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EVALUATION OF 2008 KANSAS CRASH DATA REPORTED TO MCMIS CRASH FILE

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16. Abstract

This report is part of a series evaluating the data reported to the Motor Carrier Management Information System (MCMIS) Crash File undertaken by the Center for National Truck and Bus Statistics at the University of Michigan Transportation Research Institute. The earlier studies showed that reporting to the MCMIS Crash File was incomplete. This report examines the factors that are associated with reporting rates for the State of Kansas.

MCMIS Crash File records were matched to the Kansas crash file to determine the nature and extent of underreporting. It was necessary to focus just on crashes involving a fatality, A-injury or B-injury, or in which a vehicle was towed due to disabling damage, because of problems identifying MCMIS reportable crashes in the Kansas crash file. It is estimated that Kansas reported 65.9 percent to 75.3 of reportable crash involvements in 2008.

Reporting rates were found to be related to crash severity, the configuration of the vehicle, and the type of enforcement agency that covered the crash. Over 82.5 percent of fatal crash involvements were reported, 70.9 percent of A- or B-injury involvements, and 63.1 percent of towed/disabled involvements. Trucks and buses as a whole were reported at about the same rates, but transit buses were largely overlooked.

Missing data rates are low for most variables. Corresponding data elements in the MCMIS and Kansas crash files were reasonably consistent, though specific problems were noted with hazmat variables and the truck and trailer configuration.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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1. Introduction

The Motor Carrier Management Information System (MCMIS) Crash file has been developed by the Federal Motor Carrier Safety Administration (FMCSA) to serve as a census file of trucks and buses involved in traffic crashes meeting a specified crash severity threshold. FMCSA maintains the MCMIS file to support its mission to reduce crashes, injuries, and fatalities involving large trucks and buses. Accurate and complete crash data are essential to assess the magnitude and characteristics of motor carrier crashes and to design effective safety measures to prevent such crashes. The usefulness of the MCMIS Crash file depends upon individual states transmitting a standard set of data items on all trucks and buses involved in traffic crashes that meet the crash file severity threshold.

The present report is part of a series of reports that evaluate the completeness and accuracy of the data in the MCMIS Crash file. Previous reports showed underreporting due in large part to problems in interpreting and applying the reporting criteria within the states' respective crash reporting systems. The problems often were more severe in large jurisdictions and police departments. Each state also had issues specific to the nature of its own system. [See references 2 to 36.] The states are responsible for identifying and reporting qualifying crash involvements. Accordingly, improved completeness and accuracy ultimately depends upon the efficiency and effectiveness of individual state systems.

In this report, we focus on MCMIS Crash file reporting by Kansas in 2008. Between 2003 and 2007, Kansas has reported from 1,567 to 1,739 involvements annually to the MCMIS Crash file. Kansas is the 33rd largest state by population and in most years ranks about 25th among the states in terms of the number of annual truck and bus fatal involvements. In recent years the number of fatal truck and bus involvements in Kansas has ranged from 89 in 2004 to 74 in 2006.

Police accident report (PAR) data recorded in Kansas's statewide files as of August 11, 2009, were used in this analysis. The 2008 PAR file contains the crash records for 104,383 vehicles.

The usual method for state evaluations consists of the following steps, which we attempted to pursue here:

1. The complete police accident report file (PAR file hereafter) from Kansas was obtained for the most recent year available, which was 2008. An algorithm was developed, using the data coded in the Kansas file, to identify all cases that qualified for reporting to the MCMIS Crash file.

2. All cases in the Kansas PAR file—those that qualified for reporting to the Crash file as well as those that did not—were matched to the cases actually reported to the MCMIS Crash file from Kansas.

3. Cases that should have been reported, but were not, were compared with those that were reported to identify the sources of underreporting.

4. Cases that did not qualify but which were reported were examined to identify the extent and nature of overreporting.

2. Data Preparation

The Kansas PAR file and MCMIS Crash file each required processing before the Kansas records in the MCMIS Crash file could be matched to the Kansas PAR file. In the case of the MCMIS Crash file, the major tasks were to extract records reported from Kansas and to eliminate duplicate records. The Kansas PAR file was reformatted to create a comprehensive vehicle-level file from accident, vehicle, and person data.

The following sections describe the methods used to prepare each file and some of the problems uncovered.

2.1 MCMIS Crash Data File

The 2008 MCMIS Crash file as of June 9, 2009, was used to identify records submitted from Kansas. For calendar year 2008 there were 1,748 cases reported to the file from Kansas. An analysis file was constructed using all variables in the MCMIS file. This analysis file was examined for duplicate records (more than one record submitted for the same vehicle in the same crash; i.e., the report number and sequence number were identical). No such duplicates were found.

In addition, records were reviewed to find cases with identical values on accident number, accident date/time, county, street, officer badge number, vehicle identification number (VIN), and driver license number, even though their vehicle sequence numbers were different. The purpose is to find and eliminate cases where more than one record was submitted for the same vehicle and driver within a given accident. This can happen as records are corrected. No such duplicates were found. The resulting MCMIS file contains 1,748 unique records.

2.2 Kansas Police Accident Report File

The Kansas PAR data for 2008 obtained from the state was dated August 11, 2009. The data were stored as an ACCESS database, representing Accident, Vehicle, and Person information. The file contained records for 65,858 traffic crashes involving 104,383 units. Data for the PAR file are coded from the State of Kansas Motor Vehicle Accident Report (Rev. 1-2005) completed by police officers.

The PAR file was first examined for duplicate records (involvements where more than one record was submitted for the same vehicle in the same crash). A search for records with identical case numbers and vehicle numbers found no instances of duplicates. In addition, inspection of case numbers verified that they were recorded in a consistent format, so there was no reason to suspect duplicate records based on similar, but not identical, number formats (such as 200801222870 and 2008-1222870, for example).

Just as in the preparation of the MCMIS Crash file, cases also were examined to determine if there were any records that contained identical time, place, and vehicle/driver variables, regardless of vehicle number. Two crash records would not be expected to be identical on all

variables. Records were examined for duplicate occurrences based on the fields for accident date/time, crash county, officer last name, road code, vehicle identification number (VIN), and operator license number. Based on the above algorithm, no duplicate pairs were found. The PAR file has 104,383 unique records.

3. Matching Process

The next step involved matching records from the Kansas PAR file to corresponding records from the MCMIS file. There were 1,748 Kansas records from the MCMIS file available for matching, and 104,383 records from the Kansas PAR file. All records from the Kansas PAR data file were used in the match, even those that did not meet the requirements for reporting to the MCMIS Crash file. This allowed the identification of cases reported to the MCMIS Crash file that did not meet the reporting criteria.

Matching records in the two files is accomplished by using combinations of variables common to the two files that have a high probability of uniquely identifying accidents and specific vehicles within the accidents.

Accident Key, used to uniquely identify a crash in the Kansas PAR data, and Report Number in the MCMIS Crash file, are obvious first choices, though ultimately those variables could not be used to match records. Accident Key in the Kansas PAR file is a 12-digit alphanumeric field, and in the MCMIS Crash file Report Number is stored as a 12-character alphanumeric value. The report number in the MCMIS Crash file is constructed as follows: The first two columns contain the state abbreviation (KS, in this case), followed by nine digits, and a tenth numeric or alpha value. Unfortunately, there did not appear to be any relationship between the PAR and MCMIS report numbers, so this variable could not be used in the match.

Other data items that are useful in matching at the crash level include Crash Date, Crash Time (stored in military time as hour/minute), Crash County, Crash City, Crash Street, and Reporting Officer's Identification number. The PAR file contained the Officer's Last Name, but not a Badge Number, as in the MCMIS file. City Name was unrecorded in 25 percent of PAR cases and in 47 percent of MCMIS cases, limiting its utility. The On_Road_Code and On_Road_Name variables in the PAR file did not match the format of MCMIS Crash Street. Thus, these variables could not be used in the matching process, though they were useful in some cases to verify matches made by other means.

Variables in the MCMIS file that distinguish one vehicle from another within the same crash include vehicle license plate number, driver license number, VIN, driver date of birth, and driver last name. All of these variables were present in the PAR file. They were unrecorded less than 6.6 percent of the time in the PAR file, and three percent or less in the MCMIS file.

The match was performed in five steps, using the available variables. At each step, records in either file with duplicate values on all the match variables for the particular step were excluded, along with records with missing values for the match variables. The first match included the variables crash date (month, day), crash time (hour, minute), county, city, vehicle identification number (VIN), and driver license number. The second match step dropped city as well as VIN, and matched on crash date, crash time, county, license plate number, and driver license number. After some experimentation, the third match step included crash date, license plate number (first

five digits) and driver last name (first five digits). The variables used in the final attempt at a computer-based match were crash month and the last six digits of the VIN. An attempt was made to hand-match the remaining 97 unmatched cases. In this process, we reviewed all crashes in the PAR file in the specific county, with a crash date of the record in the MCMIS file. Matching by this means resulted in twenty-one additional cases in the fifth match. All matches made in steps four and five were also individually verified, based on additional variables.

