by vendor type. However, the sample was not designed to provide statistically significant results by vendor type (beyond the scope of the project), and the sample size was small for some of the vendors. Nevertheless, crash reporting from IMC/Tritech appeared to be more complete and acceptable/consistent, while reporting from QED and the combined 'others' appeared to be less complete and acceptable/consistent.

OVERVIEW OF RECOMMENDATIONS

Based on the quantitative and qualitative findings of the CDA, as well as a review of the recommendations of the previous CDA and other data quality reviews, a list of recommendations was created. They have been grouped into three areas, with each area containing major recommendations, as well as a series of detailed recommendations that elaborate on the major ones. As an overview, the three areas, along with the associated major recommendations, are listed below. These serve as a framework for the DQ Improvement Plan. This plan can be used by the EOPSS HSD, TRCC, and other highway safety stakeholders, as a tool to prioritize projects, allocate resources, and work collaboratively to improve crash data quality in Massachusetts.

Modifications to Crash Report Form Used by Police to Record Crash Information

- Crash report and related database revisions: Phase 1.
- Establish standards for reporting fields that are currently less defined.
- Crash report and related database revisions: Phase 2.
- Consider long-term options for electronic data collection.

Improvement of Data Collection and Entry Systems Used by State and Local Police

- Standardize the data collection and entry systems.
- Improvements for State Police RAMS.
- Enhancements for both State and local police systems.

Guidance, Technical Assistance, and Training for Police Regarding Crash Reporting

- Provide crash reporting information regarding challenging fields and areas of concern.
- Expand knowledge and understanding among law enforcement on the importance of crash data and how it is used.

- Improve information exchange and dissemination with individual police departments on identified data quality issues.

MASSACHUSETTS POLICE CRASH REPORT DATA QUALITY IMPROVEMENT PLAN

The findings of the CDA and the associated recommendations were used to create a comprehensive DQ Improvement Plan that will be used to guide future data quality efforts. This plan was developed to provide recommendations to the TRCC, state agencies, police, and other stakeholders, for improving identified problem areas. Recommendations provided in the DQ Improvement Plan include details regarding the type of recommendation (systems, training, etc.), the problem being addressed, which agencies should be involved in the implementation of the recommendations, and an estimated timeframe for implementation (short, medium, or long).

Recommended Changes to Crash Report

For the recommendation suggesting modifications to the crash report used by law enforcement, the DQ Improvement Plan outlines specific crash report form changes. These include changes to instructions, fields, and the response options to fields. The plan also recommends the establishment of standards for specific fields, and the need to plan long-term crash reporting improvements, such as registration barcodes and the scanning of driver's licenses.

Recommended Changes to Data Collection Systems

Also outlined in the DQ Improvement Plan are enhancements to data collection/entry systems used by State and local police. These enhancements include the need for standardization across the various Record Management Systems (RMSs), as well as the possibility of creating a vendor certification process, or moving to one web-based data collection and entry system. The plan further outlines specific improvements that could be made to the State Police RAMS system and the local police RMSs. Some of these improvements include changes to specific fields that were found to be problematic in the CDA, and others would help to identify (for police) areas on the crash report that need more attention to detail. This might include a reminder pop-up window for particular information, or edit checks.

Recommendations for Educating Law Enforcement

The DQ Improvement Plan also outlines specific crash reporting problems that could be addressed through the provision of guidance, technical assistance, and training for police. This assistance could be provided by the Law Enforcement Liaisons (LELs), as they work with individual police departments. Further support will also come from the E-Crash Manual, which is currently in development. Specific information regarding challenging fields and areas of concern could be provided to law enforcement. In addition, sharing more about how crash data is used could give police officers more context around the importance of gathering complete and accurate information. Finally, the DQ Improvement Plan outlines methods for sharing identified data quality concerns with individual police departments.

These recommendations could be implemented through current and planned 405C-funded projects, and may include use of the LELs, and the RMV and UMassSafe project regarding *Crash Reports Accepted with Warning and Technical Assistance to Police Departments*. In addition, the planned project, *Tools for Improving Crash Report Reviews,* which includes guidelines for crash narratives and a web-based data quality tool, could be used for this purpose.

INTRODUCTION AND PROJECT BACKGROUND

Each year in Massachusetts, motor vehicle crashes result in hundreds of fatalities and thousands of injuries. These numbers represent an outstanding toll, not only in terms of lives lost, but also due to the financial burden put upon Massachusetts residents. Facing a reality of fewer resources, highway safety professionals need a strategic approach to programming.

To reduce traffic crashes, high quality crash data is needed. This information helps transportation safety stakeholders to identify problems, develop and implement countermeasures, and evaluate outcomes. Therefore, the timely, accurate, complete, consistent, and accessible crash data produced from crash reports is critical for saving lives and preventing injuries associated with motor vehicle crashes. This data helps decision-makers to understand the nature, causes, and injury outcomes of varying crashes, so they can design strategies and interventions that will reduce crashes and their consequences. Crash prevention programming is only possible because of the data collected by police on crash reports. This valuable data is utilized by federal and state partners.

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The overarching goal of the project was to improve the accuracy, completeness, timeliness, and consistency of police-collected crash data, along with the overall quantity and quality of data collected, by identifying existing issues and concerns. In order to more effectively identify problems and evaluate program effectiveness, the objectives were:

<u>Accuracy</u>

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<u>Completeness</u>

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- To identify a minimum of five police crash report fields with incomplete or invalid data, with recommendations for correction.

To assist in the identification of incorrect or incomplete fields, or those resulting in poor data, a CDA of Massachusetts police crash reports was conducted in 2001 by Data Nexus and in 2005 by UMassSafe. In 2014, with the 405c funds, UMassSafe conducted another CDA of police crash reports, as recommended in the 2014 Massachusetts Traffic Records Assessment [3].

The 2014 Massachusetts Traffic Records Assessment, conducted by a NHTSA technical assessment team, examined six primary data quality attributes for the core traffic records systems in Massachusetts. These attributes included timeliness, accuracy, completeness, uniformity, integration, and accessibility. For the crash component, Massachusetts met the criteria outlined in the Traffic Records Assessment 43.2 percent of the time, and received a total score of 68.1 percent. Specifically, the data quality control programs within the crash agenda received a 55.8 percent rating. The recommendation of the assessment team was for quality control reviews comparing the narrative, diagram, and coded contents of the crash report to be conducted, and that findings should be used to both guide TRCC data quality discussions, as well as to inform the statewide crash database's data acceptance process (Q 75). Furthermore, the assessment team recommended that independent, sample based audits be conducted periodically, for both crash reports and related database contents (Q 76).

The methodological approach employed for the 2014 CDA was consistent with the approach used in 2001 and 2005. This included a review of both paper and electronic crash reports submitted by local and State Police for 2014 crash reports (the most recent closed year of crash reports at the time the CDA was conducted).

Massachusetts Crash Reporting Process

In accordance with Massachusetts law, a crash report must be completed at the scene of any crash that results in a fatality, an injury, or damages over $1000. Crash data collection and reporting begins when local and State Police officers complete the "Commonwealth of Massachusetts Motor Vehicle Crash Report," which is produced and distributed by the Massachusetts Department of Transportation (MassDOT) Registry of Motor Vehicles (RMV) Division. The RMV Crash Data System (CDS) is a database maintained by the RMV Division with the purpose of collecting, storing, and transmitting Massachusetts crash reports. When local and State Police enter crash reports into a RMS at their employing location, or complete one on paper, the data is either mailed or electronically transmitted to the RMV CDS.

METHODOLOGY

With more than 100,000 crashes reported by police in Massachusetts each year, it is impossible to examine every crash report. Instead, the Massachusetts CDA utilized a representative sample. Teams of auditors then reviewed each of the reports in the sample.

Sample Selection Process

UMassSafe used the process outlined below to select crash reports for the CDA. Specifically, the process incorporated 3 steps: 1) querying of eligible records from CDS, 2) preparation of eligible records for sample selection, and 3) selecting and describing records included in the sample.

Step 1 - Querying of Eligible Reports

Crash reports that were eligible for inclusion in the CDA were queried from the UMassSafe Traffic Safety Data Warehouse data tables for CDS. To be eligible for inclusion, the crash report had to correspond to a crash that occurred between January 1, 2014 and December 31, 2014. Three CDS data tables were used to query records: CRASH_REPORT_DOCUMENT, CRASH_REPORT, and CRASH.

CRASH_REPORT_DOCUMENT was linked to CRASH_REPORT through the CRASH_RPT_NUMB field. Subsequently, CRASH_REPORT was linked to CRASH through the CRASH_NUMB field. By including the master CRASH table in the query, any records that may have been deleted, were considered non-qualifying, etc., were removed from the pool of eligible reports. Other fields that were included in this query for potential use later in the sample selection process are shown in the table below.

Fields included in eligible records query

FIELD	TABLE	DESCRIPTION	REFERENCE
CRASH_DATE	CRASH	Date crash occurred	c.crash_date
CRASH_NUMB	CRASH	Unique identifier at crash level	c.crash_numb
POLC_AGNCY_TYPE_CODE	CRASH	Type of police agency reporting crash (state, local, etc.)	c.polc_agncy_type_code
CRASH_RPT_NUMB	CRASH_REPORT_DOCUMENT	Crash report number to be used in random sample selection process	crd.crash_rpt_numb

CRASH_RPT_TYPE_CODE	CRASH_REPORT_DOCUMENT	Status of report such as incomplete sent to fatal, pending criminal, etc. (Note that field is empty in 99% of eligible records)	crd.crash_rpt_type_code
CRASH_REPORT_STATUS_CODE	CRASH_REPORT	Status of report such as incomplete sent to fatal, pending criminal, etc.	cr.crash_report_status_code
DATE_PROCESSED	CRASH_REPORT_DOCUMENT	Date crash report was processed which may be used to identify "newest" version of report.	crd.date_processed
DOC_BATCH_NUMB	CRASH_REPORT_DOCUMENT	Batch number to be used in pulling the paper versions of crash reports at the RMV	crd.doc_batch_numb
DOC_SEQUENCE_NUMB	CRASH_REPORT_DOCUMENT	Within each batch number, the location of the report	crd.doc_sequence_numb
DOC_TYPE_CODE	CRASH_REPORT_DOCUMENT	Identifies whether report is police (paper or electronic), operator, or fatal	crd.doc_type_code

The following SQL query was used to query information from the data warehouse CDS data for 2014.

```
select
        c.CRASH_DATE,
        c.CRASH_NUMB,
        c.POLC_AGNCY_TYPE_CODE,
        CR.CRASH_REPORT_STATUS_CODE,
        crd.CRASH_RPT_NUMB,
        crd.CRASH_RPT_TYPE_CODE,
        crd.DATE_PROCESSED,
        crd.DOC_BATCH_NUMB,
        crd.DOC_SEQUENCE_NUMB,
        crd.DOC_TYPE_CODE

        FROM

        CDS.CRASH_REPORT CR,
        cds.CRASH c,
        cds.CRASH_REPORT_DOCUMENT crd


        WHERE
        crd.CRASH_RPT_NUMB = cr.CRASH_RPT_NUMB and
        CR.CRASH_NUMB = C.CRASH_NUMB and
        to_char (c.CRASH_DATE, 'YYYY') in ('2014')
```

For 2014, there were a total of 137,656 crash records in CDS (yielded from the SQL query above). However, in the 137,656 records, there were crash numbers that appeared more than once, resulting in 130,221 unique crash numbers. Therefore, with sampling at the crash report level (and then examining the specific report), we began with a "universe" of 137,656 crash reports.

FATAL CRASHES

Two major characteristics associated with fatal crash reports make them vastly different from non-fatal crash reports:

- Crash reporting: Fatal crash report information may be submitted by police in a similar manner to that of non-fatal crash information. These fatal crash reports are coded with DOC_TYPE_CODE=FP. However, fatal crash records may also be created based on information taken from other data resources (such as accident reconstruction data) or from popular sources such as newspapers. These fatal crash reports are coded with DOC_TYPE_CODE=FR.
- Coding: While non-fatal crash reports are coded with information that indicates whether they were submitted in paper format (DOC_TYPE_CODE-PR) or electronically (DOC_TYPE_CODE=PW), this information is not included for fatal crash reports. As described previously, the DOC_TYPE_CODES associated with fatal crashes indicate whether they were submitted by police (FP), taken from other sources (FR), or submitted by an operator involved in the crash (FO). While we can determine whether the report was submitted by state or local police based on the

POLC_AGNCY_TYPE_CODE, we cannot determine whether the police submitted the report electronically or via paper submission. This eliminated the ability to classify these reports into the strata selected for the audit.

Due to the unique circumstances surrounding fatal crashes, and the differences between the way fatal and non-fatal crashes are reported to CDS, fatal crashes (DOC_TYPE_CODE=FP) were eliminated from the pool of eligible records. Also eliminated were amended reports (DOC_TYPE_CODE=PA) and operator reports (DOC_TYPE_CODE=OR).

There were 154 fatal crash records coded with FP, 1 crash record coded with OR, and 340 crash records coded with PA. Removing these 495 crash records from the original pool of 137,656, left 137,161 crash records in the "universe". This allowed for multiple reports to exist for the same crash. For example, there were cases where a local police agency and the State Police submitted individual reports for the same crash. Since the samples were drawn based on the document type code and police agency type, there was no duplication at the record level.

Step 2 - Preparation of Eligible Records for Sample Selection

Following the exclusion of crash reports associated with a fatal crash or amended report, there were 130,113 unique crash numbers (c.crash_numb). A table was created with the fields described in the previous table for only these records. Four sub-tables were also created, including one for each local police paper submission, local police electronic submission, State Police paper submission, and State Police electronic submission. Included under the local police category were records submitted by local police, along with campus security and MBTA police. The number of eligible records in each sub-table is shown in the table below. Note that eligible records are at the report level, not the crash level. Therefore, if a crash has multiple reports associated with it, that crash would appear in all of the related strata, meaning that a crash with one electronic State Police submission and one paper State Police submission would appear once in each of those categories.

Number of Eligible Records by Audit Strata

Agency Type	Report Type	Eligible Records
State Police	Electronic	20,279
State Police	Paper	33
Local Police	Electronic	81,510
Local Police	Paper	35,339

Step 3 - Sample Selection and Description of Records in the Sample

The sample was drawn by random sample selection, without replacement, using Microsoft Excel. The sample selection process was based on binomial distribution sample size selection. The sample size selection was based on a 95 percent confidence interval and a "worst case scenario" error rate. This "worst case scenario" error rate was selected, as there is no previous documented analysis providing a base error rate from which to start. Using this "worst case scenario" didn't skew the actual results of the data quality review; it only ensured that the sample size selected was large enough that the results would be significant. The "worst case scenario" accounts for the greatest margin of error possible; it is

the most conservative scenario for selecting sample size. Specifically, when sampling from a binomial distribution (i.e. 2 choices - responses are either correct or incorrect) the greatest margin of error occurs when half of the responses are correct and half are incorrect.

Based on this, the sample size was selected using the following formula, which is based on a 95 percent confidence level, and a confidence interval of plus or minus 5:

Sample Size (ss) = [z2 * (p) * (1-p)]/ c2

where z = the z value (standard statistics table). For 95 percent confidence interval, z value is 1.645
p = percentage of people selecting given answer. For worst case scenario, p = 0.5
c = confidence interval in decimal

This yielded a maximum sample size for these specifications of 385 (384.16 rounded up). This was adjusted for specific population sizes using the following formula:

Population Based Sample Size = ss/1+((ss-1)/pop)

Sample sizes were identified for four categories: local police and State Police, and within each of those, electronic or paper submission. The table below shows the sample size required for each of these categories.

This formula was originally applied to the 2014 population sizes provided by the RMV.

State Electronic Submission = 20,279

State Paper Submission = 33
Local Electronic Submission = 81,510
Local Paper Submission = 35,339

Applying the above formula to these populations yielded the following sample sizes:

State Electronic Submission = 378
State Paper Submission = 30
Local Electronic Submission = 383
Local Paper Submission = 381

While the proportion of reports being considered for each of the four categories varied based on the population size, these were the sample sizes necessary to yield significant results. As shown in the formulas above, the largest sample size necessary to yield significant results for a binomial distribution at a 90 percent confidence level + or – 5 is 385 (regardless of whether the population is 10,000 or 10,000,000).

The table below shows the number of records selected for each stratum, as well as the original sample size as a point of reference. These sample sizes were based on 95 percent confidence levels, with a 5 percent confidence interval.

Sample Size by Audit Strata

Agency Type	Report Type	Sample Size
State Police	Electronic	378
Local Police	Electronic	383
Local Police	Paper	381

In addition, 20 alternate crash reports were randomly selected for each stratum. These records were used in the cases where, for some reason, a record in the original sample could not be used.

HYPOTHESES TESTED

Using the binary distribution selected for the sample selection process, each field on the crash report form was categorized as either "correctly completed" or "incorrectly completed". For each field, we identified with statistical significance the percentage of time a specific field was completed incorrectly (incomplete, invalid, or inconsistent). The definition of "incorrect" may vary from one field to another, but each field was compared to other fields on the crash report and the narrative.

SAMPLE SELECTION PROCESS - ADDITIONAL NOTES

The commercial vehicle section was examined, only to determine whether this section should have been completed (when the narrative or vehicle type indicated the involvement of a commercial vehicle).

For special sections, such as *pedestrian* and *bicyclist information*, the sample size was not adequate to provide detailed information specific to that section. The audit indicated whether the fields were filled out appropriately. For example, if the narrative indicated that a pedestrian was involved in the crash, but there was no pedestrian information, that was counted. However, caution should be used in examining the findings of specific information within the pedestrian section due to the small sample size. Auditors noted confusion in field options for crashes involving bicyclists versus those involving pedestrians, as well as the associated safety systems used, which are listed in the general safety systems field on the crash report, instead of the non-motorist section.

CRASH DATA AUDIT PROCESS

The audit process included participants from a variety of Massachusetts agencies, including MassDOT Highway and RMV Divisions, the Massachusetts State Police (MSP), local police, and UMassSafe, and served to identify fields on the crash report form that yielded high percentages of incomplete, invalid, or inconsistent information. The project outcome was the provision of information regarding how data is collected at the scene of the crash to guide future improvements. The methodological approach employed was consistent with the approach used for the CDAs in 2001 and 2005. The 2014 CDA of police crash reports, which included both paper and electronic crash reports submitted by local and State Police for 2014 crashes (the most recently closed year of crash reports), focused on examining:

- Areas of concern that could be addressed by modifications to the crash report form, including design or wording changes to improve usability, and accuracy of data recorded;
- Areas of concern that could be addressed with improvements to data collection and entry systems used by State and local police; and
- Areas of concern that could be addressed through guidance, technical assistance, and training of police.

AUDIT REVIEW

A panel of experts in crash data collection and reporting, and/or crash data analysis, performed a manual review of each crash report in the sample. These reviewers worked in teams of two to review a subset of crashes in the sample for accuracy, which in the context of this audit referred to internal consistency and completeness of the data. Sufficient internal consistency indicated that the report's description of the crash, the vehicles, and the people involved, contained no contradictory information. Sufficient completeness indicated that the appropriate data fields were utilized and that the report contained the minimum information required. For a report to have the minimum information required, fields had to have valid responses/values and the narrative and diagram had to be completed. The level of detail associated with these sections was reviewed individually by the reviewers.