In total, this process resulted in matching 95.7 percent of the MCMIS records to the PAR file. Seventy-six cases could not be matched. Some of these cases appeared to be duplicate records in the MCMIS file, as a somewhat similar MCMIS record had already been matched to a PAR record with a different crash number. Other records could not be matched due to unrecorded values in the match variables (driver license number, license plate number, and VIN). Perhaps some of these records were added to the MCMIS file as a result of attempting to apply corrections to the original records. Table 1 shows the variables used in each match step and the number of records matched at each step.

Table 1 Steps in MCMIS/Kansas PAR File Match, 2008

Step	Matching variables	Cases matched
Match 1	Crash date (month, day), crash time (hour, minute), county, city, vehicle identification number, and driver license number.	528
Match 2	Crash date, crash time, county, license plate number, and driver license number.	894
Match 3	Crash date, license plate number (first 5 digits), and driver last name (first 5 digits)	143
Match 4	Crash month and vehicle identification number (last 6 digits)	86
Match 5	Hand-matched using all available variables	21
Total cases matched		1,672

The matches made were verified using other variables common to the MCMIS and PAR file as a final check to ensure each match was valid. The above procedure resulted in 1,672 matches, representing 95.7 percent of the 1,748 records reported to MCMIS.

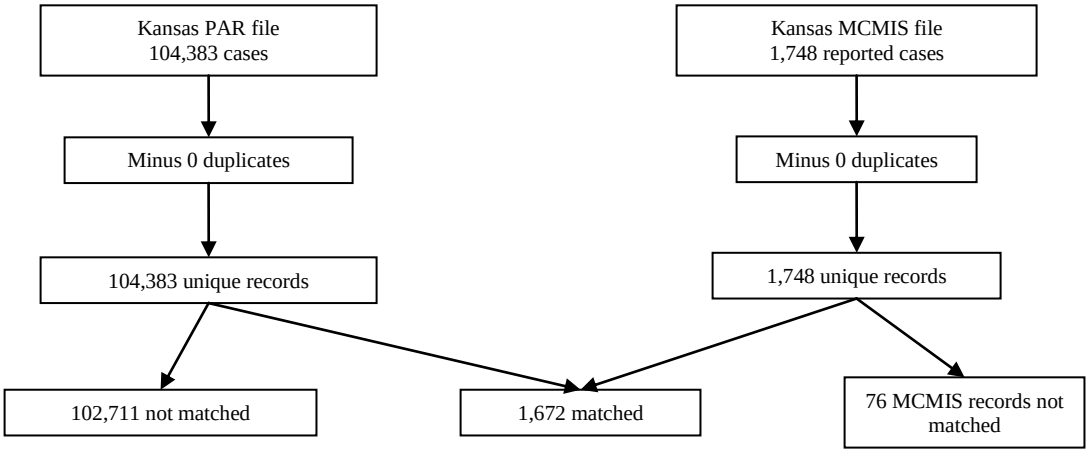

Figure 1 Case Flow in MCMIS/Kansas Crash File Match

Of the 1,672 matched cases, 1,528 apparently met the MCMIS reporting criteria (reportable), as well as that could be determined using the data supplied, and 144 did not meet the MCMIS reporting criteria (not reportable). The method of identifying cases reportable to the MCMIS Crash file is discussed in the next section.

4. Identifying Reportable Cases

4.1 Crash severity

The next step in the evaluation of crash reporting is to identify records in the Kansas data that qualify for reporting to the MCMIS Crash file. Records are selected as reportable using the information available in the computerized crash files supplied by the State of Kansas. Records that are reportable to the MCMIS Crash file meet criteria specified by the FMCSA. The reporting criteria cover the type of vehicle and the severity of the crash. These criteria are discussed in more detail below, but the point here is that records transmitted to the MCMIS Crash file must be selected from among all the records in the state's crash data.

The method developed to identify reportable records is intended to be separate from any prior selection by the state being evaluated. This approach provides an independent method of evaluating the completeness of reporting. Accordingly, we use the information recorded by the officers on the crash report for all crashes.

Some states place some of the data elements intended for the MCMIS Crash file in a special section, with instructions to the reporting officer to complete that information only for vehicles and crashes that meet the MCMIS selection criteria. Kansas uses a supplemental form (DOT form no. 852, rev 1-2003) for trucks with at least two axles and six tires with a GVW greater than 10,000 pounds or buses with seating for nine or more, or any vehicle transporting hazardous materials (hazmat). This almost perfectly captures the vehicle criteria for the MCMIS file.[1] If the present evaluation of state reporting were limited only to records where those data elements had been filled out, it would obviously miss cases that had been missed by the state selection process. Accordingly, the method of identifying reportable cases used in this report attempts to be independent, and relies on variables that describe vehicles and crash severity to determine if they meet the MCMIS Crash file reporting criteria. This approach should provide the best opportunity to identify any cases that might have been overlooked.

The MCMIS criteria for a reportable crash involving a qualifying vehicle are shown in Table 2. Reportable records must meet both the vehicle type and crash severity criteria. The method used for crash severity criteria and the vehicle are each discussed in turn.

[1] The weight requirement stated should specify the gross vehicle weight rating, not the gross weight as such.

Table 2 Vehicle and Crash Severity Threshold for MCMIS Crash File

Vehicle	Truck with GVWR over 10,000 or GCWR over 10,000, or Bus with seating for at least nine, including the driver, or Vehicle displaying a hazardous materials placard.
Accident	Fatality, or Injury transported to a medical facility for immediate medical attention, or Vehicle towed due to disabling damage.

With respect to crash severity, qualifying crashes include those involving a fatality, an injured person transported for immediate medical attention, or a vehicle towed from the scene due to disabling damage. The Kansas Person file includes information about the injury severity for each person involved in the crash. Kansas classifies injury using the common KABCN scale, where injuries are classified as fatal (K), incapacitating (A), nonincapacitating but evident (B), complaint of pain but not evident (C), not injured, and unknown.

Determining whether an injured person was transported for immediate medical attention is not as straightforward. There are "Injured Taken By" and "Injured Taken To" variables on the crash form, but they were not among the variables on the data file we received. The only other related variable that might shed light on whether an injured person was transported for medical attention appears in the Fatality section of the crash form. The "EMS at Hospital" variable appears to list the time (hours/minutes) that EMS arrived at the hospital, but the manual indicates this section of the form is required for fatal accidents only.

Since it is not known if an accident involved a transported injury, the decision was made to use A and B injuries as a surrogate for injured/transported. While unsatisfactory, this is the best available surrogate, based on comparison with national crash files that include both the KABCN (sometimes called KABC0, where the 0 indicates no injury) as well as information about whether the injured person was transported for medical attention.

We examined six years of crash data reported in the National Automotive Sample Survey General Estimates System (NASS GES or just GES) files to determine the proportion of truck and bus crash involvements that meet the MCMIS Crash severity threshold for each level of maximum injury severity in a crash. Table 3 shows the percentage of crash involvements of trucks and buses with respect to the MCMIS crash severity thresholds by the most severe injury in the crash. All fatal involvements are reportable, of course, and the table shows that 100 percent of the cases where the most severe injury was a fatality meet the MCMIS fatal reporting threshold. More interesting are the proportions for the non-fatal injuries. Note that 95.5 percent of the cases in which the maximum injury severity was an incapacitating injury (A-injury) were in the injury/transported group and an additional 3.3 percent met the tow/disabled criteria. So, overall, 98.8 percent of truck and bus involvements in which the most severe injury was an A injury met at least one of the MCMIS crash severity reporting criteria. For non-incapacitating (B) injuries, 89.9 percent (67.3 + 22.6) are reportable. A majority of involvements are reportable even where the most severe injury is a possible (C) injury, with 69.6 percent meeting either the injury/transported or tow/disabled criteria. (Note, however, that less than half of C-injured

persons were transported for treatment.) Where no injury occurred, only 18.5 percent were reportable, almost all because of the tow/disabled requirement.

Table 3 Distribution of MCMIS Reporting Threshold by Most Severe Injury in Crash, GES 2000-2005

Maximum injury severity in crash	MCMIS Reporting Threshold				Total
	Fatal	Injury/ transported	Tow/ disabled	Non-reportable	
Fatal (K)	100.0	0.0	0.0	0.0	100.0
Incapacitating (A)	0.0	95.5	3.3	1.2	100.0
Nonincapacitating (B)	0.0	67.3	22.6	10.1	100.0
Possible (C)	0.0	45.5	24.1	30.4	100.0
None	0.0	0.1	18.4	81.5	100.0

Based on Table 3, it was determined that crashes in which the most severe injury was either a fatality, an incapacitating injury, or a non-incapacitating but evident injury—K, A, or B injuries—identify a subset of crashes that have a high probability of meeting the MCMIS Crash severity criteria. About 94 percent of these crash involvements meet the MCMIS injured/transported threshold. Thus, the K, A, or B involvements can be reasonably identified as reportable, even though we do not have information on whether an injured person was transported for treatment.

The other reporting criteria related to crash severity has to do with vehicle damage, i.e., whether any vehicle in the crash was towed due to disabling damage. The Kansas PAR file includes information needed to identify such crashes. The crash form provides an area for the officer to record one or more Special Conditions per vehicle, one of which is "towed away". However, it is not certain if the vehicle was towed due to "disabling damage." Another field is used to record vehicle damage, with codes of None, Damage (minor), Functional, Disabling, Destroyed, and Other. According to the manual, "Disabling Damage" "prevents departure of the vehicle from the scene of the accident in its usual operating manner by daylight after simple repairs." "Destroyed" is defined as "Salvage is not possible or reasonable. Excludes damage which may not be feasible for economic reasons only." Since it is likely that vehicles with these damage severities had to be towed, all cases with Vehicle Damage recorded as Disabling Damage or Destroyed were considered to be towed due to disabling damage.

Having identified crashes by crash severity, the next step is to identify vehicles that qualify for reporting to the MCMIS Crash file. Vehicle type is captured in Body Type field on the crash form that classifies vehicles among 18 distinct types. The manual explains that a pickup truck with four tires on one axle (i.e., "duals" on the rear axle) should be coded 5 (pickup truck) unless the GVW is 10,001 lbs or greater. A single heavy or large truck with a minimum of two axles and six tires is a code 10 (single large truck), and a Truck-Bus Supplement is required. This information agrees with the MCMIS reporting criteria and is undoubtedly helpful to the reporting officer when filling out the crash form.

However, because the pickup category potentially crosses the 10,000 lb. GVWR category, we examined the vehicles classified as pickups in more detail. The first step was to draw a random sample of 100 vehicles categorized as Pickup Truck in the Bodytype variable to determine if some of these vehicles actually had GVWRs greater than 10,000 pounds. The VINs for these vehicles were decoded to extract the manufacturer's assignment of GVWR. Two of the 100

vehicles were determined to have a GVWR over 10,000 lbs., and so satisfy the MCMIS vehicle criteria. If the two percent rate observed among these 100 cases holds for all the vehicles classified as pickups in the Kansas data, this implies that about 387 vehicles meeting the MCMIS vehicle type criteria are among the 19,341 vehicles classified as pickups. The true number could be more or less, if all VINs were decoded.

In addition to the problem of how to handle the pickup category, we discovered that when we took all crash involvements of vehicles explicitly classified as trucks or buses, we found only 58 fatal involvements for 2008 in Kansas. This number is low relative to recent previous experience, where the number of fatal truck and bus involvements reported in UMTRI's Trucks Involved in Fatal Accidents (TIFA) and Buses Involved in Fatal Accidents (BIFA) has ranged from 89 in 2004 to 74 in 2006. The total of truck or bus fatal involvements for 2007 in Kansas is 83. A drop to 58 in one year, while very welcome, is unlikely.

Accordingly, we examined cases in the TIFA and BIFA projects from Kansas for the 2008 crash year. The survey for 2008 is still underway, so final counts are not available, but the preliminary total for 2008 is 62 fatal involvements. We were able to match each of the 62 cases to the Kansas PAR file and found that five were classified as pickups in the Kansas PAR data. Two other cases were in the Kansas PAR data, but not as fatal involvements. Also, the PAR file contained three additional fatal truck/bus cases that were not in the FARS file.

In addition, we arranged to have all the VINs of pickups decoded to determine if they met the 10,000 lb. GVWR criteria. David Hetzel of the National Institute for Safety Research agreed to process the 18,826 pickups for which VINs were available to determine their GVWR. A total of 904 had GVWRs of 10,000 lbs or greater. These vehicles were flagged as meeting the vehicle type criteria, and added to the vehicles identified using the appropriate levels in the Kansas PAR Body Type variable. Table 4 shows the code levels of the Body Type variable that meet the vehicle criteria.

Table 4 Relevant Body Type Codes in Kansas PAR file

Trucks
Pickup Truck (where VIN shows GVWR > 10,000 lbs)
Single Large Truck
Truck and trailer(s)
Tractor-trailers(s)
Buses
Cross-country bus
School bus
Transit bus

In addition to these vehicle types, any vehicle, regardless of size, displaying a hazardous materials placard, also meets the MCMIS vehicle type definition. Kansas's crash form includes fields in the Truck-Bus Supplement recording whether a vehicle was placarded for transporting hazmat, the hazmat class number (1-digit), the 4-digit material ID number, whether hazardous materials were spilled, and the weight of the material. These variables were used to identify vehicles transporting hazmat.

In total, there were 2,320 vehicles identified in the Kansas PAR data as eligible trucks and buses in crashes with a K, A-, or B- injury or a towed/disabled vehicle. Table 5 shows the distribution by vehicle type. Medium or heavy trucks accounted for 94.1 percent of the vehicles, while 5.9 percent are buses. No light vehicles with hazmat placards were involved in the serious crashes used for the evaluation.

Table 5 Vehicles Meeting MCMIS Accident and Vehicle Criteria
Kansas PAR File, 2008

Vehicle type	N	%
Truck	2,182	94.1
Bus	138	5.9
Other, transporting hazmat	0	0.0
Total	2,320	100.0

Implementing the eligible vehicle and crash severity filters identified a total of 2,320 cases in the Kansas crash data in 2008. There were 2,320 qualifying vehicles—either a truck or bus—involved in a crash that included either a fatality, an incapacitating injury (A), or a non-incapacitating but evident injury (B). As noted above, this number may underestimate somewhat the true number of reportable records, because of the problem with identifying injuries transported for medical attention.

However, the number estimated above agrees reasonably well with an estimate of reportable records based on the number of truck and bus fatal involvements in the state. UMTRI has developed a procedure for such an estimate, using the results from states that recorded the needed data to identify all aspects of the MCMIS reporting criteria. From the experience of these states, a method was developed to estimate the total number of reportable records from a state, based on the number of fatal truck and bus involvements. Fatal involvements are usually well known, simply because the seriousness of the crashes often prompt very careful investigation and documentation. Using the algorithm developed, the 63 fatal truck and bus involvements implies a total of 2,099 total reportable MCMIS records. This number is about 9.5 percent less than the number identified in the Kansas data, but it is at least reasonably close and can be regarded as supportive of the method of identifying records developed here.

As Figure 1 above shows, there were 1,748 records reported to the MCMIS Crash file by Kansas in 2008. Of these, 1,672 were matched to the Kansas PAR file. Of the 1,672 matched records, 1,528 were identified as meeting the reporting criteria under the method described above, and 144 did not qualify for reporting. There were 1,748 records reported to the MCMIS Crash file for 2008, of which 1,528 were determined to meet the MCMIS reporting criteria. Therefore, of the 2,320 reportable records, 1,528 were actually reported, for an overall reporting rate of 65.9 percent.

However, the reporting rate of 65.9 percent may be regarded as the lower bound of the true rate. It must be acknowledged that there is some uncertainty here. Not all of the reported records could be matched to the Kansas PAR data, despite a very lengthy and intensive effort. Each reported record not matched was searched for by hand, e.g., by reviewing all crashes that occurred in the same county on the same date. Even though matching records could not be found in the PAR data, they still may have been present—but just not findable because of an error in

the crash county or crash date or some other error. In addition, given the problem with identifying transported injuries, some of the 144 cases that did not seem to meet the crash severity criteria may actually have had a transported injury, but that just could not be determined because the fact of transport was not recorded. If, then, all 1,748 reported records did in fact meet the criteria, the reporting rate would be 75.3 percent. This rate is a reasonable estimate of the upper bound of the reporting rate.

5. Factors Associated with Reporting

The process described in section 4 identified 2,320 records in the 2008 Kansas crash file as meeting the MCMIS Crash file reporting criteria. This section provides a discussion of factors that apparently affected the successful identification and reporting of records to the MCMIS Crash file.

5.1 Overreporting

The state evaluations typically include a section on overreporting of cases, that is, a discussion of the number of cases reported to the MCMIS Crash file that did not qualify for reporting. However, given the uncertainties in identifying reportable cases from Kansas, it is not possible to identify with complete certainty records that should not have been reported.

Table 6 shows the cross-classification of the 144 reported cases that apparently did not meet the MCMIS reporting criteria. Note that of the 144, 126 were trucks or buses, but involved in a crash that did not meet the crash severity threshold. The other 18 are light vehicles that were not trucks or buses, nor could we find any evidence that they were transporting hazmat.