Each team of two was given two identical sets of reports (one for each reviewer), and a laptop pre-loaded with an Access database designed specifically for the entry of audit results. The database divided the crash report into crash, location, vehicle, operator, passenger, and non-motorist sections, as well as a general section that included general information and inconsistences, as well as the crash narrative and diagram. Within each section, reviewers determined whether the responses recorded on the crash report were: a) Acceptable/Unacceptable, b) Complete/Empty, or c) Valid/Invalid.

- An acceptable response was complete, valid, and consistent with information provided elsewhere in the report, including the narrative and diagram.
- Empty meant that this field was left blank on the report.
- An invalid response was one that didn't fall within the acceptable range of values for a coded response, or didn't make sense for a free-form entry field.

Auditors documented whether the response was consistent with other fields, as well as with the narrative and diagram. In addition, the database included a box for notes and comments associated with each field.

STEPS OF THE AUDIT

The methodological approach employed was consistent with the approach used by Data Nexus, Inc. for the 2001 CDA [1] and UMassSafe for the 2005 crash report audit [2]. The audit procedure included the following four steps:

STEP 1: WARM-UP:

Before beginning the audit, UMassSafe staff provided participants with an overview of the audit process. Materials that were utilized during the process were distributed and discussed, including a comprehensive checklist of items that needed to be considered when reviewing each crash report. As an orientation to the audit, the group reviewed a few examples of crash reports. Next, reviewers did a practice review, followed by a group discussion of results. This step helped to ensure that all participants had a clear understanding of the review process, along with the expected level of detail. The warm-up session was completed in a half day.

STEP 2: INDIVIDUAL REVIEWS:

After the warm-up session, each team of two reviewed a subset of all the crashes in the sample, manually inspecting each report for accuracy. In the context of this audit, accuracy referred to internal consistency and completeness of the data. Internal consistency indicated that the report's description of the crash, the vehicles, and the people involved, contained no contradictory information. Completeness indicated that the data was acceptable, and that the report contained the minimum information required.

For data to be deemed acceptable, particularly in free entry fields, the value entered had to be valid and understandable. For instance, a name had to be a text entry, not a numerical value, and age had to be a numerical value that corresponded to a feasible age (i.e. 250 would have been considered invalid). Note that accuracy in this context referred to valid information, as opposed to correct information, which would have required first-hand knowledge of the actual crash scene and associated circumstances.

STEP 3: CROSS-CHECKS:

Cross-checks involved a secondary review of a subsample of all crashes included in the individual reviews. Every 20th crash report in the sample was selected for a cross-check, and reviewed by a different reviewer. This step ensured not only that all panel members were using the same criteria for reviewing crash reports, but also whether selected portions were in need of a complete second review. At this stage, UMassSafe staff compared and examined the cross-checks and resolved differences between reviews.

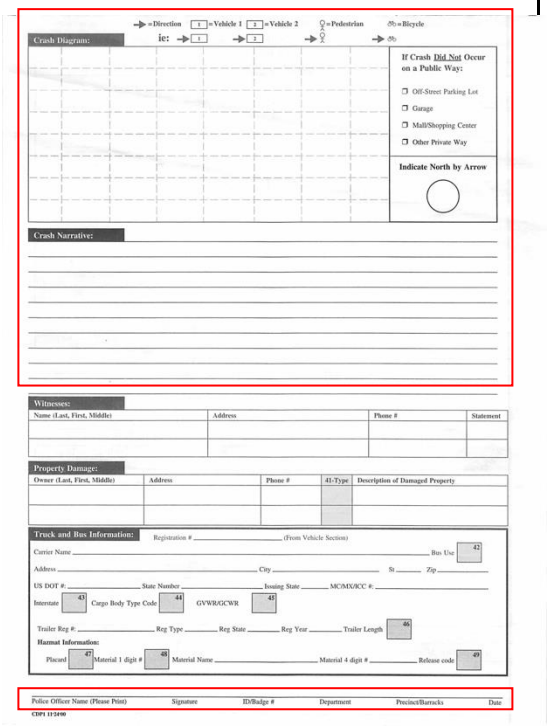
STEP 4: FINAL REVIEW:

UMassSafe staff compared and examined the cross-checks and resolved differences between reviews, when needed. In some instances, this required that reports be reviewed again, after the panel members had completed their task. Generally, these thorough reviews were completed to ensure consistency on a single issue. Often, the final review was used to verify notes or resolve questions that were written by one of the panel members during their initial review. For this reason, reviewers were encouraged to leave detailed notes, and to highlight questions they may have had as part of their written comments on each crash report.

CHECKLIST FOR AUDIT

The following table provides a list of items that were checked on each crash report reviewed in the audit. This checklist is based on the "crash report review points" used by Data Nexus in the 2001 audit and by UMassSafe in the 2005 audit. The checklist has been expanded and updated to reflect the new crash report form. In addition to this checklist, reviewers were also asked to provide detailed notes on what they viewed as inconsistent and/or incorrect in each crash report.

Crash Information



A. Is the report handwritten?

B. If handwritten, is the form legible? Though not usually a prevalent problem, if a report is too difficult to read, this fact should be noted.

C. Review narrative for sufficient detail and compare for consistency for all following fields.

D. Diagram

   a. Not included – unless the diagram section is annotated with “vehicles moved prior to arrival” or other reasoning for lack of diagram.

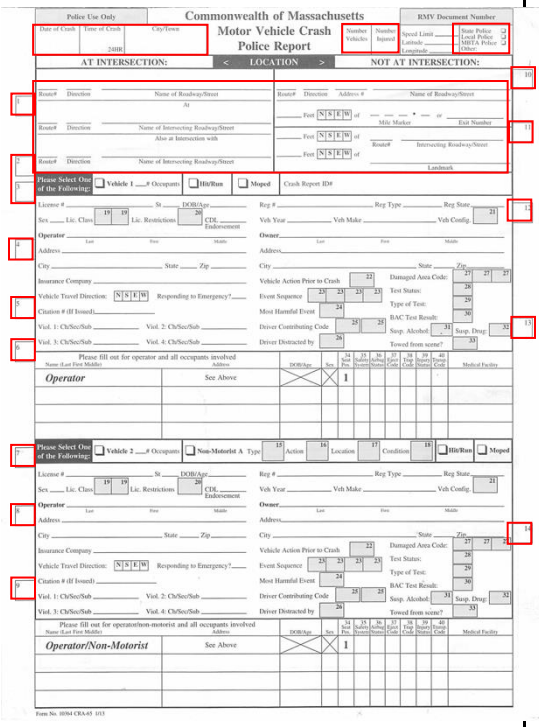
   b. Adequate

   - Are there street names there?
   - Is there a North arrow?
   - Are the locations of the vehicles marked on the diagram?

E. Report says ‘see attached detailed report’ but nothing attached.

F. Reporting officer information provided and complete.

Crash Information Continued


Commonwealth of Massachusetts
Motor Vehicle Crash
Police Report

AT INTERSECTION: < LOCATION > NOT AT INTERSECTION:

Route# Direction Name of Roadway/Street
At
Route# Direction Name of Intersecting Roadway/Street
Also at Intersection with
Route# Direction Name of Intersecting Roadway/Street

Route# Direction Address # Name of Roadway/Street
Feet N S E W of Mile Marker or Exit Number
Feet N S E W of Route# Intersecting Roadway/Street
Feet N S E W of Landmark

Please Select One of the Following: Vehicle 1 # Occupants Hit/Run Moped Crash Report ID#

Operator See Above

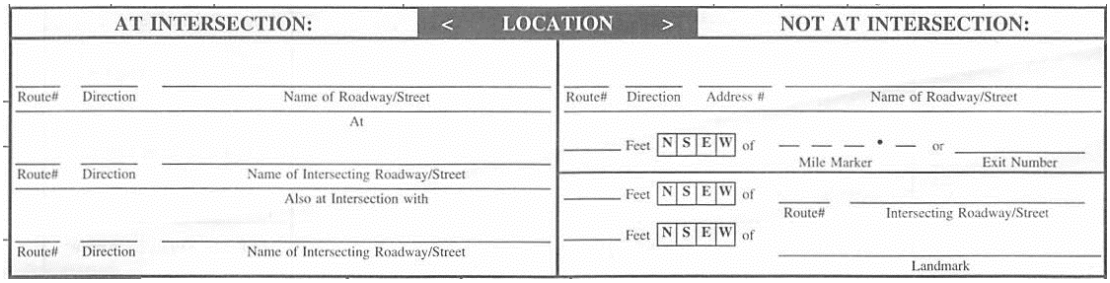
Please Select One of the Following: Vehicle 2 # Occupants Non-Motorist A Type Hit/Run Moped

Operator/Non-Motorist See Above

A. Date, time, town, number of vehicles, number of injured, and police type incomplete or inconsistent with other information in the report.

B. Light conditions (1), weather conditions (2, 3), traffic control device type (4), traffic device functioning (5), road surface (6), roadway intersection type (7), trafficway description (8) and school bus related (9), work zone related (10), manner of collision (11), first harmful event location (12), sequence of events (23), first harmful event (13), and road contributing circumstances (14) inconsistent with other information in the report.

- First harmful event (13) and first harmful event location (12) inconsistent with manner of collision (11).
- Roadway intersection type (7) and trafficway description (8) not matching the location information.
- Time of day and lighting conditions (1) inconsistent.
- Weather condition (2, 3) and road surface (6) inconsistent.
- Month and weather (2, 3) inconsistent.

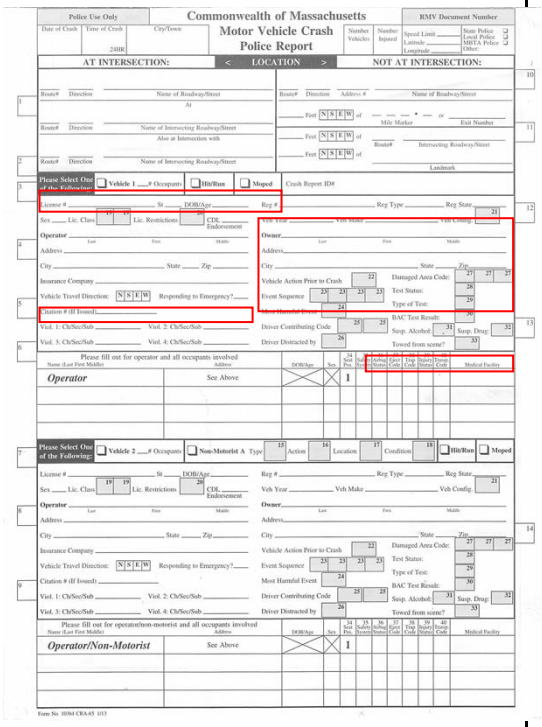

AT INTERSECTION: < LOCATION > NOT AT INTERSECTION:

Route# Direction Name of Roadway/Street
At
Route# Direction Name of Intersecting Roadway/Street
Also at Intersection with
Route# Direction Name of Intersecting Roadway/Street

Route# Direction Address # Name of Roadway/Street
Feet N S E W of Mile Marker or Exit Number
Feet N S E W of Route# Intersecting Roadway/Street
Feet N S E W of Landmark

- Which crash location method was used?
  - Intersection Method – Adequate for intersection method? Was route number or name of roadway complete? Direction? Intersecting roadway?
  - Address
  - Exit Ramp
  - Mile Marker
  - Does the location information <u>appear</u> to provide enough information to adequately locate the crash?
- Does the narrative provide additional location information?
- Is the information consistent with the narrative and diagram?

Vehicle Level



A. Number of occupants, hit/run, and moped checkbox incomplete or inconsistent with other information in the report.

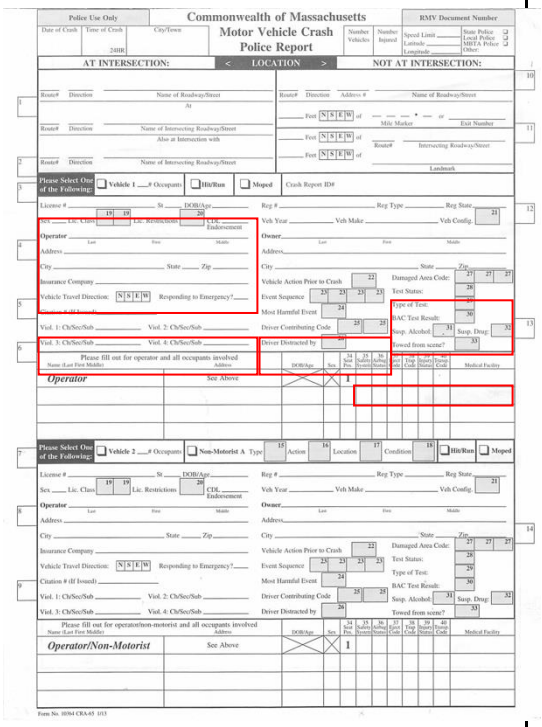
- Cross compare number of total occupants listed with number of occupants that have information listed throughout crash report (seating positon, injury status, etc.).

B. Vehicle registration #, type, state, year, and make as well as owner name and address incomplete or obviously erroneous.

C. Vehicle configuration, vehicle action prior to crash, event sequence, most harmful event, vehicle damaged area code, towed from scene inconsistent with narrative, diagram or other information in the report.

- Cross compare vehicle configuration with school bus related (9), and bus use field (42), narrative or diagram.
- Cross compare first harmful event with non-motorist type.

Driver Information



A. General driver information (license #, state, DOB/Age, sex, name, address, and insurance company) look incomplete or obviously erroneous or inconsistent with other information in the report. Operator name incomplete but indicates that the officer did not have access to the driver information: hit and run, driverless, parked vehicle, vehicle fled, etc.

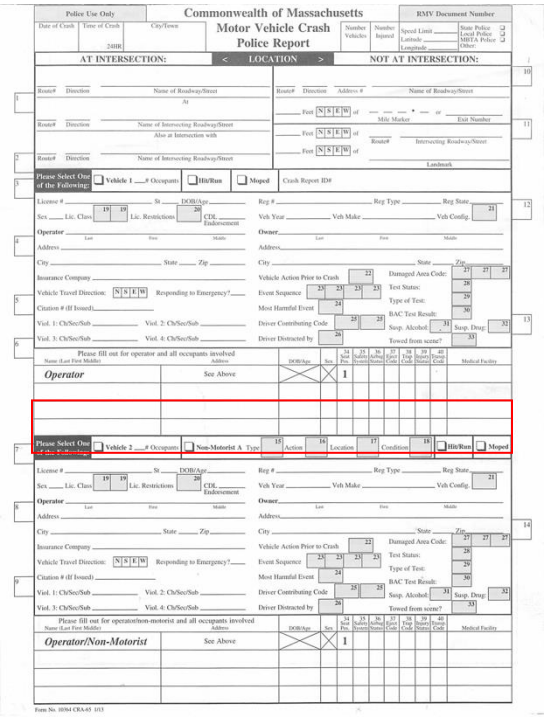
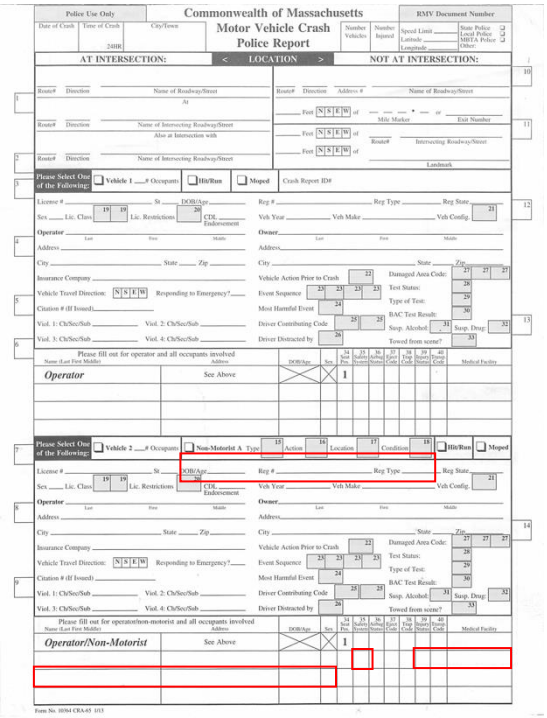
B. License class and restrictions as well as CDL endorsement, vehicle travel direction, responding to emergency incomplete or inconsistent with narrative or with other information in the report.

C. Citation # and violation information complete and consistent with other information on report (driver contributing codes and narrative).

D. Driver contributing code and driver distracted by incomplete or inconsistent with narrative and other information in the report.

E. Operator safety system, airbag status, ejection code, trap code, injury status, transport code, and medical facility inconsistent with narrative or other information on report.

- Injury status inconsistent with number injured at top of crash report.

Passenger Level (occupant information other than the operator)  Commonwealth of Massachusetts Motor Vehicle Crash Police Report Operator Operator/Non-Motorist	A. Passenger information (name, address, DOB/Age) looks incomplete or obviously erroneous. B. Passenger sex, seat position, safety system, airbag status, ejection code, trap code, injury status, transport code, and medical facility inconsistent with narrative. • Injury status consistent with number injured at top of crash report.
Non-motorist Level  Commonwealth of Massachusetts Motor Vehicle Crash Police Report Operator Operator/Non-Motorist	A. Non-motorist indicator box, type, action, location and condition incomplete or inconsistent with each other or narrative. • Non-motorist indicator consistent with first harmful and/or most harmful event. B. General non-motorist information (name, address, DOB/Age, sex) looks incomplete or obviously erroneous. C. Non-motorist safety system, injury status, transport code and medical facility incomplete, not specific or inconsistent with narrative. D. Is the Non-motorist information consistent with that for first harmful event, most harmful and sequence of events?

CDA PROCESS - ADDITIONAL NOTES

As described below, there were two specific challenges with the audit process.

While the audit teams were entering the crash report numbers into the Access database, there were instances where the number was entered incorrectly. In those cases, it could not be determined whether the audit findings were for crash reports submitted by local police (paper or electronic), or State Police (submitted electronically).

In addition, for each crash report field reviewed, there was a small difference in the total number of findings per field (as is clear in the associated tables). The reasons for this may include auditor error and/or auditor confusion regarding particular findings. For example, if a crash involved a hit and run, in some instances the auditor could not determine whether the field should have been completed (and therefore noted as empty), or could not be determined by police and shouldn't have been completed. In these instances, auditors did not make a judgment (acceptable, inconsistent, invalid, empty), which resulted in an unbalanced sum across different fields.

ANALYSIS

UMassSafe staff reviewed and tallied all results. Errors were analyzed and overall error percentages were calculated. For each field considered during the audit process, a table was created, indicating the frequency and percentage of times the field was deemed acceptable, inconsistent, invalid, or empty, for each types of report (local police paper, local police electronic, State Police paper, and State Police electronic). In addition to the table summary, comments and notes provided by the auditors for each field were documented.