Table 6 Vehicle Type and Crash Severity for Reported Cases That Did Not Meet MCMIS Reporting Criteria

Vehicle type	Fatal crash	Injured/ transported	Towed/ disabled	Other	Total
Truck	0	0	0	116	116
Bus	0	0	0	10	10
Other	1	5	12	0	18
Total	1	5	12	126	144

5.2 Case Processing

Delays in transmitting cases may partially account for the incompleteness of the MCMIS Crash file. However, in the case of Kansas, there does not appear to be a pattern to the rates of reporting by month. The overall rate was 65.9 percent and the reporting rate for most months was within a few percentage points of that number. Table 7 shows reporting rates according to month of the crash. April saw the lowest rate, but that was only 56.8 percent, and both the preceding and following months were essentially the same as the overall rate. December had the highest rate, but that was only about five percentage points higher than the overall rate. There do not appear to be any seasonal factors that might account for the low overall rate of reporting.

Table 7 Reporting Rate by Accident Month in Kansas Crash File, 2008

Crash month	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
January	224	67.0	74	9.3
February	207	70.0	62	7.8
March	162	67.3	53	6.7
April	169	56.8	73	9.2
May	193	66.8	64	8.1
June	193	66.8	64	8.1
July	172	61.0	67	8.5
August	171	68.4	54	6.8
September	184	58.7	76	9.6
October	208	68.3	66	8.3
November	169	65.1	59	7.4
December	266	70.7	78	9.8
Unrecorded	2	0.0	2	0.3
Total	2,320	65.9	792	100.0

5.3 Reporting Criteria

This section presents the results of examining reporting rates by the factors—crash severity and vehicle type—that are used to determine if a specific crash involvement is reportable. In the current evaluation, crash severity is restricted to K, A-, and B-injury crashes because these are the ones we can have relatively high confidence that they are reportable. This analysis is intended to help identify characteristics of the vehicle or crash that are more likely to trigger the process that results in a reported case.

Table 8 shows reporting rates, the number of unreported cases, and the proportion of unreported cases for each level of the MCMIS crash severity criteria. Traffic crashes that resulted in a fatality were reported at the highest rate, with 82.5 percent of such crash involvements reported. The two less-severe levels of crash severity were reported at lower rates. About 71 percent of crash involvements with an A or B injury were reported, and only about 63.1 percent of towed/disabled crash involvements. It appears that the reporting rates are lower for less serious crashes. That is, lower severity crashes are less likely to be recognized as meeting the requirements of the MCMIS Crash file. The relationship is nearly linear and statistically significant.

Table 8 Reporting Rate by MCMIS Crash Severity, Kansas 2008

Crash severity	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Fatal crash	63	82.5	11	1.4
A or B injury crash	671	70.9	195	24.6
Tow/disabled crash	1,586	63.1	586	74.0
Total	2,320	65.9	792	100.0

The second component of the MCMIS Crash file criteria is the vehicle type. As described above, trucks, buses, and other vehicles transporting sufficient amounts of hazmat to require a placard all meet the reporting requirements. There were no light vehicles transporting hazmat among the serious crashes evaluated in this report, so only reporting rates for trucks and buses are considered here. Table 9 shows the rates for the different general types of vehicles. The reporting rate for trucks was 65.9 percent, identical to the overall rate, which is expected since trucks account for 2,182 of the 2,320 total reportable vehicles. Interestingly, the reporting rate for buses is virtually the same. In almost all states evaluated, the reporting rate for buses is usually significantly lower than for trucks, so it is quite notable that the rates are the same in Kansas.

Table 9 Reporting Rate by MCMIS Vehicle Class, Kansas 2008

MCMIS vehicle class	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck	2,182	65.9	743	93.8
Bus	138	64.5	49	6.2
Total	2,320	65.9	792	100.0

Table 10 provides more detail about the effect of vehicle configuration on reporting rates, showing rates by each level of the body type field in Kansas. Note that, among the trucks, the highest reporting rates are for the biggest vehicles. Over 86.3 percent of tractor-trailers, 78.5 percent of truck and trailer, and 66.7 percent of single unit trucks are reported. On the other hand, only 1.6 percent of reportable trucks classified as pickups were reported. Actually, this is not surprising, since the pickup type straddles the 10,000 lb. GVWR boundary. The *Coding Manual* makes the distinction clear in its discussion of the pickup type, though it might be useful to point out explicitly that 2-axle, 6-tire pickups have a GVWR over 10,000 lbs. Nevertheless, it is difficult for reporting officers on the scene to classify pickups correctly, as the low reporting rate demonstrates. Large trucks are more reliably recognized as meeting the reporting requirements, while smaller trucks, which also qualify, are more often overlooked. Qualifying pickups, whose VINs show that they meet the 10,000 GVWR threshold, are reported at only a 1.6 percent rate. These vehicles account for 46.1 percent of unreported cases.

Table 10 Reporting Rate by PAR Vehicle Configuration, Kansas 2008

Unit type	Reportable cases	Reporting rate	Unreported	% of total unreported
Pickup truck (GVWR>10,000 lbs.)	371	1.6	365	46.1
Single large truck	567	66.7	189	23.9
Truck and trailer(s)	237	78.5	51	6.4
Tractor-trailer(s)	1,007	86.3	138	17.4
Cross country bus	2	100.0	0	0.0
School bus	99	73.7	26	3.3
Transit bus	37	37.8	23	2.9
Total	2,320	65.9	792	100.0

Reporting rates for buses show an interesting pattern. All the reportable involvements of "cross country" buses were reported (though there were only two), and almost three-quarters of school

bus involvements were reported, but only 37.8 percent of the involvements of transit buses. For some reason, even though buses in general are recognized as meeting the MCMIS requirements at the same rate as trucks, transit buses are more often overlooked.

Reporting rates, which are a measure of how reliably reportable records are recognized as meeting the MCMIS reporting criteria, vary by both the type of vehicle and by the severity of the crash. The effects do not seem to be additive—bus rates are low for both nonfatal crash severities and for trucks, the pattern largely follows that for crash severity by itself. (See Table 11.)

Table 11 Reporting Rate by Vehicle Type and Crash Severity, Kansas 2008

MCMIS Vehicle type	Fatal acc	A/B injury	Towed/ disabled	Total
Truck	82.0	71.7	62.9	65.9
Bus	100.0	59.0	66.0	64.5
Total	82.5	70.9	63.1	65.9

5.4 Truck/Bus Supplement Indicator

Kansas collects additional data required for the MCMIS crash file in a Truck – Bus Supplement, DOT Form 852. The reporting officer is instructed to complete the form for any vehicle that meets the MCMIS reporting requirements. The crash data file includes a Truck/Bus Supplement Indicator variable, essentially a flag variable that the supplement was completed. Almost all the records submitted to MCMIS had the truck/bus supplement indicator set to yes. Only seven of the records reported to MCMIS did not have a supplement. On the other hand, about 87 percent of reportable records with the truck/bus supplement were reported. It appears that completing the Truck/Bus supplement is a necessary condition for reporting to the MCMIS crash file, but not a sufficient one. There must be some additional step to cull out the records actually reported, which resulted in missing about 230 reportable cases. In addition, the truck/bus supplement was not completed for 571 reportable involvements.

Table 12 Reporting Rates by Truck/Bus Supplement Indicator, Kansas 2008

Indicator	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
No	571	1.2	564	71.2
Yes	1,749	87.0	228	28.8
Total	2,320	65.9	792	100.0

5.5 License state

This comparison uses license state as a surrogate (imperfect of course) for involvement in interstate commerce, to see if vehicles clearly involved in interstate commerce are more or less likely to be reported to the national crash file, maintained by the regulator of trucks and buses involved in interstate commerce. Vehicles with out-of-state licenses were more likely to be identified and reported than in-state licensed vehicles, 78.9 percent to 58.4 percent. The in-state licensed vehicles accounted for almost 70 percent of unreported cases, so this is an area that

could contribute to a substantial improvement in the overall reporting rate. Clearly, there is some filter being imposed that favors vehicles in interstate commerce over those operating locally.

Table 13 Reporting Rate by Vehicle License State
Kansas 2008

License state	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Kansas	1,323	58.4	551	69.6
Out of state	912	78.9	192	24.2
Unrecorded	85	42.4	49	6.2
Total	2,320	65.9	792	100.0

5.6 Reporting Agency

In addition to the reporting criteria, reporting rates may reflect differences in the type of enforcement agency that investigated the crash. The level and frequency of training or the intensity of supervision may also vary. Such differences can serve as a guide for directing resources to areas that would produce the greatest improvement. This section examines reporting rates by agency.

Reporting rates vary significantly by the type of investigating agency, as reflected in Table 14. There are three primary levels of investigating agencies identified in the Kansas crash file: Highway Patrol, county sheriff, and city police. Crashes covered by the State police have the highest reporting rate, at 88.5 percent, though the Highway Patrol covered only 78 of the 2,320 involvements. The reporting rate for county sheriff is 72.4 percent, and city police 51.1 percent. County sheriffs account for about half of the unreported cases, even though their reporting rate is higher than the overall. Unreported cases from city police account for almost 47 percent of total unreported cases, even though they cover only about one-third of reportable crash involvements. It is likely the differences in training and enforcement duties account for the marked differences in reporting rates among the agencies.

Table 14 Reporting Rate by Investigating Agency, Kansas 2008

Investigating agency	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Highway Patrol	78	88.5	9	1.1
County Sheriff	1,483	72.4	410	51.8
City Police	754	51.1	369	46.6
Other	5	20.0	4	0.5
Total	2,320	65.9	792	100.0

Table 15 shows the top police departments, in terms of the number of unreported cases. The first six cities represented are the top six cities in Kansas in terms of population, so it is likely that enforcement focus and training account for the lower reporting rates. Note that Overland Park, home to a major trucking company, has the highest rate of reporting among these cities.

Table 15 Reporting Rates for Selected Police Departments, Kansas 2008

Police department	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Wichita	169	55.0	76	20.6
Kansas City	84	53.6	39	10.6
Topeka	44	52.3	21	5.7
Olathe	52	61.5	20	5.4
Overland Park	57	66.7	19	5.1
Lawrence	29	37.9	18	4.9
Hutchinson	14	35.7	9	2.4
Pittsburg	10	10.0	9	2.4
Eight-Dept. Total	459	54.0	211	57.2
All Police Depts.	754	51.1	369	46.6

5.7 Fire Occurrence

Fire occurrence is captured at the vehicle level on the Kansas Motor Vehicle Accident Report form. There were 28 trucks with fire coded, and one bus. Nineteen of the truck fire cases were reported, for a reporting rate of 67.9 percent. The single case involving a bus fire was not reported.

Table 16 Reporting of Crash Involvements with Fire Occurrence, Kansas 2008

Vehicle type	Reportable cases	Reporting rate	Unreported cases	% of total unreported cases
Truck	28	67.9	9	90.0
Bus	1	0.0	1	10.0
Total	29	100.0	10	100.0

6. Data Quality and Reporting Latency of Reported Cases

In this section, we consider the quality of data reported to the MCMIS crash file, as well as reporting latency (time elapsed from crash occurrence to when the crash was reported). Two aspects of data quality are examined initially. The first is the amount of missing data. Missing data rates affect the usefulness of a data file because records with missing data cannot contribute to an analysis. The second aspect of data quality considered here is the consistency of coding between records as they appear in the state crash file and in the MCMIS Crash file. Inconsistencies may indicate problems in translating information recorded on the crash report to the values in the MCMIS Crash file.

In this section of the evaluation, all cases reported to the MCMIS crash file from Kansas for 2008 are used, since the purpose of the analysis is to examine the quality of the data as reported.

Table 17 shows missing data rates for selected, important variables in the MCMIS Crash file. Missing data rates are generally low, with a handful of exceptions. On most fundamental,

structural variables, such as date, time, number of fatalities and number of injuries, missing data rates are either zero or extremely low.

The only variable with a significantly high rate of missing data is driver license class, where the information is not present for 13.8 percent of the cases. Compared to the other variables in the file, rates are only elevated for variables relating to the driver—such as date of birth, license number and license state—and variables relating to the vehicle license. Rates for some of the sequence of events variables may appear to be high, but probably just reflect that crashes frequently include only one harmful event, the collision itself. The missing data rate for DOT number is calculated only for carriers coded as "Interstate," which therefore must have a DOT number, but 2.8 percent of the records in MCMIS were found to be missing that information. Overall, the rates of missing data are exceptionally low, reflecting very complete data collection on these variables.

Table 17 Missing Data Rates for Selected MCMIS Crash File Variables, Kansas 2008

Variable	Percent unrecorded	Variable	Percent unrecorded
Report number	0.0	Fatal injuries	0.0
Accident year	0.0	Non-fatal injuries	0.0
Accident month	0.0	Interstate	0.0
Accident day	0.0	Light	0.0
Accident hour	0.0	Event one	0.1
Accident minute	0.0	Event two	79.2
County	0.6	Event three	97.7
Body type	0.8	Event four	99.8
Configuration	0.1	Number of vehicles	0.0
GVWR class	0.4	Road access	0.1
DOT number *	2.8	Road surface	0.0
Carrier state	0.0	Road trafficway	0.0
Citation issued	2.4	Towaway	0.0
Driver date of birth	2.5	Truck or bus	0.0
Driver license number	2.7	Vehicle license number	3.1
Driver license state	2.8	Vehicle license state	2.4
Driver license class	13.8	VIN	0.2
Driver license valid	2.4	Weather	0.0

* Based on cases where the carrier is coded interstate.

Hazardous materials variable	Percent unrecorded
Hazardous materials placard	97.4
Percentages of hazmat placarded vehicles only:	
Hazardous cargo release	34.1
Hazardous materials class (1-digit)	0.0
Hazardous materials class (4-digit)	2.3
Hazardous materials name	0.0

The second section of the table shows missing data rates for the hazardous materials (hazmat) variables. Whether the vehicle displayed a Hazmat Placard was unrecorded in 97.4 percent of cases. The other missing data rates shown are limited to the 44 records in Kansas where the vehicle displayed a hazmat placard, indicating it was carrying hazmat. There was no missing data

for the 1-digit hazmat class code or the hazmat materials name, and only one of the cases was missing the 4-digit hazmat class. Hazmat cargo release was missing for 34.1 percent of the records.

The second check on data quality is to compare values for the records in the Kansas data with values for comparable variables in the MCMIS Crash file. Inconsistencies here may indicate a problem in preparing the data for upload. This comparison was made for all substantive variables, other than those that were used to match records in the two files.

Comparing the variables related to hazmat showed significant inconsistencies. For example, there were six cases coded "Y" (indicating the vehicle displayed a hazmat placard) on hazmat placard in the Kansas PAR data, but left unrecorded in the MCMIS data. Another three were coded "N" in the Kansas PAR data, but "Y" in the MCMIS data. Similarly, there were 10 cases in the Kansas crash file that had a valid hazmat 1-digit class code, but which were left blank in the MCMIS data. And 13 other records had a 1-digit hazmat class code in the MCMIS data, but that field was blank in the Kansas PAR data. There were similar problems for the 4-digit UN code. These numbers are small relative to the whole number of MCMIS records, but they are significant when compared to the 44 cases in the MCMIS file that were coded as displaying a hazmat placard. The true number of vehicles transporting hazmat in these crashes may be significantly higher, but it is not possible to say with certainty because of the inconsistency in the records.

Some inconsistencies were also found when other variables are compared between the two files. For most variables there were only minor inconsistencies. Fourteen records differed on the light condition recorded, and the weather and road condition variables were different in seven cases. With respect to the number of fatalities in the crash, the two files differed in only one case, where the record in the MCMIS file showed one fatality, but the matching record in the Kansas file showed no fatalities. It is possible that the fatality occurred subsequently and was not corrected in the Kansas PAR data.

The only truly significant differences relate to the coding of vehicle configuration and cargo body. Comparing the MCMIS vehicle configuration variable with the body type variable in the Kansas data showed that almost 11 percent of the cases were coded differently in the two files. The primary problems are with how combination units are handled. There were 137 records coded truck and trailer in the Kansas data (a straight truck pulling a trailer) that were coded tractor-semitrailer in the MCMIS Crash file. Similarly, 12 records coded tractor-trailer in the Kansas data were coded truck trailer in the MCMIS file. These two inconsistencies account for almost nine percentage points of the total of 10.9 percent of the cases that differed. There were a few other clusters of inconsistencies, generally a vehicle coded as a truck and trailer in one file and a straight truck in the other.

With respect to cargo body, almost nine percent of the records differed, with most of the problem being a large number of cases coded as a hopper in the Kansas data, but with the "van/enclosed box" body in the MCMIS data. A large number of grain trailers are operated in Kansas, many of which are hopper bottoms, and it is possible that is the source of the confusion. There is a scattering of other isolated inconsistencies, which probably reflect transcription errors or updating a record in one file without updating the other.

Reporting latency also reflects data quality. All reportable crash involvements for a calendar year are required to be transmitted to the MCMIS Crash file within 90 days of the date of the crash. The 2008 MCMIS Crash file as of June, 2009, approximately 180 days after the end of 2008, was used to identify records submitted from Kansas, so all 2008 cases should have been reported by that date. Figure 2 shows the cumulative percent of cases submitted by latency in days, i.e. the number of days between the crash date and the date the case was uploaded to the MCMIS Crash file. Crash reports are required to be submitted to the MCMIS Crash file within 90 days of the crash. Almost 95 percent of the records that were ultimately reported were submitted within 90 days of the crash. The median time between crash occurrence and record upload is about 29 days. Two-thirds are submitted within 37 days, and 99 percent were submitted within 124 days.