RESULTS BY POLICE REPORTING TYPE

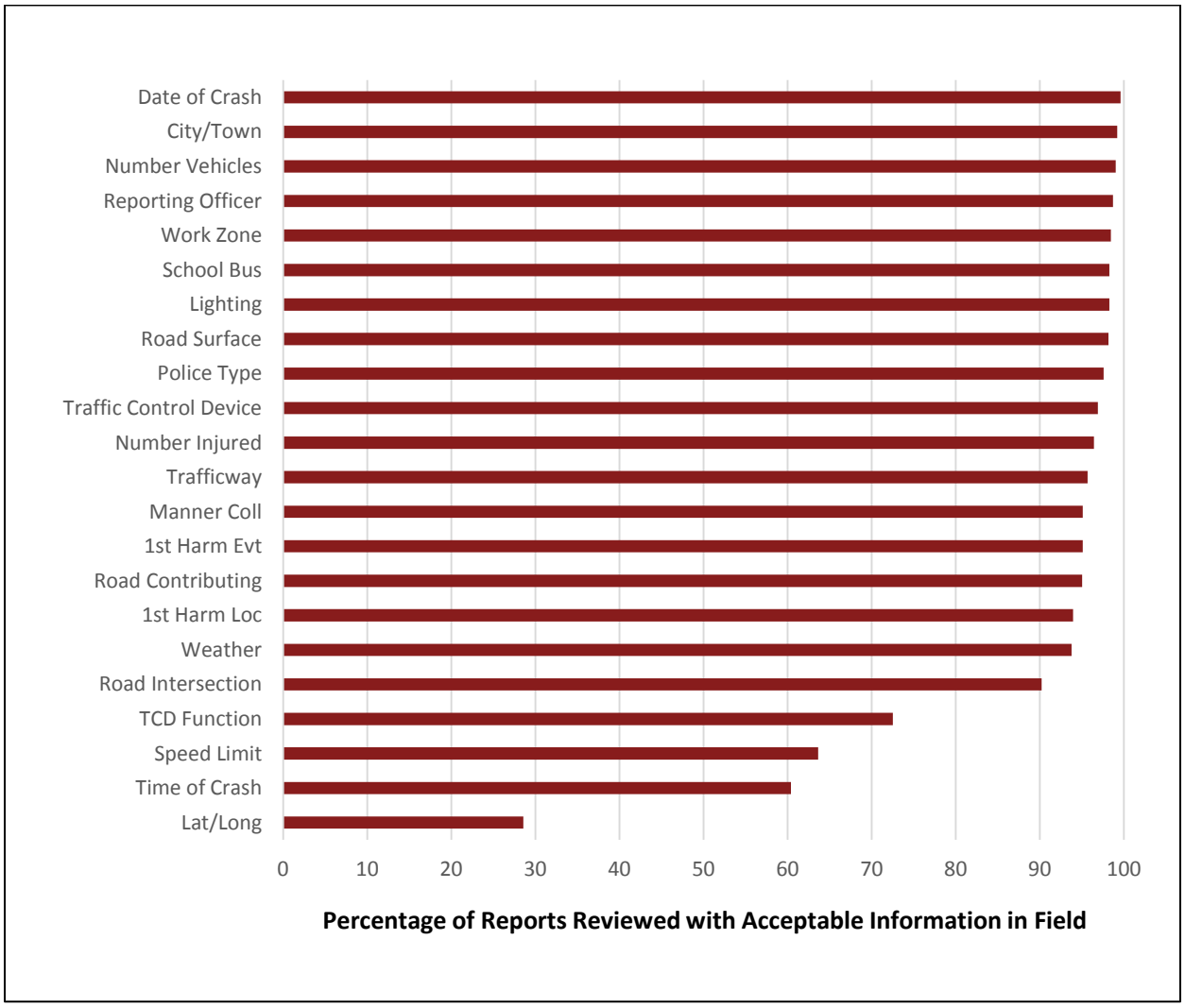
The results of the audit are shown in the following tables.

Results are divided into six sections: crash, location, vehicle, non-motorist, driver, and passenger. Within each section, tables are shown in ascending order, with the fields having the lowest overall percentage of acceptable or unacceptable responses coming first, followed by those with the highest percentage. Each data field section contains a short discussion describing the results, along with qualitative findings and results from the auditors. Data fields with an "acceptable" rate greater than or equal to 95 percent do not contain a discussion unless there were relevant comments made by auditors.

CRASH LEVEL RESULTS

The figure below outlines the percentage of crash reports reviewed where the crash level field was deemed acceptable or complete by reviewers. For fields where consistency could not be verified, only completeness was examined. The *Date of Crash* was appropriately recorded for almost 100 percent of reports reviewed, followed closely by the *City/Town, Number of Vehicles, Reporting Officer, Work Zone, School Bus, Lighting Conditions*, and *Road Surface* fields. However, the *Latitude/Longitude*, *Time of Crash Speed Limit,* and *Traffic Device Functioning Code* field were deemed sufficient less often.

Percentage of Reports Reviewed with "Acceptable" or "Complete" Information in Field – Crash Level Fields.



Crash Level Fields With Less Than 95% Acceptable

Below is further information on each crash level field that yielded an 'acceptable' rating of less than 95 percent.

Latitude and Longitude

Report Type	Complete		Incomplete	
Local Police (electronic)	8	2.3%	340	97.7%
Local Police (paper)	9	2.5%	352	97.5%
State Police (electronic)	282	84.4%	52	15.6%
Total	299	28.7%	744	71.3%

Latitude and Longitude were other fields where consistency could not be verified. For this reason, only completeness was examined. As shown in the table, this field was complete in 29 percent of reports reviewed. Local police completed this field less than 3 percent of the time, while State Police populated the *Latitude/Longitude* field 85 percent of the time. However, often 0.00 was filled in. Furthermore, conversations with MassDOT auditors indicated that the completed entries were often inaccurate.

Time of Crash

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	291	83.1%	-	-	59	16.9%	-	-
Local Police (paper)	331	94.8%	-	-	18	5.2%	-	-
State Police (electronic)	1	0.3%	-	-	331	99.7%	-	-
Total	623	60.4%	-	-	408	39.6%	-	-

The *Time of Crash* field in the crash section of the report was the field with the second highest frequency of unacceptable information. It was deemed acceptable, in military time, in only 60 percent of the reports reviewed. While the acceptable percentages for local police reports (both electronic and paper) were relatively high, the State Police reports submitted electronically were almost all considered invalid. With further research, it was found that State Police reports were exported in the standard (AM/PM) format, rather than in military time. When compared to the findings from the 2008 audit, the percent acceptable decreased by nearly 20 percentage points, which may be due to the fact that in 2008, the use of standard time instead of military time was required for all reports.

Speed Limit

Report Type	Complete		Incomplete	
Local Police (electronic)	170	47.5%	188	52.5%
Local Police (paper)	170	47.4%	189	52.6%
State Police (electronic)	325	97.3%	9	2.7%
Total	665	63.3%	386	36.7%

While it was not possible to determine whether the *Speed Limit* field is consistent with the rest of the report (due to lack of other fields to compare it to) the field was only completed in 63 percent of the reports reviewed. Furthermore, there was considerable variation among police agency types. Of the reports reviewed, this field was completed by State Police more than 97 percent of the time. For local police, both paper and electronic reports had this field completed only 47 percent of the time.

Traffic Device Functioning Code

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	227	64.9%	3	0.9%	115	32.9%	5	1.4%
Local Police (paper)	267	76.5%	8	2.3%	69	19.8%	5	1.4%
State Police (electronic)	253	76.2%	-	-	73	22.0%	6	1.8%
Total	747	72.5%	11	1.1%	257	24.9%	16	1.6%

The *Traffic Device Functioning Code* was the field in the crash section of the report that had the fourth highest frequency of unacceptable information, and was completed in an acceptable manner 72 percent of the time. Of the almost 25 percent of reports that were considered invalid, the issue was due to an entered value for the *Traffic Device Functioning Code* when 'No Device' was selected in the preceding field, *Traffic Control Device Type*. This invalid entry existed across all three report types, and was most common in the local police electronic reports. It does not appear as though any of the RMS's skip this field when no traffic control device present has been indicated in the previous field. This field was also problematic for local police crash reports submitted via paper. The overall acceptable value matched the value from the 2008 audit almost exactly, where the same problem was also identified.

Roadway Intersection Type

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	318	89.3%	29	8.1%	1	0.3%	8	2.2%
Local Police (paper)	315	87.3%	36	10.0%	2	0.6%	8	2.2%
State Police (electronic)	311	93.4%	15	4.5%	1	0.3%	6	1.8%
Total	944	89.9%	80	7.6%	4	0.4%	22	2.1%

Roadway Intersection Type was found to be acceptable in 90 percent of the reports reviewed. Compared to State Police, local police had a slightly higher rate of inconsistent entries. This could be due to the higher variety of intersection types on local roads, patrolled by local police as compared to interstates and state routes patrolled by State Police.

First Harmful Event Location

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	336	93.9%	11	3.1%	2	0.6%	9	2.5%
Local Police (paper)	332	92.0%	16	4.4%	4	1.1%	9	2.5%
State Police (electronic)	316	94.6%	12	3.6%	-	-	6	1.8%
Total	984	93.4%	39	3.7%	6	0.6%	24	2.3%

The *First Harmful Event Location* field was completed appropriately for 93 percent of the reports reviewed. Of the portion that was considered unacceptable, almost 4 percent had issues with consistency, and slightly more than 2 percent had an empty field. Among the different police agency types and reporting methods (paper vs. electronic), the variation was minimal. Auditors representing law enforcement commented on confusion regarding the difference between roadway and roadside, and suggested further clarification on this distinction. In general, the inconsistencies were due to contradictory information in the narrative. There were no appreciable differences in findings since the previous 2005 audit.

Weather Conditions

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	336	94.6%	12	3.4%	2	0.6%	5	1.4%
Local Police (paper)	340	94.2%	16	4.4%	-	-	5	1.4%
State Police (electronic)	306	91.6%	1	0.3%	-	-	27	8.1%
Total	982	93.5%	29	2.8%	2	0.2%	37	3.5%

Of the reports audited, *Weather Conditions* was completed in an acceptable manner 93 percent of the time. As shown here, State Police had a slightly higher incidence of leaving the field empty than local Police but had a lower incidence of inconsistences between this field and other fields on the crash report. Auditors commented that officers often completed the second weather field with either the same entry as the first weather condition code, or marked it unknown. With no significant difference between paper and electronically submitted reports, this does not appear to be a systems issue.

Road Contributing Circumstances

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	190	95.0%	1	0.5%	-	-	9	4.5%
Local Police (paper)	174	94.1%	2	1.1%	-	-	9	4.9%
State Police (electronic)	-	-	-	-	-	-	-	-
Total	364	94.5%	3	0.8%	-	-	18	4.7%

Road Contributing Circumstances is a field that was completed appropriately for almost 95 percent of the reports reviewed, with very little variation between the two submittal types for local police. The majority of the time, if the field was considered unacceptable, it was left empty. Please note that there is no data for State Police reports, as this is a new crash report field and was not being used by State Police during the audit period.

First Harmful Event

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	339	94.4%	9	2.5%	1	0.3%	10	2.8%
Local Police (paper)	337	93.4%	11	3.0%	3	0.8%	10	2.8%
State Police (electronic)	320	95.8%	11	3.3%	-	-	3	0.9%
Total	996	94.5%	31	2.9%	4	0.4%	23	2.2%

The *First Harmful Event* field was appropriately completed in almost 95 percent of the reports reviewed. For the reports that were deemed unacceptable, inconsistency was the issue for nearly 3 percent. Leaving the field empty occurred in 2 percent of the reports reviewed, and happened more often with local police than State Police. Finally, invalid entries occurred in just under 0.5 percent of the reports. There was an appreciable improvement for reports submitted electronically by local police since the previous audit, where this field was deemed acceptable only 87 percent of the time.

Manner of Collision

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	332	93.8%	17	4.8%	1	0.3%	4	1.1%
Local Police (paper)	339	93.9%	15	4.2%	3	0.8%	4	1.1%
State Police (electronic)	325	97.3%	7	2.1%	-	-	2	0.6%
Total	996	94.9%	39	3.7%	4	0.4%	10	1.0%

For all the reports reviewed, the completion of *the Manner of Collision* field was acceptable nearly 95 percent of the time. The rate of inconsistencies for State Police was lower than both paper and electronic report types for local police.

Crash Level Fields With 95 Percent or Greater Acceptable

The following fields had an overall acceptable rate of 95 percent or greater. As such, only the summary tables are shown.

Trafficway Description

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	336	95.5%	11	3.1%	1	0.3%	4	1.1%
Local Police (paper)	344	95.3%	6	1.7%	-	-	11	3.0%
State Police (electronic)	322	96.4%	11	3.3%	-	-	1	0.3%
Total	1002	95.7%	28	2.7%	1	0.1%	16	1.5%

Police Type

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	352	94.6%	-	-	-	-	20	5.4%
Local Police (paper)	337	93.4%	4	1.1%	-	-	20	5.5%
State Police (electronic)	332	99.7%	-	-	-	-	1	0.3%
Total	1021	95.8%	4	0.4%	-	-	41	3.8%

Number Injured

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	346	98.3%	5	1.4%	-	-	1	0.3%
Local Police (paper)	339	93.9%	13	3.6%	-	-	9	2.5%
State Police (electronic)	325	97.3%	6	1.8%	-	-	3	0.9%
Total	1010	96.5%	24	2.3%	-	-	13	1.2%

Traffic Control Device

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	342	97.2%	7	2.0%	-	-	3	0.9%
Local Police (paper)	344	95.8%	6	1.7%	2	0.6%	7	1.9%
State Police (electronic)	327	97.9%	3	0.9%	-	-	4	1.2%
Total	1013	96.9%	16	1.5%	2	0.2%	14	1.3%

Road Surface Conditions

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	347	98.0%	-	-	-	-	7	2.0%
Local Police (paper)	348	96.9%	3	0.8%	1	0.3%	7	1.9%
State Police (electronic)	330	99.1%	2	0.6%	-	-	1	0.3%
Total	1025	98.0%	5	0.5%	1	0.1%	15	1.4%

Lighting Condition

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	345	98.0%	5	1.4%	-	-	2	0.6%
Local Police (paper)	352	97.5%	4	1.1%	1	0.3%	4	1.1%
State Police (electronic)	331	99.4%	1	0.3%	-	-	1	0.3%
Total	1028	98.3%	10	1.0%	1	0.1%	7	0.7%

School Bus Related

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	348	98.9%	-	-	-	-	4	1.1%
Local Police (paper)	349	96.7%	2	0.6%	-	-	10	2.8%
State Police (electronic)	322	99.4%	1	0.3%	1	0.3%	-	-
Total	1019	98.3%	3	0.3%	1	0.1%	14	1.4%

Work Zone Related

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	346	98.3%	2	0.6%	-	-	4	1.1%
Local Police (paper)	353	97.8%	-	-	-	-	8	2.2%
State Police (electronic)	332	99.4%	2	0.6%	-	-	-	-
Total	1031	98.5%	4	0.4%	-	-	12	1.1%

Reporting Officer

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	342	98.0%	3	0.9%	-	-	4	1.1%
Local Police (paper)	350	98.9%	-	-	-	-	4	1.1%
State Police (electronic)	324	99.4%	2	0.6%	-	-	-	-
Total	**1016**	98.7%	**5**	0.5%	**-**	-	**8**	0.8%

Number of Vehicles

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	350	99.4%	1	0.3%	-	-	1	0.3%
Local Police (paper)	357	98.9%	1	0.3%	1	0.3%	2	0.6%
State Police (electronic)	330	98.8%	3	0.9%	1	0.3%	-	-
Total	**1037**	99.0%	**5**	0.5%	**2**	0.2%	**3**	0.3%

CITY/TOWN

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	350	99.4%	1	0.3%	-	-	1	0.3%
Local Police (paper)	356	98.6%	1	0.3%	4	1.1%	-	-
State Police (electronic)	333	99.7%	1	0.3%	-	-	-	-
Total	**1039**	99.2%	**3**	0.3%	**4**	0.4%	**1**	0.1%

DATE OF CRASH

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	352	99.7%	-	-	-	-	1	0.3%
Local Police (paper)	357	98.9%	2	0.6%	2	0.6%	-	-
State Police (electronic)	333	100.0%	-	-	-	-	-	-
Total	**1042**	99.5%	**2**	0.2%	**2**	0.2%	**1**	0.1%

Location Information Results

Crash Diagram

For 89 percent of reports reviewed, the *Crash Diagram* was rated as adequate. Additionally, approximately 87 percent of reports contained a north arrow. Auditors were unable to determine whether the existing north arrow was being used correctly. Other challenges included a missing *Roadway* name or a general lack of specificity. Also, some crashes (most often submitted by local police) were found to have occurred on a private way or in a parking lot, and should not have been reported to the RMV. Auditors explained that some officers responding to crashes that occurred in a parking lot may have completed a crash report to be helpful for insurance or store liability purposes. Even in these situations, the report could be filed at the police department, instead of being submitted to the RMV.

A later review, conducted by UMassSafe, identified 25 crashes that occurred on a private way that should not have been reported. The majority of these crashes occurred in the local police (electronically submitted) sample, which was likely due more to varying police department policies on reportable crashes, and less because of vendor differences.

Crash Diagram Adequate?

Report Type	Yes		No	
Local Police (electronic)	309	87.5%	44	12.5%
Local Police (paper)	313	86.7%	48	13.3%
State Police (electronic)	313	93.4%	22	6.6%
Total	935	89.1%	114	10.9%

Crash Occur on Private Way?

Report Type	Yes		No	
Local Police (electronic)	21	5.9%	332	94.1%
Local Police (paper)	1	0.3%	360	99.7%
State Police (electronic)	3	0.9%	332	99.1%
Total	25	2.4%	1024	97.6%

Intersection Method

The *Intersection* Method was the method of location that had the highest percentage of crashes that could be adequately geolocated (81 percent). The rates of successful geolocation were much higher for local police than State Police. However, State Police rarely used this location method (n=20). The *Direction* was often missing on reports using the *Intersection* Method. In almost 32 percent of these cases, the *Narrative* and/or *Diagram* provided additional information that was helpful for geolocating the crash.

The common inconsistency on local police reports was whether the crash occurred in an intersection or in close proximity to an intersection. State Police auditors indicated that even if two intersecting roadways were entered into RAMS in the 'At Intersection' section, it is populated and transferred to the RMV in the 'Not at Intersection' section. The way RAMS is designed, the officers likely do not realize that their default is 'Not at Intersection'.

Intersection Method Adequate?

Report Type	Yes		No	
Local Police (electronic)	112	88.9%	14	11.1%
Local Police (paper)	130	80.7%	31	19.3%
State Police (electronic)	8	40.0%	12	60.0%
Total	250	81.4%	57	18.6%

Intersection Method – Roadway Direction Used?

Report Type	Yes		No	
Local Police (electronic)	25	19.8%	101	80.2%
Local Police (paper)	32	19.9%	129	80.1%
State Police (electronic)	2	10.0%	18	90.0%
Total	59	19.2%	248	80.8%

Intersection Method - Narrative/Diagram Provides More Info to Geolocate?

Report Type	Yes		No	
Local Police (electronic)	40	31.7%	86	68.3%
Local Police (paper)	46	28.6%	115	71.4%
State Police (electronic)	11	55.0%	9	45.0%
Total	97	31.6%	210	68.4%

Address Method

Auditors deemed the *Address Method* to be inadequate when either the road name was given, but not the address number, or with the *Intersection Method* would have been more appropriate. The *Address Method* was used effectively by local police, meaning that the crashes were able to be geolocated, 78 percent of the time. Conversely, when State Police used the *Address Method*, crashes could only be geolocated 14 percent of the time. However, State Police rarely used this location method (n=13). As described earlier, for State Police reported crashes that should have used the *Intersection Method, some* may have been populated and/or transferred to the RMV using the *Address Method*. The *Narrative* and/or *Diagram* provided additional information used to locate the crash 38 percent of the time.

Address Method Adequate?

Report Type	Yes		No	
Local Police (electronic)	172	78.2%	48	21.8%
Local Police (paper)	155	79.1%	41	20.9%
State Police (electronic)	13	14.1%	79	85.9%
Total	340	66.9%	168	33.1%

Address Method - Narrative/Diagram Provides More Info to Geolocate?