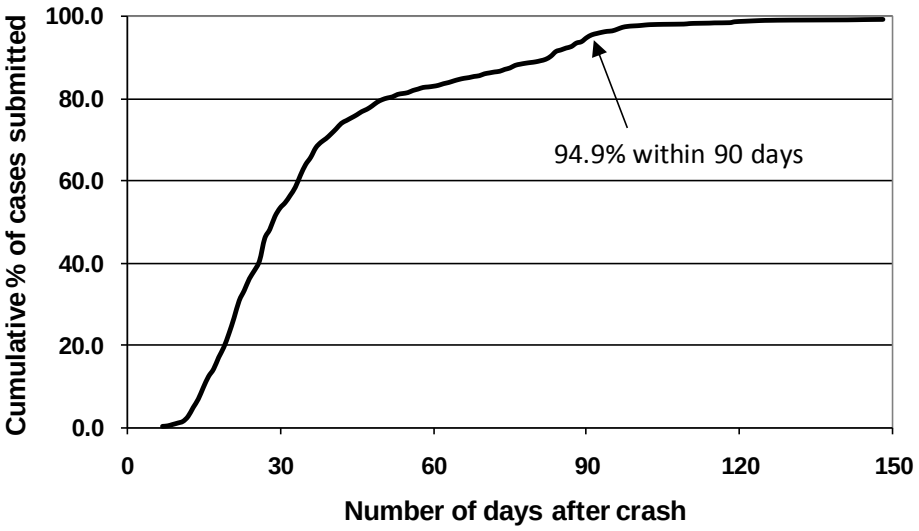

Figure 2 Cumulative Percent of Cases Submitted to MCMIS Crash File by Number of Days After Crash, Kansas 2008

The first date on which crash records from 2008 were uploaded was January 23, 2008, when eleven records were uploaded. On average, uploads occurred every 4.7 days between then and March 13, 2009, when the last upload occurred. An average of 20 records were uploaded per upload. About one-third of the uploads contained fewer than 10 records, and the largest single upload was of 72 records. Most uploads consisted ten to 40 records, with one record being the most common number uploaded.

7. Summary and Discussion

The analysis of reporting by the state of Kansas to the MCMIS Crash file had to be limited to a subset of the cases that meet the MCMIS reporting criteria, because of data limitations. It was not possible to identify crashes in which an injured person was transported for medical attention. So we focused instead on crash involvements that have an high probability of meeting the reporting criteria, even though we don't know directly whether an injured person was transported for treatment. These are crashes involving a fatal, A-injury, or B-injury. Analysis of comparable data has shown that about 94 percent of these cases meet the reporting threshold, so they are a reasonable substitute. In combination with the towed/disabled criteria, (which could be applied) about 97 percent of the records evaluated meet the MCMIS reporting criteria.

Vehicles that meet the MCMIS standard were identified by using the Body Type field primarily. Most of the code levels in that field can be sorted either as a vehicle that meets the description or does not. However, the pickup code level may include vehicles that arguably could meet the 10,000 lb. GVWR threshold. For these vehicle types, where there was a VIN available, we reviewed the VIN to determine if the vehicle met the GVWR requirement. We found that about five percent of the pickups met the GVWR threshold.

Limiting the evaluation just to crash involvements that included a K, A-, or B-injury, a total of 2,320 crash involvements were identified for evaluation. Of these cases, 1,528 were reported to the MCMIS Crash file, for a reporting rate of 65.9 percent of this restricted subset. However, given the uncertainty associated with identifying reportable crashes, we estimate that the reporting rate may be as high as 75.3 percent.

The evaluation of factors that influenced reporting rates was limited to the subset of serious (K, A-, or B-injury) involvements. Fatal crash involvements were reported at a higher rate than the nonfatal, even though all of the nonfatal crashes were quite serious. This difference may occur because more serious crashes are more readily recognized as meeting the reporting requirements. It may also occur because more serious crashes receive more attention from the investigators.

With respect to vehicle types, it is noteworthy that, overall, buses are reported at almost precisely the same rate as trucks. In most states, buses are often overlooked and trucks are reported at a significantly higher rate. Of the three types of buses identified, cross-country (motor coaches) and school buses were reported at a much higher rate than transit buses. Transit buses are operated within cities, and it was noted that reportable crashes covered by city police have the lowest rate of reporting, so it may be that city police tend not to recognize their local transit buses as meeting the requirements for the Truck – Bus Supplement. Among truck involvements, the smallest trucks—vehicles coded as pickups even though their GVWR exceeded the 10,000 lb. threshold—were reported at a very low rate, but all other truck types were reported at rates that ranged from 66.7 percent (single large truck) to 86.3 percent (truck tractor with one or more trailers). This indicates a tendency for big trucks to be more readily recognized as meeting the reporting requirements than smaller trucks.

Kansas collects much of the information uploaded to the MCMIS Crash file on the Truck – Bus Supplement, which the reporting officer is trained to complete if the vehicle meets the reporting criteria. Analysis showed that completing this form was critical to the process of identifying records to submit to the MCMIS Crash file. Only seven of the 1,748 records reported to MCMIS did not have Truck – Bus Supplement completed. Clearly, how well the reporting officer recognizes cases that meet the reporting criteria is highly influential in determining whether a case is reported, though it is not decisive, since many reportable cases with a Truck – Bus Supplement were not uploaded.

The influence of the reporting officer may also be observed in two other comparisons. Vehicles with Kansas license plates were less likely to be reported than those from out-of-state, possibly because out-of-state vehicles are most readily recognized as of interest to the special data collection for the Federal government. And, as in other states, it was observed that the reporting rate for the state police was much higher than for crashes covered by either city police or county sheriffs. This difference could be because of training, enforcement focus, or experience.

The timeliness of uploading those cases Kansas does identify as reportable is very good. Almost 95 percent of the cases they identified were uploaded within the 90 day period allowed. Some few straggled well beyond that limit, but overall, reporting was timely and prompt.

With respect to the reported data itself, missing data rates for most fields reported to the MCMIS Crash file are quite low, though there were some problems. Data for driver license state were missing in almost 14 percent of records. Hazardous material cargo release was missing in about one-third of cases where the vehicle was coded as displaying a hazmat placard.

However, it should be noted that hazmat placard was unrecorded for over 97 percent of all vehicles. And potentially significant inconsistencies were noted when the hazmat data in the Kansas PAR file was compared with the hazmat data reported to the MCMIS Crash file. There were only 44 records in the MCMIS data from cases identified as displaying a hazmat placard. However, there were an additional six records in the Kansas data with a hazmat placard, but these cases were left blank in the MCMIS data. In addition there were 10 records in the Kansas data with a valid hazmat 1-digit code, but left blank in the data reported to MCMIS. Other inconsistencies were also noted. The total number of inconsistent cases is small, relative to the overall file, but quite large relative to the number of hazmat cases. It could not be determined which record is correct, but clearly this is an area that needs additional attention, to ensure that the two files are consistent in this critical area.

There were scattered inconsistencies between code values for other variables. For the most part, they did not appear to be reflective of a systematic problem, but more likely related to updating a record in one file but not the other. However, there does appear to be a problem in two variables that describe the vehicles involved. A large number of vehicles are coded truck and trailer in the Kansas data, but tractor-semitrailer in the MCMIS file. There is also the opposite problem. Again, it is not known which record is correct, but clearly one or the other is wrong. Additional training on how to distinguish these two configurations may be useful. A problem was also noted with the hopper cargo body type, which is incorrectly translated to the van/enclosed box cargo body type. Some hopper grain trailers may superficially resemble vans, but they are different types. Again, additional training may be appropriate.

In many respects, the Kansas data and approach to crash reporting should facilitate a high reporting rate. Other than the pickup code level, about five percent of which meets the GVWR threshold, the vehicles meeting the vehicle type criteria are easily identified. Pickups are a problem, because they are so common and increasingly often exceed the GVWR threshold. Possibly adding some text to the manual reminding officers that rear duals indicates a GVWR over 10,000 lbs. would help. There is also clearly a problem with capturing transit buses properly.

The other major area to be improved has to do with identifying injuries transported for medical attention. The information is on the Motor Vehicle Accident Report, or at least there are areas where this information is captured. If this information was added to the computerized crash record, it could be used by the State to identify crashes meeting the MCMIS reporting criteria. As it is, Kansas is very close to having a computerized record that could be used to identify cleanly all the cases that must be submitted to the MCMIS Crash file. With a few small changes, we believe the reporting rate could be increased substantially.

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12 Blower, D., and Matteson, A., Evaluation of Washington Crash Data Reported to MCMIS Crash File. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. June 2006. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.

13 Blower, D., and Matteson, A., Evaluation of Iowa Crash Data Reported to MCMIS Crash File. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. August 2006. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.

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15 Green, P.E., and Matteson, A., Evaluation of Maryland Crash Data Reported to MCMIS Crash File. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. July 2006. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.

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20 Blower, D., and Matteson, A., Evaluation of 2004 Tennessee Crash Data Reported to MCMIS Crash File. University of Michigan Transportation Research Institute, Ann Arbor, Michigan. May 2007. Sponsor: Federal Motor Carrier Safety Administration, U.S. D.O.T.