Report Type	Yes		No	
Local Police (electronic)	77	35.0%	143	65.0%
Local Police (paper)	74	37.8%	122	62.2%
State Police (electronic)	40	43.5%	52	56.5%
Total	191	37.6%	317	62.4%

Mile Marker Method

The *Mile Marker Method* of locating a crash was only used by State Police. Although auditors found this method to be adequate 73 percent of the time, after further review by UMassSafe, it was determined that none of these crash reports had the *Distance from Mile Marker* filled in, and only 63 percent had the *Route Direction* filled in, making it difficult to determine the precise location of the crash. Furthermore, the *Mile Marker Method* had the lowest percentage (22 percent) of reports containing additional information in the *Narrative* and/or *Diagram* that would help in the geolocation of the crash.

Even though mile markers are self-explanatory, and don't leave much room for error (exactly why they are preferred), discussion with officers helped to explain the potential for problems. Officers suggested that when they're situated on the side of a busy roadway, they are focused on collecting the pertinent people/vehicle information, and plan to complete the remaining pieces (including location) after they have left the crash scene.

Mile Marker Method Adequate?

Report Type	Yes		No	
Local Police (electronic)	-	-	-	-
Local Police (paper)	-	-	-	-
State Police (electronic)	50	73.5%	18	26.5%
Total	50	73.5%	18	26.5%

Mile Marker - Route Direction Used?

Report Type	Yes		No	
Local Police (electronic)	-	-	-	-
Local Police (paper)	-	-	-	-
State Police (electronic)	43	63.2%	25	36.8%
Total	43	63.2%	25	36.8%

Mile Marker - Feet from Mile Marker Used?

Report Type	Yes		No	
Local Police (electronic)	-	-	-	-
Local Police (paper)	-	-	-	-
State Police (electronic)	-	-	68	100%
Total	-	-	68	100%

Mile Marker - Narrative/Diagram Provides More Info to Geolocate?

Report Type	Yes		No	
Local Police (electronic)	-	-	-	-
Local Police (paper)	-	-	-	-
State Police (electronic)	15	22.1%	53	77.9%
Total	15	22.1%	53	77.9%

Exit Ramp Method

The *Exit Ramp Method* was used only used by State Police, with less than 28 percent of reports within the sample having adequate information to geolocate the crash. The *Route Direction* of the roadway (connected to the ramp) was provided on only 49 percent of the reports reviewed. Another issue with this location method was that the *Distance* of the crash location from the exit ramp was only provided on about 5 percent of reports. Furthermore, only 31 percent of the reports audited in this sample had additional information in the *Narrative* and/or *Diagram*.

Auditors determined that there is a lack of instruction and training on how to use this field properly. Often, an exit will be listed as the location by the officer because it is the nearest landmark, but the crash being described actually occurred in the travel lane of the highway. Additionally, there is confusion around how to properly use the distance field, and from where to measure. The greatest impact on the usability of this data is the lack of information in the *Direction* field. Without this piece, people using the data could be looking at a ramp that is different from where the crash occurred. For example, the northbound and southbound directions of a highway both have an 'Exit 4', but they are in different

locations, connect to different sections of the cross-road, and could have completely different landscape attributes and roadway designs.

Exit Ramp Method Adequate?

Report Type	Yes		No	
Local Police (electronic)	-	-	2	100.0%
Local Police (paper)	1	33.3%	2	66.7%
State Police (electronic)	42	27.6%	110	72.4%
Total	43	27.4%	114	72.6%

Exit Ramp – Route Direction Used?

Report Type	Yes		No	
Local Police (electronic)	1	50.0%	1	50.0%
Local Police (paper)	-	-	3	100.0%
State Police (electronic)	74	48.7%	78	51.3%
Total	75	47.8%	82	52.2%

Exit Ramp – Feet from Ramp Used?

Report Type	Yes		No	
Local Police (electronic)	1	50.0%	1	50.0%
Local Police (paper)	-	-	3	100.0%
State Police (electronic)	6	3.9%	146	96.1%
Total	7	4.5%	150	95.5%

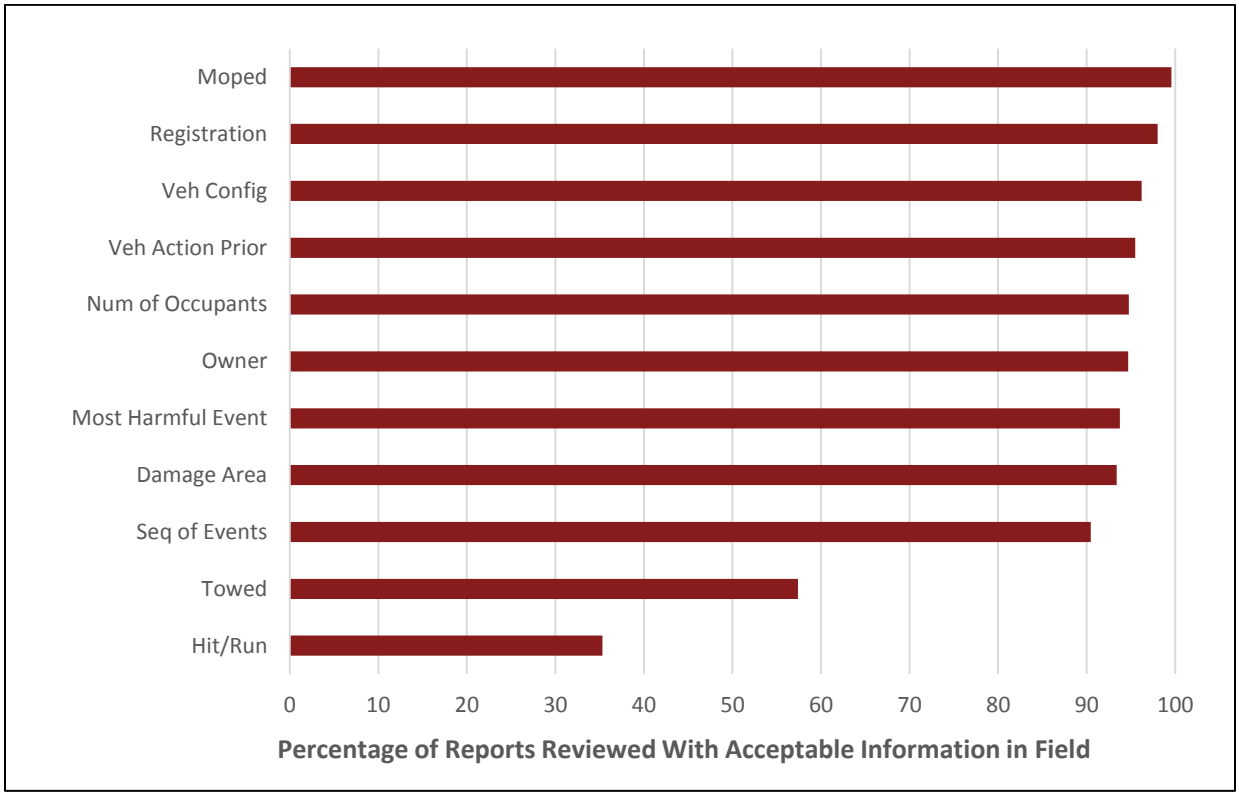
Exit Ramp - Narrative/Diagram Provides More Info to Geolocate?

Report Type	Yes		No	
Local Police (electronic)	1	50.0%	1	50.0%
Local Police (paper)	-	-	3	100.0%
State Police (electronic)	48	31.6%	104	68.4%
Total	49	31.2%	108	68.8%

Vehicle Level Results

Vehicle level results were recorded for each vehicle involved in a crash that was reviewed as part of the audit. The figure below outlines the percentage of vehicles reviewed where the field was deemed acceptable or complete by reviewers. For fields where consistency could not be verified, only completeness was examined. The *Moped* and *Registration* fields were appropriately recorded most of the time, while the *Hit and Run* and *Towed* fields were deemed sufficient much less often.

Percentage of Reports Reviewed with "Acceptable" or "Complete" Information in Field – Vehicle Level Fields.



Vehicle Level Fields With Less Than 95 Percent Acceptable

More information on each vehicle level field that yielded an 'acceptable' rating of less than 95 percent can be found on the following pages.

Hit and Run

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	11	28.2%	28	71.8%	-	-	-	-
Local Police (paper)	15	38.5%	24	61.5%	-	-	-	-
State Police (electronic)	4	57.1%	3	42.9%	-	-	-	-
Total	30	35.3%	55	64.7%	-	-	-	-

Due to the small number of *Hit and Run* crashes in the sample, a special review of this field was conducted. After the audit, each crash report was examined to identify whether the *Hit and Run* box was checked, or if the crash narrative indicated a *Hit and Run* occurred. In total, 85 reports were identified, and then carefully examined to assess the accuracy of the *Hit and Run* checkbox on the report. Overall, it was found that only 35 percent of reports had correctly used the *Hit and Run* boxes. The most common errors (in order of prevalence) were: not selecting any *Hit and Run* box, checking multiple *Hit and Run* boxes, and selecting the wrong *Hit and Run* box. During the audit, there was extensive discussion regarding this field, as it was not intuitive which vehicle should have the *Hit and Run* box checked.

Towed from Scene

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	544	88.2%	5	0.8%	12	1.9%	56	9.1%
Local Police (paper)	545	85.7%	7	1.1%	9	1.4%	75	11.8%
State Police (electronic)	-	-	-	-	-	-	643	100.0%
Total	1089	57.4%	12	0.6%	21	1.1%	774	40.8%

The *Towed from Scene* field was the field in the vehicle section of the report that had the highest frequency of unacceptable information, at 57 percent. State Police left this field empty 100 percent of the time, likely revealing a systems issue, either with RAMS or the RMV. Local police left this field empty in 9 percent of reports submitted electronically, and in 12 percent of the reports submitted via paper. In some instances, the field was left empty because it was a parked car. Auditors representing law enforcement felt that officers were not sure how to complete information regarding parked vehicles. When comparing this data to the 2008 audit, the percentage of acceptable reports decreased by 30 percent.

Sequence of Events

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	570	92.2%	45	7.3%	-	-	3	0.5%
Local Police (paper)	570	89.5%	45	7.1%	8	1.3%	14	2.2%
State Police (electronic)	558	89.7%	58	9.3%	1	0.2%	5	0.8%
Total	1698	90.5%	148	7.9%	9	0.5%	22	1.2%

The *Sequence of Events* field was the field in the vehicle section of the report that had the third highest frequency of unacceptable information, at 90 percent. Most often, the issue was with an inconsistency with other information in the crash report. State Police had a slightly higher percentage of inconsistences than either submission type by local police. This field often had only one or two options completed, when other information on the report indicated additional information. Law enforcement auditors shared their view that officers found this field confusing, and additional information on how it should be used would be helpful.

Damaged Area

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	568	91.9%	8	1.3%	-	-	42	6.8%
Local Police (paper)	590	92.8%	27	4.2%	-	-	19	3.0%
State Police (electronic)	594	95.5%	19	3.1%	-	-	9	1.4%
Total	1752	93.4%	54	2.9%	-	-	70	3.7%

Damaged Area was the field in the vehicle section of the report that had the fourth highest frequency of unacceptable information. However, it was still deemed acceptable in 94 percent of reports reviewed. In cases where the field was not considered acceptable, most often, it was due to being left empty. This was especially true for local police reporting electronically (6.8 percent of reports). The overall number of acceptable reports went down by 2 percent, when compared to the 2008 audit. Law enforcement auditors indicated that the format for this field was easier on the older crash report, where officers marked the damage on a diagram of a vehicle, compared to now needing to visualize and lookup corresponding codes.

Most Harmful Event

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	587	95.0%	26	4.2%	-	-	5	0.8%
Local Police (paper)	585	91.8%	18	2.8%	2	0.3%	32	5.0%
State Police (electronic)	588	94.5%	21	3.4%	1	0.2%	12	1.9%
Total	1760	93.8%	65	3.5%	3	0.2%	49	2.6%

The *Most Harmful Event* field was completed appropriately in 94 percent of the reports reviewed. The field was found to be inconsistent with other portions of the crash report in 4 percent of reports audited, was left empty in more than 2 percent of reports, and was deemed invalid in 0.2 percent. This data shows a 4 percent increase in acceptable reports when compared to the 2008 audit. Auditor findings indicated that the challenge with this field was determining how to single out which event was most harmful, acknowledging that a series of crash events may have different interpretations. When more than one serious action has occurred, officers stated that it becomes difficult to determine which event would be the most harmful.

Owner Information

Report Type	Complete		Incomplete	
Local Police (electronic)	573	92.7%	45	7.3%
Local Police (paper)	622	97.5%	16	2.5%
State Police (electronic)	584	93.7%	39	6.3%
Total	1779	94.7%	100	5.3%

The *Owner Information* fields were completed in almost 95 percent of the reports reviewed. These fields were incomplete more often for reports submitted electronically by both local and State Police. Paper submissions by local police were acceptable in more than 97 percent of the reports reviewed. The *Owner Information* was more often left empty when the owner was a business. Comparing this data to the 2008 audit, the number of complete reports has increased from 90 percent to almost 95 percent.

Number of Occupants

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	603	97.1%	11	1.8%	-	-	7	1.1%
Local Police (paper)	612	94.2%	8	1.2%	1	0.2%	29	4.5%
State Police (electronic)	583	93.1%	33	5.3%	1	0.2%	9	1.4%
Total	1798	94.8%	52	2.7%	2	0.1%	45	2.4%

Number of Occupants was a field deemed acceptable in almost 95 percent of the reports reviewed. This increased from 80 percent in the 2008 audit. This field appears to be a greater challenge for State Police reported crashes as well as those reported by local police via paper submission. When submitted electronically by local police, this field was found acceptable by the auditors slightly more than 97 percent of the time. Reports found to be unacceptable either had inconsistencies with the rest of the report (2.7 percent) or an empty field (2.4 percent). Based on comments from the auditors, the reports with inconsistencies in this field had issues due to the officer indicating more occupants in this field than those they provided additional information for in other sections of the report. Additionally, if the vehicle was involved in a hit and run, it was likely that the officer didn't have information regarding the occupants involved, and was unclear how to document this.

Vehicle Level Fields With 95 Percent or Greater Acceptable

The following fields had an overall acceptable rate of 95 percent or greater. As such, only the summary tables are shown.

Vehicle Action Prior to Crash

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	592	95.9%	22	3.6%	1	0.2%	2	0.3%
Local Police (paper)	599	93.9%	30	4.7%	-	-	9	1.4%
State Police (electronic)	601	96.6%	13	2.1%	1	0.2%	7	1.1%
Total	1792	95.5%	65	3.5%	2	0.1%	18	1.0%

Vehicle Configuration

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	591	95.8%	9	1.5%	-	-	17	2.8%
Local Police (paper)	604	94.8%	6	0.9%	1	0.2%	26	4.1%
State Police (electronic)	609	98.1%	6	1.0%	-	-	6	1.0%
Total	1804	96.2%	21	1.1%	1	0.1%	49	2.6%

Vehicle Registration Information

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	611	98.9%	5	0.8%	-	-	2	0.3%
Local Police (paper)	624	98.0%	9	1.4%	2	0.3%	2	0.3%
State Police (electronic)	605	97.3%	10	1.6%	-	-	7	1.1%
Total	1840	98.0%	24	1.3%	2	0.1%	11	0.6%

Moped

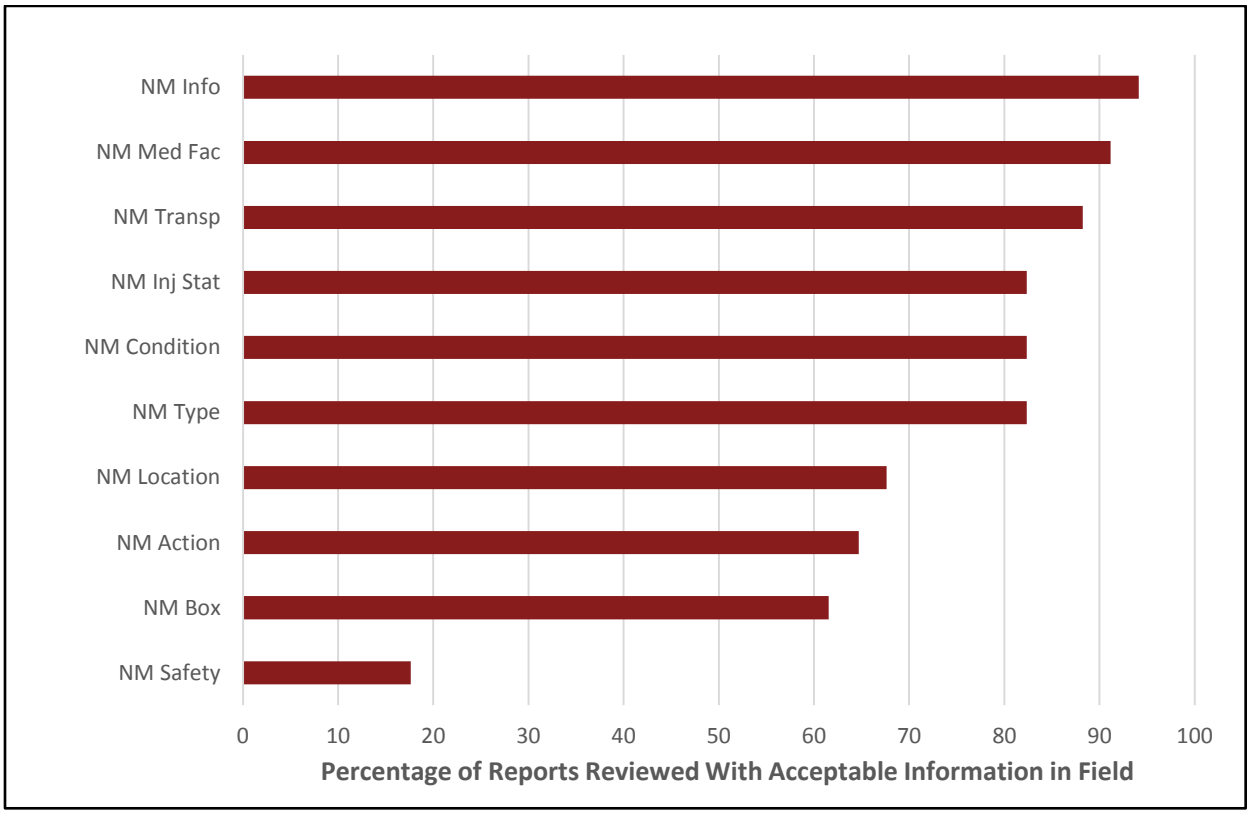
Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	616	99.7%	1	0.2%	-	-	1	0.2%
Local Police (paper)	640	100.0%	-	-	-	-	-	-
State Police (electronic)	617	99.0%	2	0.3%	-	-	4	0.6%
Total	1873	99.6%	3	0.2%	-	-	5	0.3%

NON-MOTORIST (NM) RESULTS

Due to a very small percentage of crashes involving a non-motorist, non-motorist level results were analyzed separately, after the audit. Each crash report was individually reviewed to identify reports that either had non-motorist information filled out, or had a crash narrative which indicated that a non-motorist was involved. From this review, a small sample of 42 crashes was generated. All non-motorist fields were found to have fewer than 95 percent acceptable. However caution should be used with these findings due to the small sample size (n=42). The *Non-Motorist Indicator Box* was the first data element reviewed. Often it was found that the *NM indicator box* was checked, while the information was actually that of a passenger or a witness. In those cases, the other non-motorist fields were not reviewed, as they did not represent actual non-motorist information. As such, the sum for the non-motorist indicator box is 42 crashes, whereas the sum of all other non-motorist fields was 36 crashes.