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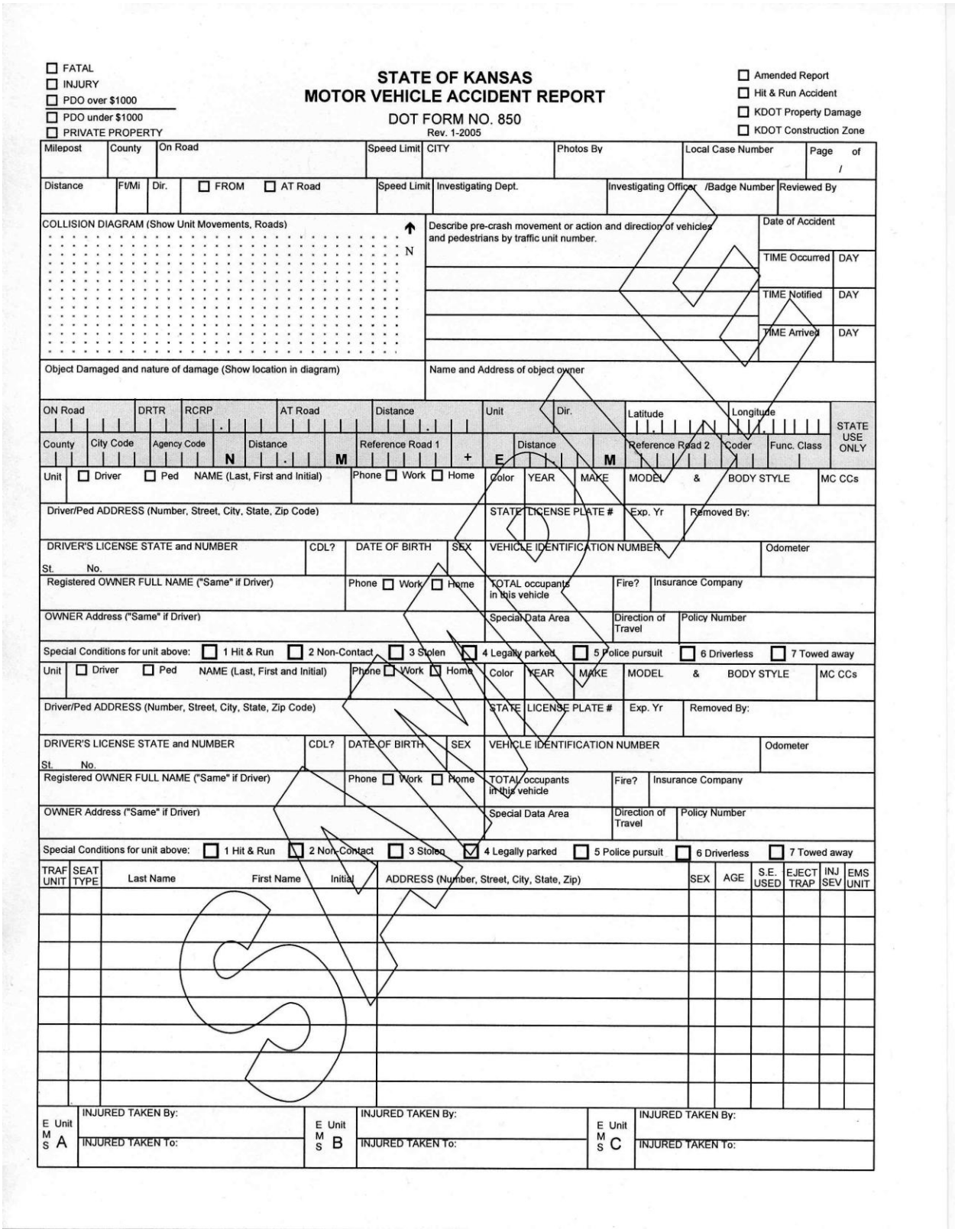
Appendix A Kansas Traffic Accident Reports



☐ FATAL
☐ INJURY
☐ PDO over $1000
☐ PDO under $1000
☐ PRIVATE PROPERTY

STATE OF KANSAS
MOTOR VEHICLE ACCIDENT REPORT
DOT FORM NO. 850
Rev. 1-2005

☐ Amended Report
☐ Hit & Run Accident
☐ KDOT Property Damage
☐ KDOT Construction Zone

Milepost	County	On Road	Speed Limit	CITY	Photos By	Local Case Number	Page of /
Distance	Ft/Mi	Dir. ☐ FROM ☐ AT Road	Speed Limit	Investigating Dept.	Investigating Officer /Badge Number	Reviewed By	

COLLISION DIAGRAM (Show Unit Movements, Roads) ↑ N

Describe pre-crash movement or action and direction of vehicles and pedestrians by traffic unit number.

Date of Accident
TIME Occurred DAY
TIME Notified DAY
TIME Arrived DAY

Object Damaged and nature of damage (Show location in diagram)

Name and Address of object owner

ON Road	DRTR	RCRP	AT Road	Distance	Unit	Dir.	Latitude	Longitude	STATE USE ONLY
County	City Code	Agency Code	Distance N/M	Reference Road 1	+	Distance E/M	Reference Road 2	Coder / Func. Class	

Unit	☐ Driver ☐ Ped NAME (Last, First and Initial)	Phone ☐ Work ☐ Home	Color	YEAR	MAKE	MODEL & BODY STYLE	MC CCs
	Driver/Ped ADDRESS (Number, Street, City, State, Zip Code)		STATE	LICENSE PLATE #	Exp. Yr	Removed By:	
	DRIVER'S LICENSE STATE and NUMBER St. No.	CDL? DATE OF BIRTH SEX	VEHICLE IDENTIFICATION NUMBER				Odometer
	Registered OWNER FULL NAME ("Same" if Driver)	Phone ☐ Work ☐ Home	TOTAL occupants in this vehicle	Fire?	Insurance Company		
	OWNER Address ("Same" if Driver)		Special Data Area	Direction of Travel	Policy Number		

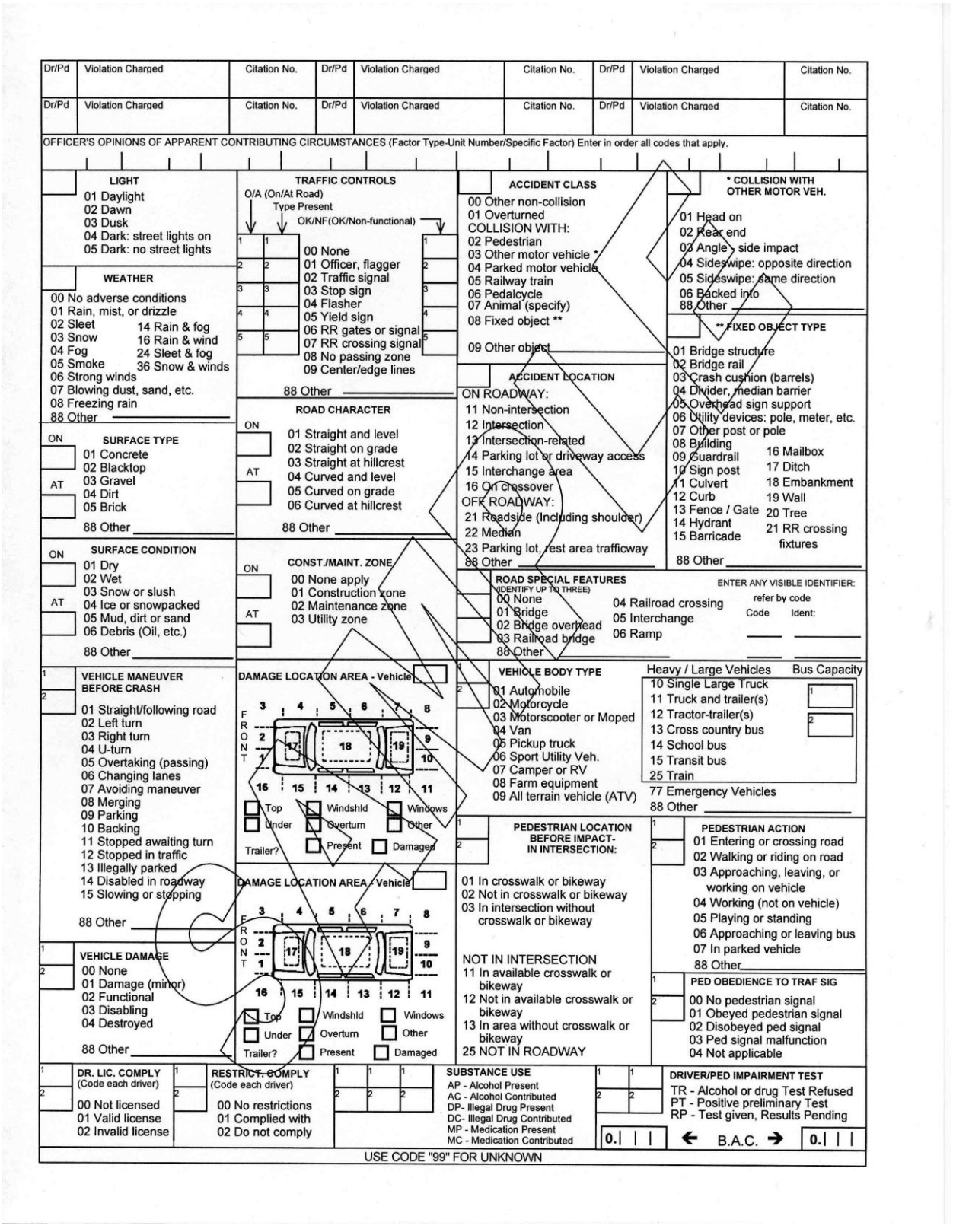
Special Conditions for unit above: ☐ 1 Hit & Run ☐ 2 Non-Contact ☐ 3 Stolen ☐ 4 Legally parked ☐ 5 Police pursuit ☐ 6 Driverless ☐ 7 Towed away