Due to the small sample size, detailed quantitative findings are not as meaningful as they are for the other sections. For that reason, caution should be used when utilizing the findings. The figure below outlines the percentage of non-motorist fields reviewed where the field was deemed acceptable or complete by reviewers. For fields where consistency could not be verified, only completeness was examined.

Percentage of Reports Reviewed with "Acceptable" or "Complete" Information in Field – Non-Motorist Level Fields



Additional information on each non-motorist level field that yielded an 'acceptable' rating of 95 percent or less is provided in the following tables.

NON-MOTORIST SAFETY SYSTEM USED

Report Type	Complete		Incomplete	
Local Police (electronic)	4	21.1%	15	78.9%
Local Police (paper)	5	35.7%	9	64.3%
State Police (electronic)	1	33.3%	2	66.7%
Total	10	27.8%	26	72.2%

The *Non-Motorist Safety System Used* field was only found to be complete in 28 percent of the reports reviewed (10 of 36). Local police electronic submissions were incomplete most often (15 of 19) with local police paper submissions incomplete 63 percent of the time, (9 of 14) and State Police electronic submissions incomplete 67 percent (2 of 3).

NON-MOTORIST INDICATOR BOX

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	17	85.0%	2	10.0%	-	-	1	5.0%
Local Police (paper)	13	81.3%	-	-	-	-	3	18.8%
State Police (electronic)	3	50.0%	2	33.3%	1	16.7%	-	-
Total	33	78.6%	4	9.5%	1	2.4%	4	9.5%

The *Non-Motorist Indicator Box* was completed in an acceptable manner in 79 percent (33 of 42) of the reports reviewed. Although reports submitted by State Police were only deemed acceptable 50 percent (3 of 6) of the time, the total State Police reports reviewed with a NM indicator was six. This may be due to the fact that non-motorists are rarely found on state roads. Electronic and paper submissions by local police were acceptable 85 (17 of 20) and 81 percent (13 of 16) of the time, respectively. Based on the comments from the auditors, many of the unacceptable reports were due to car occupants or witnesses being recorded in the incorrect field.

NON-MOTORIST ACTION

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	14	73.7%	2	10.5%	-	-	3	15.8%
Local Police (paper)	8	57.1%	1	7.1%	-	-	5	35.7%
State Police (electronic)	3	100.0%	-	-	-	-	-	-
Total	25	69.4%	3	8.3%	-	-	8	22.2%

For the *Non-Motorist Action* field, the percentage of acceptable completions for the *NM Action* field was 69 percent (25 of 36). While the reports submitted by the State Police were acceptable 100 percent of the time (3 of 3), paper submissions by local police were acceptable just over 57 percent (8 of 13) of the time. The issue with most of these unacceptable reports was that the officer left the field empty 22 percent (8 of 36) of the time.

NON-MOTORIST LOCATION

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	15	78.9%	1	5.3%	-	-	3	15.8%
Local Police (paper)	8	57.1%	-	-	-	-	6	42.9%
State Police (electronic)	1	33.3%	2	66.7%	-	-	-	-
Total	24	66.7%	3	8.3%	-	-	9	25.0%

The *Non-Motorist Location* field was completed in an acceptable way in 67 percent (24 of 36) of the reports reviewed. Of the three police submission types, the State Police had the lowest acceptable rate, at about 33 percent of their reports (1 of 3). The biggest issue for local police was that for paper submissions, about 43 percent (6 of 14) of the reports had this field left blank.

NON-MOTORIST TYPE

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	16	84.2%	-	-	-	-	3	15.8%
Local Police (paper)	8	57.1%	2	14.3%	-	-	4	28.6%
State Police (electronic)	3	100.0%	-	-	-	-	-	-
Total	27	75.0%	2	5.6%	-	-	7	19.4%

The *Non-Motorist Type* field was completed in an acceptable way in 75 percent of the reports reviewed (27 of 36). For 19 percent (7 of 36) of the reports, this field was left empty, although the Non-Motorist indictor was complete. Electronic entries by local police had an empty *Non-Motorist Type* field in about 16 percent (3 of 19) of the reports reviewed, and paper entries by local police had this field empty in 29 percent (4 of 14) of the reports.

NON-MOTORIST CONDITION

Report Type	Complete		Incomplete	
Local Police (electronic)	14	73.7%	5	26.3%
Local Police (paper)	8	57.1%	6	42.9%
State Police (electronic)	3	100.0%	-	-
Total	25	69.4%	11	30.6%

The *Non-Motorist Condition* field was found to be appropriately complete in 69 percent of the 36 reports reviewed. The main contributor to this low number was the amount of paper submissions by local police that had an incomplete response for this field (43 percent, 6 of 14).

Non-Motorist Injury Status

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	16	84.2%	1	5.3%	0	0.0%	2	10.5%
Local Police (paper)	10	71.4%	1	7.1%	0	0.0%	3	21.4%
State Police (electronic)	3	100.0%	0	0.0%	0	0.0%	0	0.0%
Total	29	80.6%	2	5.6%	0	0.0%	5	13.9%

The *Non-Motorist Injury Status* field was found to be complete 81 percent (29 of 36) of the reports reviewed. Local police with paper submissions had the lowest percentage acceptable, with just over 21 percent (3 of 14) having an empty field. State Police had this field completed in an acceptable manner in 100 percent of the reports reviewed (3 of 3).

Non-Motorist Transported

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	17	89.5%	-	-	-	-	2	10.5%
Local Police (paper)	10	71.4%	-	-	-	-	4	28.6%
State Police (electronic)	3	100.0%	-	-	-	-	-	-
Total	30	83.3%	-	-	-	-	6	16.7%

The *Non-Motorist Transported* field was completed appropriately in 83 percent (30 of 36) of the reports reviewed. No reports were found to have inconsistencies or invalid entries for this field. The issues for both submission types for local police were with empty fields. State Police had a 100 percent (3 of 3) acceptable rate.

Non-Motorist Medical Facility

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	16	84.2%	-	-	-	-	3	15.8%
Local Police (paper)	12	85.7%	-	-	-	-	2	15.4%
State Police (electronic)	3	100.0%	-	-	-	-	-	-
Total	31	86.1%	-	-	-	-	5	13.9%

The *Non-Motorist Medical Facility* field was completed appropriately for 86 percent (31 of 36) of the reports reviewed. For the rest of the local police reports, this field was found empty. State Police had a 100 percent acceptable rate (3 of 3), with both submission types for local police at around 85 percent.

NON-MOTORIST INFORMATION

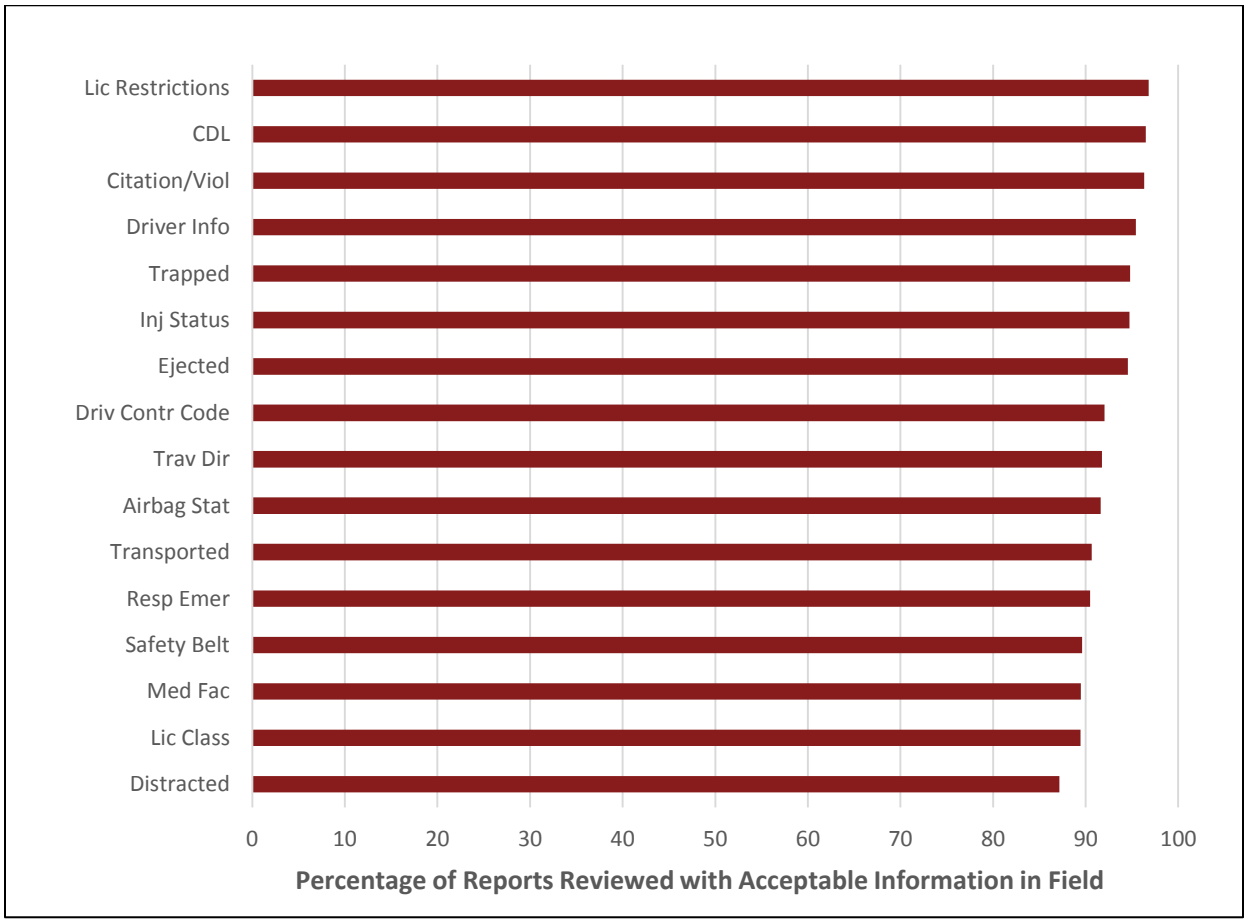
Report Type	Complete		Incomplete	
Local Police (electronic)	17	89.5%	2	10.5%
Local Police (paper)	13	92.9%	1	7.1%
State Police (electronic)	2	66.7%	1	33.3%
Total	32	88.9%	4	11.4%

The *Non-Motorist Info* field was found to be complete in about 89 percent (32 of the 36) of the reports reviewed. While local police submissions (both electronic and paper) were complete 90 and 93 percent (17 of 19 and 13 of 14) of the time, State Police submissions were complete 67 percent (2 of 3) of the time.

DRIVER LEVEL RESULTS

The figure below outlines the percent of crash reports reviewed where the driver level fields were deemed acceptable or complete by reviewers. For fields where consistency could not be verified, only completeness was examined. Auditors found all driver level fields to be acceptable at least 87 percent of the time. The field deemed acceptable the least amount of time was *Driver Distracted By*, followed by *License Class, Driver Medical Facility,* and *Driver Safety System Used (Belt Status)*. The fields found acceptable most often were *License Restrictions*, *Commercial Driver's License, Citation Number/Violation Number,* and *Driver Information*, all at 95 percent or greater.

Percentage of Reports Reviewed with "Acceptable" or "Complete" Information in Field – Driver Level Fields



DRIVER LEVEL FIELDS WITH LESS THAN 95 PERCENT ACCEPTABLE

Additional information regarding each crash level field that yielded an 'acceptable' rating of less than 95 percent can be found on the following pages.

Driver Distracted By

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	287	85.2%	5	1.5%	2	0.6%	43	12.8%
Local Police (paper)	290	89.2%	-	-	1	0.3%	34	10.5%
State Police (electronic)	-	-	-	-	-	-	-	-
Total	577	87.2%	5	0.8%	3	0.5%	77	11.6%

The *Driver Distracted By* field was the field in the driver section of the report that had the highest frequency of unacceptable information, completed in 87 percent of the reports reviewed. Most of the remaining reports had left the distracted field empty. Auditors commented that informal policies varied by department, sometimes requiring that a citation be issued in order to use this field. Furthermore, law enforcement auditors stated that responses to this field can be questioned in court and therefore only complete this field if they can verify it, and also issue a citation.

License Class

Report Type	Complete		Incomplete	
Local Police (electronic)	540	90.8%	55	9.2%
Local Police (paper)	557	91.0%	55	9.0%
State Police (electronic)	540	86.7%	83	13.3%
Total	1637	89.5%	193	10.5%

License Class is a field that was completed appropriately in 90 percent of the reports reviewed. This field was incomplete in 13 percent of the reports submitted by State Police, which was the highest incomplete rate of the three submission types. This field presented the greatest challenge for law enforcement in cases where there was no license. There is no way for an officer to fill in information for an unlicensed driver. As a result, this field is often left blank. Law enforcement auditors also indicated a need for an 'out of state' license option.

Driver Medical Facility

Report Type	Complete		Incomplete	
Local Police (electronic)	540	90.8%	55	9.2%
Local Police (paper)	557	91.0%	55	9.0%
State Police (electronic)	540	86.7%	83	13.3%
Total	1637	89.5%	193	10.5%

Driver Medical Facility is a field that was considered to be complete in 90 percent of the reports reviewed. *Driver Medical Facility* being left blank was considered acceptable when the *Driver Transported Code* indicated that the driver was not transported. State Police had the highest percentage

of incomplete reports. Auditors recommended providing a drop-down menu for medical facility that would include all such facilities, as well as options for 'not applicable' and 'unknown'.

Driver Safety System Used (Belt Status)

Report Type	Complete		Incomplete	
Local Police (electronic)	574	96.5%	21	3.5%
Local Police (paper)	551	90.0%	61	10.0%
State Police (electronic)	514	82.6%	108	17.4%
Total	1639	89.6%	190	10.4%

Driver Safety System Used is the field that was found to be complete in 90 percent of the reports reviewed, which is a decrease from the 2005 audit findings (from 95 percent). Although both submittal types for local police had a percent completed rate in the 90s, reports submitted by the State Police had a slightly lower rate, at just over 82 percent. In instances where this field is completed, auditors commented that it is often unverified. Furthermore, there were a number of instances where the collision involved a parked vehicle or a hit and run crash and would not be applicable.

Responding to Emergency

Report Type	Complete		Incomplete	
Local Police (electronic)	529	88.5%	69	11.5%
Local Police (paper)	520	85.0%	92	15.0%
State Police (electronic)	609	97.9%	13	2.1%
Total	1658	90.5%	174	9.5%

Responding to Emergency is a field that was completed in 90 percent of the reports reviewed. State Police submissions were completed 98 percent of the time, with both submission types for local police completed between 85-90 percent of the time. Law enforcement auditors indicated that some officers are confused as to whether this is only for Fire/Police/EMS vehicles or personal situations. In addition, law enforcement auditors indicated that when officers leave this field empty, it's an indication that the vehicle was not responding to an emergency.

Driver Transported

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	544	91.4%	5	0.8%	-	-	46	7.7%
Local Police (paper)	542	88.6%	3	0.5%	1	0.2%	66	10.8%
State Police (electronic)	571	91.9%	3	0.5%	1	0.2%	46	7.4%
Total	1657	90.6%	11	0.6%	2	0.1%	158	8.6%

The field *Driver Transported* was deemed acceptable in 91 percent of the reports reviewed. The greatest issue for this field was paper submissions by local police, with almost 11 percent leaving it empty. Many officers leave this field empty when the driver is not transported.

Driver Airbag Status

Report Type	Complete		Incomplete	
Local Police (electronic)	580	97.5%	15	2.5%
Local Police (paper)	548	89.7%	63	10.3%
State Police (electronic)	546	87.9%	75	12.1%
Total	1674	91.6%	153	8.4%

The *Driver Airbag Status* field was found to be complete in 92 percent of the reports reviewed. The highest completion rate of the three report types was local police submitted electronically, with less than 3 percent of the reports showing an incomplete field. Out of the three police report types, when compared to the 2008 audit, the reports submitted electronically by local police had an acceptable completion rate that increased about 4 percentage points. The acceptable completion rate of the other two police report types decreased slightly for this field. Commonly, the field was left blank, even though officers completing the form should have been able to see whether the airbag deployed.

Vehicle Travel Direction

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	560	93.8%	13	2.2%	4	0.7%	20	3.4%
Local Police (paper)	511	83.4%	23	3.8%	1	0.2%	78	12.7%
State Police (electronic)	611	98.1%	1	0.2%	-	-	11	1.8%
Total	1682	91.8%	37	2.0%	5	0.3%	109	5.9%

The *Vehicle Travel Direction* field was deemed acceptable in 92 percent of the reports reviewed. Local police submitting paper reports left this field empty almost 13 percent of the time, and recorded inconsistent information nearly 4 percent of the time while about 98 percent of State Police submissions were acceptable. Discussion among auditors brought up that this field could represent the actual physical direction the vehicle was moving in, or the overall road direction. This caveat becomes more complex at intersections when the vehicle is making a turn.

Driver Contributing Code

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	568	95.1%	14	2.3%	2	0.3%	13	2.2%
Local Police (paper)	554	90.2%	33	5.4%	3	0.5%	24	3.9%
State Police (electronic)	563	90.8%	17	2.7%	1	0.2%	39	6.3%
Total	1685	92.0%	64	3.5%	6	0.3%	76	4.2%

The *Driver Contributing Code* field was considered acceptable in 92 percent of the reports reviewed. In reports that had inconsistencies, the greatest percentage came from paper submissions by local police. Another issue with this field was leaving it empty, which was the case for more than 4 percent of reports reviewed, and the biggest issue for State Police. Compared to the 2008 audit, the percentage of acceptable reports for this field has gone up by 2 percent. Auditors expressed concern about the difference between inattention and distracted. Auditors also commented that police departments had varying informal policies regarding their use of this field and its relationship to the cause of the crash and citations issued. Some departments indicated a citation needed to be written for whatever driver contributing factor was described here. Therefore, the field was only completed if the officer was certain of the driver contributing factor and was willing to issue a citation.

Driver Ejected

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	580	97.5%	8	1.3%	-	-	7	1.2%
Local Police (paper)	550	90.0%	4	0.7%	1	0.2%	56	9.2%
State Police (electronic)	597	96.3%	2	0.3%	-	-	21	3.4%
Total	1727	94.6%	14	0.8%	1	0.1%	84	4.6%

Driver Ejected is a field that was completed in an acceptable manner in nearly 95 percent of the reports reviewed. However, paper reports submitted by local police left the field empty about 9 percent of the time. The percentage of acceptable reports was almost identical to the percentage found acceptable in the 2008 audit. Law enforcement auditors commented that police often left this field empty if the air bag was not deployed. They stressed the need for education on entering 'not deployed', instead of leaving this field empty.

Driver Injury Status

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	578	97.3%	6	1.0%	-	-	10	1.7%
Local Police (paper)	551	90.2%	5	0.8%	1	0.2%	54	8.8%
State Police (electronic)	601	96.8%	3	0.5%	-	-	17	2.7%
Total	1730	94.7%	14	0.8%	1	0.1%	81	4.4%

Driver Injury Status is a field that was completed in an acceptable manner in nearly 95 percent of the reports reviewed. Local police reports submitted electronically had the lowest rate of acceptable reports at 90 percent with almost 9 percent left empty. Compared to data from the 2008 audit, the percentage of acceptable reports increased by 2 percentage points. In addition, there was an improvement over the 2008 audit for local police reports submitted electronically, with a decrease in incidences of leaving the field empty (16.5 percent in 2008 to 1.7 percent in 2017). During audit discussions, law enforcement described the lack of specificity for each injury status option, and suggested more detailed clarification on each of the options.

Driver Trapped

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	580	97.5%	6	1.0%	-	-	9	1.5%
Local Police (paper)	550	90.0%	4	0.7%	1	0.2%	56	9.2%
State Police (electronic)	602	96.9%	1	0.2%	-	-	18	2.9%
Total	1732	94.8%	11	0.6%	1	0.1%	83	4.5%

The field *Driver Trapped* was completed in an acceptable way in nearly 95 percent of the reports reviewed, with each of the three submission types deemed acceptable at least 90 percent of the time. The biggest issue was with paper submissions from local police, as those reports had an empty *Driver Trapped* field about 9 percent of the time. Similar to the *Driver Ejected* field, auditors indicated that often times, if the driver was not trapped, officers left this field empty.

Driver Level Fields With 95 Percent or Greater Acceptable

The following fields had an overall acceptable rate of 95 percent or greater. As such, only the summary tables are shown.

Driver Information

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	586	96.7%	10	1.7%	2	0.3%	8	1.3%
Local Police (paper)	602	95.6%	19	3.0%	-	-	9	1.4%
State Police (electronic)	588	94.1%	21	3.4%	1	0.2%	15	2.4%
Total	1776	95.4%	50	2.7%	3	0.2%	32	1.7%

Citation Number/ Violation Number

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	578	97.0%	3	0.5%	-	-	15	2.5%
Local Police (paper)	597	97.7%	6	1.0%	-	-	8	1.3%
State Police (electronic)	588	94.4%	9	1.4%	1	0.2%	25	4.0%
Total	1763	96.3%	18	1.0%	1	0.1%	48	2.6%

Commercial Driver's License

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	572	96.3%	5	0.8%	-	-	17	2.9%
Local Police (paper)	596	97.7%	4	0.7%	2	0.3%	8	1.3%
State Police (electronic)	595	95.5%	1	0.2%	-	-	27	4.3%
Total	**1763**	96.5%	**10**	0.5%	**2**	0.1%	**52**	2.8%

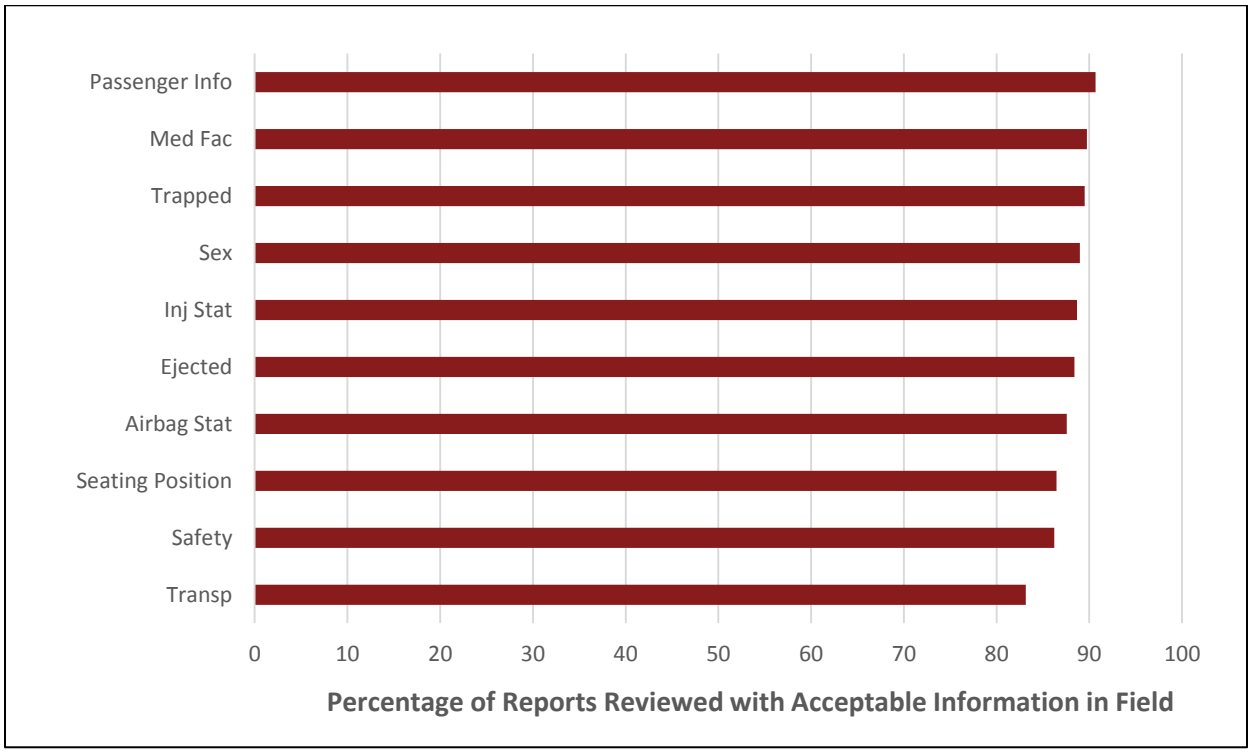
License Restrictions

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	570	97.3%	9	1.5%	7	1.2%	-	-
Local Police (paper)	559	93.9%	8	1.3%	28	4.7%	-	-
State Police (electronic)	610	99.2%	4	0.7%	1	0.2%	-	-
Total	1739	96.8%	21	1.2%	36	2.0%	-	-

PASSENGER LEVEL RESULTS

Passenger level results were recorded for passengers in each vehicle involved in a crash that was reviewed as part of the audit. The figure below outlines the percentage of passenger level fields reviewed where the field was deemed acceptable or complete by reviewers. For fields where consistency could not be verified, only completeness was examined. As shown, the *Passenger Transported* field had the lowest percentage of reports deemed acceptable, followed by *Passenger Safety System Used, Passenger Seating Positon,* and *Passenger Airbag Status*. Fields found to be acceptable most often were the *Passenger Information* (name, address) followed by *Passenger Medical Facility*. Auditors representing State Police indicated that Troopers do not always have time to complete all of the information on passengers. Reasons indicated for this included being called to another crash, having numerous other calls, and the inability to collect the information at the crash scene.

Percentage of Reports Reviewed with "Acceptable" or "Complete" Information in Field – Passenger Level Fields.



PASSENGER TRANSPORTED

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	106	84.8%	1	0.8%	-	-	18	14.4%
Local Police (paper)	134	89.9%	1	0.7%	-	-	14	9.4%
State Police (electronic)	61	69.3%	-	-	-	-	27	30.7%
Total	301	83.1%	2	0.6%	-	-	59	16.3%

Passenger Transported is the field in the passenger section of the report that had the highest frequency of unacceptable information. It was found to be acceptably completed in 83 percent of reports reviewed. The highest percentage of reports leaving this field empty came from the State Police (31 percent) followed by electronic submissions by local police (14 percent). Auditors indicated that this field was often left empty when the passenger was not transported. However, there is a field option for 'not transported'.

Passenger Safety System Used

Report Type	Complete		Incomplete	
Local Police (electronic)	119	95.2%	6	4.8%
Local Police (paper)	139	93.3%	10	6.7%
State Police (electronic)	55	61.8%	34	38.2%
Total	313	86.2%	50	13.8%

Passenger Safety System Used is a field that was completed for 86 percent of the reports reviewed. Similar to other fields in this section, State Police had the highest percentage of reports deemed incomplete, with about 38 percent. This was true for most passenger fields in this section of the crash report. Some auditors indicated if there were no passenger injuries, this section was often left incomplete.

Passenger Seating Position

Report Type	Complete		Incomplete	
Local Police (electronic)	116	92.8%	9	7.2%
Local Police (paper)	137	91.9%	12	8.1%
State Police (electronic)	60	68.2%	28	31.8%
Total	313	86.5%	49	13.5%

Passenger Seating Position is another field where the accuracy could not be verified. In total, this field was completed for 87 percent of the reports reviewed. Similar to other fields in this section, State Police had the highest percentage of reports deemed incomplete, with almost one-third empty. This was true for most passenger fields in this section of the crash report. Some auditors indicated that if there were no passenger injuries, this section was often left incomplete.

Passenger Airbag Status

Report Type	Complete		Incomplete	
Local Police (electronic)	117	93.6%	8	6.4%
Local Police (paper)	138	92.6%	11	7.4%
State Police (electronic)	62	70.5%	26	29.5%
Total	317	87.6%	45	12.4%

Consistent with all passenger level results, *Passenger Airbag Status* is a field that was deemed complete in 88 percent of the reports reviewed. Once again, State Police reports had issues with this field, leaving it empty nearly 30 percent of the time. This was true for most passenger fields in this section of the crash report. Some auditors indicated if there were no passenger injuries, this section was often left incomplete.

Passenger Ejected

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	118	94.4%	3	2.4%	-	-	4	3.2%
Local Police (paper)	136	91.3%	2	1.3%	-	-	11	7.4%
State Police (electronic)	66	75.0%	-	-	-	-	22	25.0%
Total	320	88.4%	5	1.4%	-	-	37	10.2%

Passenger Ejected is a field that was found to be acceptably completed in approximately 88 percent of the reports reviewed. The highest percentage of reports leaving this field empty came from the State Police (25 percent), with both submission types from local police showing much lower numbers (3 percent for electronic and 7 percent for paper). This was true for most passenger fields in this section of the crash report. Some auditors indicated if there were no passenger injuries, this section was often left incomplete.

Passenger Injury Status

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	120	96.0%	1	0.8%	-	-	4	3.2%
Local Police (paper)	136	91.3%	1	0.7%	-	-	12	8.1%
State Police (electronic)	65	73.9%	-	-	-	-	23	26.1%
Total	321	88.7%	2	0.6%	-	-	39	10.8%

Passenger Injury Status is a field that was completed in an acceptable manner in 89 percent of the reports reviewed. The highest percentage of reports reviewed with this field empty came from the State Police (26 percent), with both submission types from local police showing much lower numbers (3 percent for electronic and 8 percent for paper).

Passenger Sex

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	123	97.6%	1	0.8%	-	-	2	1.6%
Local Police (paper)	142	95.3%	-	-	-	-	7	4.7%
State Police (electronic)	58	65.9%	1	1.1%	-	-	29	33.0%
Total	323	89.0%	2	0.6%	-	-	38	10.5%

The *Passengers Sex* field was deemed acceptable in 90 percent of the reports reviewed. However, State Police reports had this field empty one-third of the time. This was true for most passenger fields in this section of the crash report. Some auditors indicated if there were no passenger injuries, this section was often left incomplete.

Passenger Trapped

Report Type	Acceptable		Inconsistent		Invalid		Empty	
Local Police (electronic)	120	96.0%	1	0.8%	-	-	4	3.2%
Local Police (paper)	138	92.6%	-	-	-	-	11	7.4%
State Police (electronic)	66	75.0%	-	-	-	-	22	25.0%
Total	324	89.5%	1	0.3%	-	-	37	10.2%

The *Passenger Trapped* field was found to be acceptably complete in 90 percent of reports reviewed. State Police had the highest percentage of reports deemed unacceptable, with 25 percent of reports reviewed having an empty field. This was true for most passenger fields in this section of the crash report. Auditors indicated that if there were no passenger injuries, this section was often left incomplete.

Passenger Medical Facility

Report Type	Complete		Incomplete	
Local Police (electronic)	118	95.2%	6	4.8%
Local Police (paper)	142	95.3%	7	4.7%
State Police (electronic)	64	72.7%	24	27.3%
Total	324	89.8%	37	10.2%

Passenger Medical Facility is a field that was found to be acceptably complete in 90 percent of the reports reviewed. State Police had the highest percentage of reports deemed incomplete (27percent), with relatively low incomplete numbers for both submission types for local police. Auditors commented that there is officer confusion regarding whether this field could be left incomplete if there was no transport. In addition, law enforcement officers indicated there were instances where the officer did not know where the injured person had been transported. They suggested an option for 'not applicable', as well as 'unknown'.

Passenger Info

Report Type	Complete		Incomplete	
Local Police (electronic)	165	95.9%	7	4.1%
Local Police (paper)	206	94.1%	13	5.9%
State Police (electronic)	145	81.5%	33	18.5%
Total	516	90.7%	53	9.3%

The *Passenger Information* field, which encompasses name and date of birth, was complete 91 percent of the time with local police reports (both electronic and paper) completed more often than State Police submitted reports. For State Police reports, many times, instead of listing the passenger as such, they appear on the report as a witness instead. Auditors noted that passenger fields were often left incomplete by State Police and were empty more often when there were no passenger injuries.

RESULTS BY VENDOR TYPE

Each field (except non-motorist due to small sample size) was also examined by vendor type. The findings are shown for the most frequently used vendors of the crash reports in the CDA, with the remaining RMS vendors combined into a group called other. The CDA sample was only designed with a representative sample based on report type (local police paper, local police electronic, and State Police electronically submitted), which is smaller than necessary to produce statistically significant results by vendor type (as that was beyond the scope of the project). Therefore, caution should be used with these findings. There were approximately 400 crash reports from IMC/Tritech, more than 300 from RAMS, approximately 100 each for Pamet and QED, and only 30-35 for Larimore and Microsystems. The remaining 34 were combined into an 'other' category.

The tables on the next several pages demonstrate the findings by vendor type, for fields found acceptable, and fields found to be empty. The findings are outlined by crash report section: crash level, vehicle level, driver level, and passenger level. For fields where the percentage of crash reports in the audit with acceptable findings by vendor was 4 percentage points lower than the findings for the CDA as a whole, the fields are highlighted in yellow and those with acceptable findings of 4 percentage points higher are highlighted in green. The same is done in the tables for fields found empty by vendor. Fields where crash reports from a particular vendor were empty 4 percentage points more often than that for the CDA as whole are highlighted in yellow. Those where the field was found empty 4 percentage points more than the whole sample are highlighted in green. The column within each table for the total may be slightly different than totals in the findings by police reporting type due to differences in field responses left empty by auditors.

Crash Level Fields By Vendor

Crash level fields deemed acceptable by auditors as well as those found empty by vendor type are outlined in the two tables below.

Crash Level Fields Deemed Acceptable By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
City/Town	99.3%	99.7%	98.1%	99.0%	100.0%	100.0%	97.1%	99.2%
Date of Crash	100.0%	100.0%	99.0%	99.0%	100.0%	96.8%	97.1%	99.6%
First Harm Event	96.1%	95.8%	95.2%	90.1%	97.1%	93.5%	97.1%	95.1%
First Harm Loc	96.1%	94.6%	92.3%	87.1%	94.3%	93.5%	97.1%	94.0%
Lat/Long	2.2%	84.4%	2.9%	2.0%	5.7%	0.0%	97.1%	28.6%
Lighting	98.3%	99.4%	96.2%	98.0%	97.1%	100.0%	97.1%	98.3%
Manner Coll	95.1%	97.3%	94.2%	89.1%	100.0%	93.5%	97.1%	95.1%
Number Injured	98.0%	97.3%	93.3%	96.0%	94.3%	96.8%	97.1%	96.5%
Number Vehicles	100.0%	98.8%	100.0%	96.0%	100.0%	100.0%	97.1%	99.0%
Police Type	99.8%	99.7%	97.1%	85.1%	97.1%	93.5%	97.1%	97.6%
Reporting Officer	98.8%	99.4%	99.0%	99.0%	100.0%	93.5%	97.1%	98.7%
Road Contributing	95.1%	NA	85.5%	78.9%	100.0%	94.4%	97.1%	92.9%
Road Intersection	91.7%	93.4%	81.7%	88.1%	97.1%	80.6%	97.1%	90.2%
Road Surface	98.8%	99.1%	97.1%	95.0%	100.0%	100.0%	97.1%	98.2%
School Bus	99.5%	99.4%	99.0%	92.1%	97.1%	93.5%	97.1%	98.3%
Speed Limit	42.2%	97.3%	71.2%	43.0%	37.1%	73.3%	97.1%	63.6%
TCD	97.8%	97.9%	98.1%	92.1%	100.0%	90.3%	97.1%	96.9%
TCD Function	70.2%	80.7%	75.0%	77.2%	85.7%	87.1%	97.1%	75.6%
Time of Crash	97.3%	44.3%	99.0%	69.3%	91.4%	93.5%	97.1%	77.1%
Trafficway	96.8%	96.4%	96.2%	89.1%	97.1%	100.0%	97.1%	95.7%
Weather	97.3%	91.6%	90.4%	88.1%	100.0%	100.0%	97.1%	93.8%
Work Zone	99.3%	99.4%	99.0%	93.1%	100.0%	96.8%	97.1%	98.5%

Crash Level Fields EMPTY By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
City/Town	0.00%	0.00%	0.00%	1.00%	0.00%	0.00%	0.00%	0.10%
Date of Crash	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
First Harm Event	1.00%	0.90%	1.90%	5.00%	0.00%	0.00%	5.90%	1.50%
First Harm Loc	0.50%	1.80%	1.90%	5.00%	0.00%	0.00%	8.80%	1.70%
Lat/Long	97.80%	15.60%	87.50%	98.00%	94.30%	96.80%	94.10%	70.30%
Lighting	0.20%	0.30%	1.00%	2.00%	0.00%	0.00%	5.90%	0.70%
Manner Coll	0.20%	0.60%	1.00%	2.00%	0.00%	0.00%	5.90%	0.80%
Number Injured	0.20%	0.90%	0.00%	2.00%	5.70%	0.00%	14.70%	1.20%
Number Vehicles	0.00%	0.00%	0.00%	1.00%	0.00%	0.00%	5.90%	0.30%
Police Type	0.20%	0.30%	2.90%	10.90%	2.90%	6.50%	5.90%	2.00%
Reporting Officer	1.00%	0.00%	1.00%	1.00%	0.00%	0.00%	6.10%	0.80%
Road Contributing	3.40%	N/A	10.90%	15.80%	0.00%	0.00%	11.10%	4.80%
Road Intersection	0.50%	1.80%	2.90%	5.00%	0.00%	0.00%	5.90%	1.70%
Road Surface	0.50%	0.30%	1.90%	5.00%	0.00%	0.00%	8.80%	1.20%
School Bus	0.20%	0.00%	1.00%	7.90%	0.00%	6.50%	5.90%	1.30%
Speed Limit	57.80%	2.40%	28.80%	57.00%	62.90%	26.70%	50.00%	36.20%
TCD	0.50%	1.20%	1.00%	4.00%	0.00%	3.20%	5.90%	1.30%
TCD Function	0.50%	2.40%	1.00%	6.90%	0.00%	3.20%	8.80%	2.10%
Time of Crash	0.00%	0.30%	0.00%	2.00%	0.00%	0.00%	2.90%	0.40%
Trafficway	0.50%	0.30%	3.80%	6.90%	0.00%	0.00%	5.90%	1.50%
Weather	0.20%	8.10%	1.00%	3.00%	0.00%	0.00%	5.90%	3.20%
Work Zone	0.20%	0.00%	1.00%	6.90%	0.00%	3.20%	5.90%	1.10%

Location Level Fields By Vendor

The method of location used by police, as well as the accuracy of each method (i.e. is the information entered able to be geolocated?), is provided in the three tables below. The first table illustrates the method of location used by each vendor, using absolute numbers to illustrate the sample size by vendor and location method. The other two tables demonstrate the location method and accuracy of location by vendor, using percentages for comparison.

Method of Location by Vendor – Absolute Numbers*

Method	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Intersection	154	20	42	44	21	12	14	307
Exit Ramp	3	152	1	0	1	0	0	157
Mile Marker	0	68	0	0	0	0	0	68
Address	245	92	59	56	13	18	20	503

Method of Location by Vendor – As a Percentage*

Method	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Intersection	38%	6%	41%	44%	60%	40%	41%	30%
Exit Ramp	1%	46%	1%	0%	3%	0%	0%	15%
Mile Marker	0%	20%	0%	0%	0%	0%	0%	7%
Address	61%	28%	58%	56%	37%	60%	59%	49%

Accuracy of Location Method*

Method	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Intersection	84.4%	40.0%	78.6%	88.6%	85.7%	66.7%	100.0%	81.4%
Exit Ramp	33.3%	27.6%	0.0%	N/A	0.0%	N/A	N/A	27.4%
Mile Marker	N/A	73.5%	N/A	N/A	N/A	N/A	N/A	73.5%
Address	72.2%	14.1%	86.4%	83.9%	92.3%	94.4%	90.0%	66.6%

Vehicle Level Fields By Vendor

Vehicle level fields deemed acceptable by auditors, as well as those found empty by vendor type, are outlined in the two tables below.

Vehicle Level Fields Deemed Acceptable By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Action Prior	95.7%	96.6%	94.6%	95.5%	96.6%	94.3%	85.1%	95.5%
Damage Area	94.0%	95.5%	94.0%	93.3%	96.6%	84.9%	70.1%	93.4%
Driv Cont Code	95.1%	90.8%	91.7%	88.3%	96.2%	91.8%	78.5%	92.0%
Hit/Run	97.9%	99.2%	97.3%	96.1%	93.4%	96.2%	100.0%	98.0%
Moped	99.9%	99.0%	99.5%	100.0%	100.0%	100.0%	100.0%	99.6%
Most Harm Evt	95.9%	94.5%	94.0%	87.2%	89.8%	94.3%	83.6%	93.8%
Num Occ	98.6%	93.1%	91.0%	91.8%	96.7%	92.5%	88.1%	94.8%
Owner	95.2%	93.7%	96.2%	91.6%	98.3%	96.2%	97.0%	94.7%
Registration	98.7%	97.3%	97.3%	99.4%	98.3%	98.1%	95.5%	98.0%
Seq of Event	94.7%	89.7%	87.0%	82.7%	96.6%	86.8%	80.6%	90.5%
Towed	96.2%	9.4%	89.2%	52.5%	89.8%	84.9%	73.1%	61.4%
Veh Action Prior	95.7%	96.6%	94.6%	95.5%	96.6%	94.3%	85.1%	95.5%
Veh Config	96.9%	98.1%	97.3%	92.2%	94.9%	88.7%	86.6%	96.2%

Vehicle Level Fields EMPTY by Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Microsystems	Other	Total
Action Prior	0.3%	1.1%	1.1%	0.6%	0.0%	0.0%	9.0%	1.0%
Damage Area	3.7%	1.4%	3.8%	3.3%	3.4%	9.4%	22.4%	3.7%
Driv Cont Code	1.0%	6.3%	4.4%	7.0%	0.0%	6.1%	10.8%	4.2%
Hit/Run	0.4%	0.5%	0.5%	0.6%	0.0%	0.0%	0.0%	0.4%
Moped	0.1%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
Most Harm Evt	0.8%	1.9%	1.1%	9.5%	5.1%	1.9%	11.9%	2.6%
Num Occ	0.7%	1.4%	5.3%	6.0%	3.3%	5.7%	7.5%	2.4%
Owner	4.2%	3.5%	2.7%	8.4%	1.7%	3.8%	1.5%	4.0%
Registration	0.3%	1.1%	0.0%	0.0%	0.0%	1.9%	1.5%	0.6%
Seq of Event	0.1%	0.8%	1.1%	3.9%	0.0%	0.0%	10.4%	1.2%
Towed	2.8%	88.6%	4.9%	47.5%	3.4%	11.3%	13.4%	36.2%
Veh Config	1.7%	1.0%	2.2%	7.3%	5.1%	7.5%	10.4%	2.6%

Driver Level Fields By Vendor

Driver level fields deemed acceptable by auditors, as well as those found empty by vendor type are outlined in the two tables below.

Driver Level Fields Deemed Acceptable By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Airbag Stat	98.3%	87.9%	91.2%	81.7%	90.4%	98.0%	80.0%	91.6%
CDL	98.0%	95.5%	96.1%	94.1%	98.1%	95.9%	96.9%	96.5%
Citation/Viol	98.0%	94.4%	96.1%	95.9%	96.2%	98.0%	98.5%	96.3%
Distracted	81.4%	N/A	71.3%	58.2%	95.3%	59.5%	63.3%	76.6%
Driver Info	97.2%	94.1%	95.7%	96.5%	93.2%	92.2%	90.9%	95.4%
Eject	98.3%	96.3%	94.5%	82.2%	88.5%	95.9%	75.4%	94.6%
Inj Stat	98.4%	96.8%	93.9%	79.9%	90.2%	93.9%	81.5%	94.7%
Lic Class	94.9%	86.7%	89.5%	81.7%	96.2%	71.4%	86.2%	89.5%
Lic Rest	82.5%	86.7%	80.7%	80.4%	78.8%	85.7%	69.2%	83.0%
Med Fac	98.5%	96.6%	94.4%	86.3%	92.3%	95.9%	89.1%	95.8%
Resp Emer	94.7%	97.9%	93.4%	52.7%	83.0%	76.0%	83.1%	90.5%
Safety Belt	97.8%	82.6%	94.5%	81.7%	92.3%	85.7%	76.9%	89.6%
Transported	97.8%	91.9%	93.9%	61.5%	90.4%	77.6%	78.5%	90.6%
Trapped	99.0%	96.9%	92.3%	80.5%	90.4%	95.9%	76.9%	94.8%
Trav Dir	96.4%	98.1%	87.8%	72.2%	66.7%	78.0%	75.4%	91.8%

Driver Level Fields EMPTY By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Airbag Stat	0.7%	11.6%	7.2%	18.3%	9.6%	0.0%	20.0%	7.6%
CDL	1.2%	4.3%	3.3%	5.3%	1.9%	0.0%	1.5%	2.8%
Citation/Viol	1.2%	4.0%	3.3%	3.6%	3.8%	0.0%	1.5%	2.6%
Distracted	17.0%	N/A	27.2%	40.8%	4.7%	35.1%	30.0%	21.6%
Driver Info	1.0%	2.4%	0.5%	2.9%	5.1%	0.0%	1.5%	1.7%
Eject	0.6%	3.4%	5.5%	17.8%	9.6%	0.0%	21.5%	4.6%
Inj Stat	0.6%	2.7%	5.5%	20.1%	9.8%	0.0%	16.9%	4.4%
Lic Class	3.0%	12.8%	8.8%	18.3%	1.9%	20.4%	7.7%	9.0%
Lic Rest	8.1%	11.1%	5.0%	13.7%	1.9%	6.1%	9.2%	9.1%
Med Fac	1.0%	3.2%	5.6%	13.7%	7.7%	2.0%	6.3%	3.8%
Resp Emer	3.5%	2.1%	6.1%	44.4%	11.3%	22.0%	15.4%	8.2%
Safety Belt	1.4%	16.9%	5.5%	18.3%	7.7%	8.2%	23.1%	9.8%
Transported	1.4%	7.4%	5.5%	38.5%	9.6%	20.4%	18.5%	8.6%
Trapped	0.6%	2.9%	5.5%	18.9%	9.6%	0.0%	21.5%	4.5%
Trav Dir	1.0%	1.8%	9.4%	21.9%	31.5%	12.0%	21.5%	5.9%

Passenger Level Fields By Vendor

Passenger level fields deemed acceptable by auditors, as well as those found empty by vendor type are outlined in the two tables below.

Passenger Level Fields Deemed Acceptable By Vendor Type*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Airbag Stat	96.2%	70.5%	91.5%	86.5%	100.0%	80.0%	71.4%	87.6%
Eject	95.5%	75.0%	91.5%	86.5%	100.0%	90.0%	57.1%	88.4%
Info	97.9%	81.5%	89.3%	96.4%	82.6%	86.7%	87.5%	90.7%
Inj Stat	97.4%	73.9%	93.6%	81.1%	100.0%	90.0%	57.1%	88.7%
Med Fac	98.1%	72.7%	95.7%	91.9%	100.0%	80.0%	57.1%	89.8%
Safety	98.1%	61.8%	93.6%	86.5%	100.0%	80.0%	57.1%	86.2%
Seating Position	95.5%	68.2%	89.4%	86.5%	100.0%	80.0%	71.4%	86.5%
Sex	98.7%	65.9%	91.5%	97.3%	100.0%	90.0%	71.4%	89.0%
Transported	96.8%	69.3%	91.5%	48.6%	100.0%	60.0%	71.4%	83.1%
Trapped	98.1%	75.0%	91.5%	86.5%	100.0%	90.0%	57.1%	89.5%

PASSENGER LEVEL FIELDS EMPTY BY VENDOR TYPE*

Field	IMC/Tritech	RAMS	PAMET	QED	Larrimore	Micro systems	Other	Total
Airbag Stat	1.3%	29.5%	8.5%	13.5%	0.0%	20.0%	28.6%	11.3%
Eject	1.3%	25.0%	8.5%	13.5%	0.0%	10.0%	42.9%	10.2%
Info	1.7%	15.2%	7.1%	3.6%	17.4%	6.7%	12.5%	7.6%
Inj Stat	1.3%	26.1%	6.4%	18.9%	0.0%	10.0%	42.9%	10.8%
Med Fac	1.3%	26.1%	4.3%	8.1%	0.0%	20.0%	28.6%	9.4%
Safety	1.3%	37.1%	6.4%	13.5%	0.0%	20.0%	42.9%	13.2%
Seating Position	1.3%	27.3%	6.4%	10.8%	0.0%	20.0%	28.6%	10.2%
Sex	0.6%	33.0%	8.5%	2.7%	0.0%	10.0%	28.6%	10.5%
Transported	2.6%	30.7%	8.5%	48.6%	0.0%	40.0%	28.6%	16.3%
Trapped	1.3%	25.0%	8.5%	13.5%	0.0%	10.0%	42.9%	10.2%

*Caution should be used with these findings due to small sample size by vendor.

CONCLUSIONS

The audit of a sample of police-completed crash reports that were submitted by local and State Police (both in paper format and electronically) provided interesting information that may be used as guidance for future efforts aimed at improving the quality of Massachusetts crash data. The most notable findings are outlined below, divided into the following sections: 1) crash level, 2) location level, 3) vehicle level, 4) non-motorist level, 5) driver level, and 6) passenger level.

Crash Level Findings

- *Latitude* and *Longitude* were fields often left incomplete by local police (paper and electronic reports). This field was completed more often on State Police reports, but it was often 0.00 or an irrelevant location.
- *Time of C*rash was often found to be invalid due to the use of the standard (AM/PM) format, instead of the required military time. Most often, this was true for State Police electronic reports.
- Although the *Speed Limit* field was completed by State Police often, it was left empty by local police more than 50 percent of the time.
- The *Traffic Device Functioning* Code presented challenges for all police types, due to a value being entered for the Traffic Device Functioning Code when 'No Device' was selected in the preceding field, *Traffic Control Device Type*.
- *Roadway Intersection Type* was found to be unacceptable more often for local police (paper and electronic), which may have been due to the higher variety of intersection types on local roads patrolled by local police, as compared to interstates and state routes patrolled by State Police.
- The *First Harmful Event Location* field had a 6 percent rate of inconsistent/incomplete information.
- While *Weather Co*nditions were often completed in an acceptable manner, State Police had a slightly higher incidence of leaving the field empty, while local police had a higher rate of inconsistencies between this field and other fields on the crash report.
- The *Road Contributing Circumstances* field, a new crash report field, was left empty about 5 percent of the time. This was only examined for police departments using the new crash report, which excluded State Police.
- The *First Harmful Event* field was found to be incomplete more often for local police (paper and electronic) than State Police, but was inconsistent with other information on the crash report for both police types.

Location Information Findings

For 89 percent of reports reviewed, the *Crash Diagram* was rated as adequate. Additionally, approximately 87 percent of reports contained a north arrow. Auditors were unable to determine

whether the existing north arrow was being used correctly. Other challenges included a missing *Roadway* name or a general lack of specificity. Also, some crashes (most often submitted by local police) were found to have occurred on a private way or in a parking lot, and should not have been reported to the Massachusetts Department of Transportation (MassDOT) Registry of Motor Vehicles (RMV) Division. Auditors explained that some officers responding to crashes that occurred in a parking lot may have completed a crash report to be helpful for insurance or store liability purposes. Even in these situations, the report could be filed at the police department, instead of being submitted to the RMV.

A later review, conducted by UMassSafe, identified 25 crashes that occurred on a private way that should not have been reported. The majority of these crashes occurred in the local police (electronically submitted) sample, which was likely due more to varying police department policies on reportable crashes, and less because of vendor differences.

The Intersection Method was the method of location that had the highest percentage of crashes that could be adequately geolocated (81 percent). The rates of successful geolocation were much higher for local police than State Police. However, State Police rarely used this location method (n=20). The *Direction* was often missing on reports using the *Intersection* Method. In almost 32 percent of these cases, the *Narrative* and/or *Diagram* provided additional information that was helpful for geolocating the crash. The common inconsistency on local police reports was whether the crash occurred in an intersection or in close proximity to an intersection. State Police auditors indicated that even if two intersecting roadways were entered into the State Police Record Management System, called RAMS in the 'At Intersection' section, it is populated and transferred to the RMV in the 'Not at Intersection' section. The way RAMS is designed, the officers likely do not realize that their default is 'Not at Intersection'.

Auditors deemed the Address Method to be inadequate when either the road name was given, but not the address number, or if the Intersection Method would have been more appropriate. The Address Method was used effectively by local police, meaning that the crashes were able to be geolocated, 78 percent of the time. Conversely, when State Police used the Address Method, crashes could only be geolocated 14 percent of the time. However, State Police rarely used this location method (n=13). As described earlier, for State Police reported crashes that should have used the Intersection Method, some may have been populated and/or transferred to the RMV using the Address Method. The *Narrative* and/or *Diagram* provided additional information that was used to locate the crash in 38 percent of the sample reviewed.

The Mile Marker Method of locating a crash was only used by State Police. Although auditors found this method to be adequate 73 percent of the time, after further review by UMassSafe, it was determined that none of these crash reports had the *Distance from Mile Marker* filled in, and only 63 percent had the *Route Direction* filled in, making it difficult to determine the precise location of the crash. Furthermore, the Mile Marker Method had the lowest percentage (22 percent) of reports containing additional information in the *Narrative* and/or *Diagram* that would help in the geolocation of the crash.

Even though mile markers are self-explanatory, and don't leave much room for error (exactly why they are preferred), discussion with officers helped to explain the potential for problems. Officers suggested

that when they're situated on the side of a busy roadway, they are focused on collecting the pertinent people/vehicle information, and plan to complete the remaining pieces (including location) after they have left the crash scene.

The Exit Ramp Method was only used by State Police, with less than 28 percent of reports within the sample having adequate information to geolocate the crash. The *Route Direction* of the roadway (connected to the ramp) was provided on only 49 percent of the reports reviewed. Another issue with this location method was that the *Distance* of the crash location from the exit ramp was only provided on about 5 percent of reports. Furthermore, only 31 percent of the reports audited in this sample had additional information in the *Narrative* and/or *Diagram*.

Auditors determined that there is a lack of instruction and training on how to use this field properly. Often, an exit will be listed as the location by the officer because it is the nearest landmark, but the crash being described actually occurred in the travel lane of the highway. Additionally, there is confusion around how to properly use the distance field, and from where to measure. The greatest impact on the usability of this data is the lack of information in the *Direction* field. Without this piece, people using the data could be looking at a ramp that is different from where the crash occurred. For example, the northbound and southbound directions of a highway both have an 'Exit 4', but they are in different locations, connect to different sections of the cross-road, and could have completely different landscape attributes and roadway designs.

<u>Vehicle Level Findings</u>

- The *Hit and Run* field was found to be challenging for both police types, although less so for State Police reported crashes. Officers were confused about which vehicle the Hit and Run box should be checked for, and also how to complete information for the unknown driver/vehicle.

- State Police reports were often found to have the *Towed from* Scene field incomplete. In some instances, the field was left empty because the car in question was parked.

- The *Sequence of Events* field often had only one or two options completed, when other information on the report specified additional events that would have been appropriate to include in this field.

- The *Damaged Area* field was incomplete or inconsistent with other information on the report in more than 6 percent of reports reviewed. Law enforcement auditors indicated that the format for this field was easier on the older crash report.

- For the *Most Harmful Event* field, it appeared that officers found it challenging to single out which event was most harmful.

- *Owner Inf*ormation was incomplete more often when either the owner of the vehicle was a business, or when it was a case of hit and run, and therefore, officers did not have the information and were unclear on how to document the situation.

- Challenges with the *Number of Occ*upants field were often due to having more occupants listed in this field than in the passenger section. Additionally, if the vehicle was involved in a hit and run, it was likely that the officer did not have information regarding the occupants, and was unclear on how to document the situation.

Non-Motorist Level Findings

Due to a very small percentage of crashes involving a non-motorist, these crash reports were specifically analyzed after the audit by UMassSafe staff. Although all non-motorist fields had acceptable findings that were under 95 percent, the small sample size (n=42) could be at fault. The non-motorist field that was most frequently considered unacceptable was *Non-Motorist Safety System Used*, followed by the *Non-Motorist Indicator Box*, *Non-Motorist Action*, and *Non-Motorist Location*.

Driver Level Findings

- The *Driver Distracted By* field was often incomplete. Auditors commented that informal policies varied by department, sometimes requiring that a citation be issued in order to use this field.

- *License Class* was often incomplete across all police submission types, but more often by State Police. This field presented the greatest challenge for law enforcement in cases where there was no license, or an out of state license.

- *Medical Facility*, for both driver and passenger, was often left incomplete, even with the Transport Code indicating that the driver or passenger was transported. Auditors recommended providing a drop-down menu for Medical Facility that would include all such facilities, as well as options for 'not applicable' and 'unknown'.

- The *Safety System Used* field was often incomplete. In instances where this field was completed, auditors commented that the information was often unverified, based only on the information provided by the driver. This field was also challenging for collisions that involved a parked vehicle or a hit and run crash.

- *Responding to Emergency* is a field that was often incomplete for local police (paper and electronic) reported crashes. Law enforcement auditors indicated that when officers leave this field empty, it is an indication that the vehicle was not responding to an emergency.

- The Driver *Transported* field was often incomplete. It appears that many officers leave this field empty when the driver is not transported.

- The Driver *Airbag Status* field was often left blank, even though officers completing the crash report should have been able to determine whether the airbag deployed.

- *Travel Direction* was often incomplete for local police paper submitted reports. Auditors discussed the varying interpretation of this field, unsure if it's the overall road lane travel direction, or the trajectory in which the vehicle was moving. This confusion may contribute to the higher rate of incomplete data for crashes on local roads.

- In reports that had inconsistencies for the *Driver Contributing C*ode, the greatest percentage came from paper submissions by local police, while incomplete information was found more often for State Police reports. Auditors commented that police departments had varying informal policies regarding their use of this field, along with its relationship to the cause of the crash and citations issued.

- The *Driver Ejected, Trapped* and *Injury Status* fields were incomplete in approximately 5 percent of the reports reviewed, most often on paper reports submitted by local police. Law enforcement auditors commented that police might leave this row of fields empty if the air bag was not deployed, or the driver was not trapped. Auditors also discussed the lack of specificity for each injury status option, and suggested more detailed clarification on each of the options.

Passenger Level Findings

- All passenger level fields were incomplete or inconsistent in more than 10 percent of the reports audited. The greatest challenge was for State Police reports, where these fields were left incomplete more than 25 percent of the time. Furthermore, these fields were left incomplete more often when there were no passenger injuries.

General Findings

- Across police types, there was no consensus regarding the appropriate level of detail to include in the narrative section of the crash report.

- Similar to the 2005 CDA, there were overall challenges associated with crashes, where critical information was not available. These instances included collisions with a parked car, where driver information either wasn't relevant or couldn't be easily collected, and hit and run crashes, where the driver information was relevant, but difficult or impossible to obtain.

Results by Vendor Type

Most of the fields described above were also examined by vendor type. However, the sample was not designed to provide statistically significant results by vendor type (beyond the scope of the project), and the sample size was small for some of the vendors. Nevertheless, crash reporting from IMC/Tritech appeared to be more complete and acceptable/consistent, while reporting from QED and the combined 'others' appeared to be less complete and acceptable/consistent.

POLICE CRASH REPORT DATA QUALITY IMPROVEMENT PLAN

OVERVIEW OF RECOMMENDATIONS

Based on the quantitative and qualitative findings of the CDA, as well as a review of the recommendations of the previous CDA and other data quality reviews, a list of recommendations was created. They have been grouped into three areas, with each area containing major recommendations, as well as a series of detailed recommendations that elaborate on the major ones. As an overview, the three areas, along with the associated major recommendations, are listed below. These serve as a framework for the DQ Improvement Plan. This plan can be used by the EOPSS HSD, TRCC, and other highway safety stakeholders, as a tool to prioritize projects, allocate resources, and work collaboratively to improve crash data quality in Massachusetts.

Modifications to Crash Report Form Used by Police to Record Crash Information

- Crash report and related database revisions: Phase 1.
- Establish standards for reporting fields that are currently less defined.
- Crash report and related database revisions: Phase 2.
- Consider long-term options for electronic data collection.

Improvement of Data Collection and Entry Systems Used by State and Local Police

- Standardize the data collection and entry systems.
- Improvements for State Police RAMS.
- Enhancements for both State and local police systems.

Guidance, Technical Assistance, and Training for Police Regarding Crash Reporting

- Provide crash reporting information regarding challenging fields and areas of concern.
- Expand knowledge and understanding among law enforcement on the importance of crash data and how it is used.
- Improve information exchange and dissemination with individual police departments on identified data quality issues.

MASSACHUSETTS POLICE CRASH REPORT DATA QUALITY IMPROVEMENT PLAN

The findings of the CDA and the associated recommendations were used to create a comprehensive DQ Improvement Plan that will be used to guide future data quality efforts. This plan was developed to provide recommendations to the TRCC, state agencies, police, and other stakeholders, for improving identified problem areas. Recommendations provided in the DQ Improvement Plan include details regarding the type of recommendation (systems, training, etc.), the problem being addressed, which agencies should be involved in the implementation of the recommendations, and an estimated timeframe for implementation (short, medium, or long).

1. Consider Modifications to Crash Report Used by Police to Record Crash Information

Crash data collected on the Commonwealth of Massachusetts Motor Vehicle Crash Report form is vital for planning crash prevention countermeasures. For that reason, it is important to regularly collect feedback from data collectors and data users on the usefulness and quality of the data. Modifications to the crash report form should be considered every several years, as well as each time the Model Minimum Uniform Crash Criteria (MMUCC) is revised. The TRCC could facilitate discussion on potential changes once annually, and the RMV could maintain a list of ongoing suggestions.

Findings from the CDA suggest both minor and more significant changes may be needed. With this in mind, suggested revisions should be reviewed and implemented in two phases, with the first addressing minor changes that can be made quickly, and the second examining and addressing larger issues. Potential revisions to the crash report should be vetted against CDS and each RMS requirements and necessary updates, as well as MMUCC standards.

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
Crash report and related database revisions: Phase 1						
X	X		X	Create a TRCC subcommittee to review potential crash report changes and make determinations.	S	Lead Agency: EOPSS HSD Collaborating Agencies: TRCC, MassDOT RMV and Highway, State Police, Local Police
X	X		X	Review Model Minimum Uniform Crash Criteria (MMUCC) 5th Edition for recommended crash report changes.	S/M	Lead Agency: MassDOT RMV Collaborating Agency: EOPSS HSD
X	X		X	Develop a team to further study crash location challenges, conduct a state of the practice assessment with similar states, and develop improved methods for collecting location information.	S/M	Lead Agency: MassDOT Highway Collaborating Agencies: EOPSS HSD, MassDOT RMV State Police, Local Police
X	X		X	Consider changes to crash report directions: • Provide additional information on what is a reportable crash; specifically that the crash needs to occur on a public way. This information was provided on the old crash report but was removed from the newer crash report; • Provide specific directions for how hit and run crash reports should be completed (especially those involving parked cars); • Provide specific information on how to complete the location section; • Clarify need for travel direction on the diagram; and • Further clarify when the Truck and Bus section needs to be completed.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
X	X			Consider adding additional response options for the following fields: • Vehicle Configuration: Add option for SUV; • License Class – Add option for unlicensed driver; • Licensed Restriction – Add an option for none; • Transported By – Add options for life flight and not applicable/no transport, consider removing option of police; and • Medical Facility – Add option for not transported.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
X	X			Replace free form fields with options: • Responding to Emergency: Yes/No; and • CDL Endorsements: List various endorsements.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
X	X			Consider changing the format for the Damage Area field from current options, to marking damage on diagram of vehicle (as in previous crash report).	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
X	X			Add new fields: • Y/N check for 'Is this a reportable crash for RMV?' (Occurred on Public Way and one of following: Property damage of $1,000 or greater to any Vehicle/Property or Non-Fatal Personal Injury or Resulted in a Fatality); and • Citations/Violation: Add a Y/N checkbox. When citation is empty it is unclear if it is because it was not completed or there is no citation.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
X	X		X	Consider increasing the crash report criteria of property damage from $1,000. Review what other states use for this criteria for the property damage threshold.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
X				Driver Contributing Code: Consider removing 'glare' and add this to list of options under Road Contributing Circumstances.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPS HSD, MassDOT Highway, State Police, Local Police
Establish standards for reporting currently less defined fields						
X	X		X	Establish standards to clarify the information collection for hit and run crashes and crashes with parked vehicles. Current form allows for variation and instills some confusion.	S/M	Lead Agency: MassDOT RMV Collaborating Agencies: EOPSS HSD, MassDOT Highway, State Police, Local Police

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
X	X		X	Establish a set level of detail that should be included in the narrative.	M	Lead Agencies: MassDOT RMV and Highway, UMassSafe (with 405C pending grant)
Crash report and related database revisions: Phase 2						
X	X	X	X	Continue work of TRCC subcommittee to review potential crash report changes and determine implementation phase.	M	TRCC Subcommittee on Crash Report Revisions
X	X	X	X	Continue work of team to further study crash location challenges and develop improved methods for collecting location information.	M	TRCC Subcommittee on Crash Report Revisions
X			X	Create standard options for crashes involving a parked car or a hit and run crash.	M	TRCC Subcommittee on Crash Report Revisions
X				Consider separating field options for crashes involving pedestrians and those involving bicyclists.	M	TRCC Subcommittee on Crash Report Revisions
X				Consider changing hit and run field from a vehicle field to a crash field.	M	TRCC Subcommittee on Crash Report Revisions
X				Review all crash report options with entry options '0', '1', or '2' and make changes for consistency. For example, School Bus Related and Work Zone Related have a code '2' for 'No' but Road Contributing Circumstances has a code of '1' for 'None' and Damage Area Code has a '0' code for 'None' while Driver Distracted By has a code of '0' for Not Distracted. In addition, for Injury Severity, the code '5' is used for 'No Injury'.	M	TRCC Subcommittee on Crash Report Revisions
X	X			Consider moving Safety System Used codes 6 to 10 to the non-motorist section.	M	TRCC Subcommittee on Crash Report Revisions
Consider long term options for electronic data collection						
X	X	X	X	Use electronic systems for scanning driver licenses that would capture all license-related information including restrictions and driver information. Consider whether it is feasible to include out-of-state drivers in the electronic data collection system or save an image.	L	Lead Agency: MassDOT RMV Collaborating Agencies: EOPSS HSD, State Police and Local Police
X	X	X	X	Add a barcode to registration and use an electronic system for scanning registration barcode and collecting all registration information including registration type.	L	Lead Agency: MassDOT RMV Collaborating Agencies: EOPSS HSD, State Police and Local Police

2. Make Improvements to Data Collection/Entry Systems Used by State & Local Police

Once police have collected information on a crash, they are required to submit it to the RMV. Many local police departments, as well as the State Police, use electronic data entry and management systems to enter and submit crash report information. There are many Records Management Systems (RMS) developed and managed by numerous vendors, each with their own caveats. Many of the crash data quality issues found in the CDA exist due to challenges in the various RMSs, and many others could be easily corrected within the RMS. Improvements to these systems could yield notable improvements in the quality of information received by the RMV.

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
Standardize Data Collection and Entry Systems						
X	X	X	X	Establish formalized process for communication with RMS vendors and law enforcement (State and local) to discuss data quality problems and solutions.	S	Lead Agency: MassDOT RMV Collaborating Agency's/Committees: EOPSS HSD, TRCC, MassDOT Highway Division, MA COPA, State Police
X	X	X	X	Institute a vendor certification process with overall RMS standards (edit checks, validations, etc.). Provide small incentive funding for initial development.	M	
X	X	X	X	Consider development of one web-based data collection and entry system.	M/L	
Improvements to State Police RAMS						
X	X		X	Continue to update electronic transfer software for XML transfer to MassDOT RMV Division with version 2, provided by the RMV Division.	S	Lead Agency: State Police Collaborating Agencies: MassDOT RMV Division
X				Automate system to skip Traffic Device Functioning Code if Traffic Control Device Type is "No Controls".	S	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X			Make improvements to crash location section of RAMS (From MSP DQ Project Recommendations) including: • Update RAMS location drop-down menus (with data provided by MassDOT Highway) for Roadway, Route Number (Roadway Route), Street Number (Roadway Address), Exit (Route Exit Ramp and Route Exit sign), and Mile Marker (Route Mile Marker); • Change Mile Marker and Exit fields in RAMS from free form field to drop-downs (with updated list provide by MassDOT Highway); • Divide Exit field in RAMS into two selections: Route Exit Ramp and Route Exit Sign. This will	S/M	Lead Agency: State Police Collaborating Agency: MassDOT RMV Division (continued)

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
				assist Troopers in defining when a crash is on the Route by the Exit versus when it is on the Exit Ramp; • Add reminder screens in RAMS for fields that often have missing or invalid information (Mile Marker, Distance from Mile Marker, Direction from Mile Marker, Roadway Direction, Distance from Exit, Direction from Exit, Nearest Intersecting Roadway/Route) as well as a prompt asking officers whether they want to enter an intersection or a location. Currently, it defaults to intersection and this affects the accuracy of address entries; • Provide a warning (visual and/or audible) that an incomplete location was entered; and • Provide location verification system.		
X	X			Replace free-form fields with drop-down boxes for Speed Limit, Number of Vehicles, Number Injured, and Number of Occupants.	S/M	State Police
X	X		X	Change response options for the time field to military time.	S/M	State Police
X	X			Examine towed field to determine if reason this field is so often incomplete is a systems problem.	S/M	State Police
	X			Review coding in narrative section for issues such as the quote sign turning into '&QUOT'.	S/M	State Police
X	X		X	Make dependent fields mandatory in RAMS. For example, if a Trooper indicates a crash occurred at an exit, then Distance from Exit and Direction from Exit would be required fields, or vice versa (From MSP C DQ recs). If a Trooper indicates a vehicle configuration of 4 through 13, and a vehicle tow and/or injury in any vehicle in the crash, then Truck and Bus Section would be required.	M	State Police
Improvements for Both State and Local Police RMS						
X	X		X	Create standards and directions for fields that were found to be problematic such as: • Traffic Control Device Functioning Code; • Time of Crash; • Speed Limit; • Towed; • Non-Motorist; • Weather Conditions (field two) • Driver Distracted By; • License Class; • Hit and Run;	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police (continued)

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
				• Passenger Information (safety system used, airbag status, transported, etc.); and • Crash Location.		
X	X		X	Date and Time: Add option of unknown for parked and hit and run. Too often, this is completed in error because RMS requires an entry.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
	X			Consider reminder screens or pop-up windows to identify critical problems of insufficient information and field prompts for dependent fields.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X			Replace free form fields with drop-down boxes for violation codes.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
	X			Consider completion requirements for the following fields often left empty including, when appropriate, the option for none or N/A: • Latitude/Longitude; • Speed Limit; • Towed from Scene; • Driver Distracted By; and • Medical Facility.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
	X			Create system for non-motorist crashes, to ensure all non-motorist fields are completed if the non-motorist indicator is checked.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X	X	X	Review ways to ensure that revised crash reports are resubmitted to the RMV.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X		X	Create vendor edit check system and standard error logging for all RMSs.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X			Change auto populate – if something is N/A, then auto populate rest. Ex. If no injuries then skip transport code and medical facility. Ex. If no TCD, then automatically skip TCD Functioning. Ex. If no alcohol, then skip all associated fields.	M	Lead Agency: MassDOT RMV Collaborating Agencies: State Police and Local Police
X	X		X	Develop universal crash location mapping tool.	M	Lead Agency: MassDOT Highway Collaborating Agencies: MassDOT RMV, State Police and Local Police

3. Establish/expand mechanisms for providing guidance, technical assistance, and training for police regarding crash reporting issues

Law enforcement auditors participating in the CDA expressed a sincere interest in providing quality crash data, as well as concern regarding the lack of training and technical assistance provided to law enforcement on crash reporting. Additionally, they expressed an interest in receiving feedback from the MassDOT RMV and Highway Divisions on the areas that require improvement, specific information on changes to individual reports, and opportunities not only for general improvement, but also specific to their department. To facilitate this type of improvement at the data collection level, the EOPSS HSD and its TRCC have recently funded a number of 405C projects, and have plans for others that could provide this guidance, feedback, and technical assistance, including the following:

- Massachusetts Revised Crash Report Form E-Manual and Evaluation (current);
- Use of Law Enforcement Liaisons (LELs) to provide assistance to police departments (current);
- Data Quality Review of Crash Reports Accepted With Warning and Technical Assistance to Police Departments to Improve Completeness and Reduce Errors (under development); and
- Tools for Improving Crash Report Reviews – Crash Narrative Guidelines (waiting funding/contract).

Each of these projects can provide the needed guidance, technical assistance, and feedback on crash reporting itself, and also regarding data quality issues. In addition, updates to and expansion of crash report training for new police recruits, as well as in-service and roll call training for current officers would be beneficial. Furthermore, crash report instructions, as well as current RMV feedback mechanisms on specific crash report problems could be expanded. The steps outlined below highlight the specific areas of concern, along with strategies for utilizing the current projects to address them.

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
Provide crash reporting information regarding challenging fields and areas of concern via the E-Crash Manual, use of LELs, expanded training, individual police department data review and feedback, as well as crash narrative guidelines.						
X	X		X	Provide guidance on fields/field options found to be challenging including: • Sequence of Events; • Crash Location; • Most Harmful Event; • Intersection; • Driver Medical Facility; • Injury Status; • Driver Contributing Code • Responding to Emergency; • Weather conditions (second field);	S/M	Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants awarded and pending) Collaborating Agencies: State Police and Local Police (continued)

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
				• Roadway Intersection Type - driveway or intersection, traffic circle; and • Hit and Run.		
	X			Provide guidance on fields often left incomplete including: • Latitude and Longitude; • Speed Limit; • Travel Direction; • Towed from Scene - Choose option for 'no' instead of leaving blank; • Non-Motorist fields when non-motorist box is checked; • Driver Distracted By – Choose option for 'no improper driving' instead of leaving blank; • Responding to Emergency – Indicate 'no' instead of leaving field empty; • Driver Transported – Chose option for 'not transported' instead of leaving empty; • Driver Airbag Status - Choose option for 'not deployed' instead of leaving blank; • Driver Ejected - Choose option for 'not ejected' instead of leaving blank; • Driver Trapped - Choose option for 'not trapped' instead of leaving blank; • Travel Direction; and • Passenger Fields – Complete these fields even if no passenger injury.	S/M	Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants awarded and pending) Collaborating Agencies: State Police and Local Police
X	X		X	Clarify confusion regarding the following fields or field options: • Tow: Includes any type of tow (police ordered, driver called AAA, etc.); • First Harmful Event Location: Difference between on roadway and roadside or shoulder; • Traffic Control Device Functioning: How this should be completed for non-signalized device; • Clarify definition of intersection crash – crash in the intersection? Crash impacted by intersection; • Diagram: Needs travel direction as well as north arrow; • When to complete the Truck/Bus section; • Leaving field empty does not indicate 'no', 'not applicable', or 'unknown'; • How to complete report for crashes involving parked vehicles; • How to complete report for crashes involving hit and run; and • Uninsured vehicle.	S/M	Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants) Collaborating Agencies: State Police and Local Police
X	X			Stress importance of complete and accurate information on the following fields and how they are used: • Road Contributing Circumstances; • Safety Systems Used; and • Law enforcement suspects alcohol use/drug use.	S/M	Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants awarded and pending) Collaborating Agencies: State Police and Local Police

Accuracy	Completeness	Timeliness	Consistency	Steps	Time Frame	Agencies
		X	X	Clarify issues including the following: • Need for corrected police reports to be submitted to RMV; and • Attachments are most often not received by RMV.	S/M	Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants awarded and pending) Collaborating Agencies: State Police and Local Police
	X		X	Provide guidance on what to include in the crash narrative.		Lead Agency: MassDOT RMV LELs and UMassSafe (with 405C grants awarded and pending) Collaborating Agencies: State Police and Local Police
Expand knowledge and understanding among law enforcement on the importance of crash data and how it is used.						
X	X	X	X	Utilize LELs to stress the importance of this.	S	MassDOT RMV
X	X	X	X	Discuss this problem at TRCC meetings to develop other strategies.	S	Lead Agencies: EOPSS HSD and TRCC
X	X	X	X	Provide information on the importance of crash data in E-Crash Manual.	S/M	Lead Agency: UMassSafe Collaborating Agencies: MassDOT RMV, EOPSS HSD, State Police and Local Police
X	X	X	X	Include this information in all academy, in-service, and roll call training on crash investigation and reporting.	M	Lead Agencies: EOPSS HSD, State Police and Local Police
Improve information exchange and dissemination with individual police departments on identified data quality concerns.						
X	X	X	X	Continue dialogue between TRCC, MassDOT Highway and RMV, State Police, and local police to better understand challenges faced by officers collecting information in the field.	Ongoing	Lead Agency: EOPSS HSD and TRCC Collaborating Agencies: MassDOT Highway and RMV, State Police and Local Police
X	X	X	X	Expand formalized processes for regular communication between MassDOT RMV and police on specific problems with data including returning crash reports with errors.	M	Lead Agency: MassDOT RMV

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