Unit	☐ Driver ☐ Ped NAME (Last, First and Initial)	Phone ☐ Work ☐ Home	Color	YEAR	MAKE	MODEL & BODY STYLE	MC CCs
	Driver/Ped ADDRESS (Number, Street, City, State, Zip Code)		STATE	LICENSE PLATE #	Exp. Yr	Removed By:	
	DRIVER'S LICENSE STATE and NUMBER St. No.	CDL? DATE OF BIRTH SEX	VEHICLE IDENTIFICATION NUMBER				Odometer
	Registered OWNER FULL NAME ("Same" if Driver)	Phone ☐ Work ☐ Home	TOTAL occupants in this vehicle	Fire?	Insurance Company		
	OWNER Address ("Same" if Driver)		Special Data Area	Direction of Travel	Policy Number		

Special Conditions for unit above: ☐ 1 Hit & Run ☐ 2 Non-Contact ☐ 3 Stolen ☑ 4 Legally parked ☐ 5 Police pursuit ☐ 6 Driverless ☐ 7 Towed away

TRAF UNIT	SEAT TYPE	Last Name First Name Initial	ADDRESS (Number, Street, City, State, Zip)	SEX	AGE	S.E. USED	EJECT TRAP	INJ SEV	EMS UNIT

EMS Unit A	INJURED TAKEN By: / INJURED TAKEN To:	EMS Unit B	INJURED TAKEN By: / INJURED TAKEN To:	EMS Unit C	INJURED TAKEN By: / INJURED TAKEN To:



Dr/Pd	Violation Charged	Citation No.	Dr/Pd	Violation Charged	Citation No.	Dr/Pd	Violation Charged	Citation No.
Dr/Pd	Violation Charged	Citation No.	Dr/Pd	Violation Charged	Citation No.	Dr/Pd	Violation Charged	Citation No.

OFFICER'S OPINIONS OF APPARENT CONTRIBUTING CIRCUMSTANCES (Factor Type-Unit Number/Specific Factor) Enter in order all codes that apply.

LIGHT
01 Daylight
02 Dawn
03 Dusk
04 Dark: street lights on
05 Dark: no street lights

WEATHER
00 No adverse conditions
01 Rain, mist, or drizzle
02 Sleet
03 Snow
04 Fog
05 Smoke
06 Strong winds
07 Blowing dust, sand, etc.
08 Freezing rain
14 Rain & fog
16 Rain & wind
24 Sleet & fog
36 Snow & winds
88 Other

SURFACE TYPE (ON / AT)
01 Concrete
02 Blacktop
03 Gravel
04 Dirt
05 Brick
88 Other

SURFACE CONDITION (ON / AT)
01 Dry
02 Wet
03 Snow or slush
04 Ice or snowpacked
05 Mud, dirt or sand
06 Debris (Oil, etc.)
88 Other

VEHICLE MANEUVER BEFORE CRASH
01 Straight/following road
02 Left turn
03 Right turn
04 U-turn
05 Overtaking (passing)
06 Changing lanes
07 Avoiding maneuver
08 Merging
09 Parking
10 Backing
11 Stopped awaiting turn
12 Stopped in traffic
13 Illegally parked
14 Disabled in roadway
15 Slowing or stopping
88 Other

VEHICLE DAMAGE
00 None
01 Damage (mirror)
02 Functional
03 Disabling
04 Destroyed
88 Other

TRAFFIC CONTROLS
O/A (On/At Road)
Type Present
OK/NF(OK/Non-functional)
00 None
01 Officer, flagger
02 Traffic signal
03 Stop sign
04 Flasher
05 Yield sign
06 RR gates or signal
07 RR crossing signal
08 No passing zone
09 Center/edge lines
88 Other

ROAD CHARACTER (ON / AT)
01 Straight and level
02 Straight on grade
03 Straight at hillcrest
04 Curved and level
05 Curved on grade
06 Curved at hillcrest
88 Other

CONST./MAINT. ZONE (ON / AT)
00 None apply
01 Construction zone
02 Maintenance zone
03 Utility zone

DAMAGE LOCATION AREA - Vehicle

DAMAGE LOCATION AREA - Vehicle

ACCIDENT CLASS
00 Other non-collision
01 Overturned
COLLISION WITH:
02 Pedestrian
03 Other motor vehicle *
04 Parked motor vehicle
05 Railway train
06 Pedalcycle
07 Animal (specify)
08 Fixed object **
09 Other object

ACCIDENT LOCATION
ON ROADWAY:
11 Non-intersection
12 Intersection
13 Intersection-related
14 Parking lot or driveway access
15 Interchange area
16 On crossover
OFF ROADWAY:
21 Roadside (Including shoulder)
22 Median
23 Parking lot, rest area trafficway
88 Other

ROAD SPECIAL FEATURES (IDENTIFY UP TO THREE)
00 None
01 Bridge
02 Bridge overhead
03 Railroad bridge
04 Railroad crossing
05 Interchange
06 Ramp
88 Other
ENTER ANY VISIBLE IDENTIFIER: refer by code — Code / Ident:

VEHICLE BODY TYPE
01 Automobile
02 Motorcycle
03 Motorscooter or Moped
04 Van
05 Pickup truck
06 Sport Utility Veh.
07 Camper or RV
08 Farm equipment
09 All terrain vehicle (ATV)
Heavy / Large Vehicles
10 Single Large Truck
11 Truck and trailer(s)
12 Tractor-trailer(s)
13 Cross country bus
14 School bus
15 Transit bus
25 Train
Bus Capacity
77 Emergency Vehicles
88 Other

PEDESTRIAN LOCATION BEFORE IMPACT- IN INTERSECTION:
01 In crosswalk or bikeway
02 Not in crosswalk or bikeway
03 In intersection without crosswalk or bikeway
NOT IN INTERSECTION
11 In available crosswalk or bikeway
12 Not in available crosswalk or bikeway
13 In area without crosswalk or bikeway
25 NOT IN ROADWAY

PEDESTRIAN ACTION
01 Entering or crossing road
02 Walking or riding on road
03 Approaching, leaving, or working on vehicle
04 Working (not on vehicle)
05 Playing or standing
06 Approaching or leaving bus
07 In parked vehicle
88 Other

PED OBEDIENCE TO TRAF SIG
00 No pedestrian signal
01 Obeyed pedestrian signal
02 Disobeyed ped signal
03 Ped signal malfunction
04 Not applicable

*** COLLISION WITH OTHER MOTOR VEH.**
01 Head on
02 Rear end
03 Angle - side impact
04 Sideswipe: opposite direction
05 Sideswipe: same direction
06 Backed into
88 Other

**** FIXED OBJECT TYPE**
01 Bridge structure
02 Bridge rail
03 Crash cushion (barrels)
04 Divider, median barrier
05 Overhead sign support
06 Utility devices: pole, meter, etc.
07 Other post or pole
08 Building
09 Guardrail
10 Sign post
11 Culvert
12 Curb
13 Fence / Gate
14 Hydrant
15 Barricade
16 Mailbox
17 Ditch
18 Embankment
19 Wall
20 Tree
21 RR crossing fixtures
88 Other

DR. LIC. COMPLY (Code each driver)
00 Not licensed
01 Valid license
02 Invalid license

RESTRICT. COMPLY (Code each driver)
00 No restrictions
01 Complied with
02 Do not comply

SUBSTANCE USE
AP - Alcohol Present
AC - Alcohol Contributed
DP- Illegal Drug Present
DC- Illegal Drug Contributed
MP - Medication Present
MC - Medication Contributed

DRIVER/PED IMPAIRMENT TEST
TR - Alcohol or drug Test Refused
PT - Positive preliminary Test
RP - Test given, Results Pending
0.| | | ← B.A.C. → 0.| | |

USE CODE "99" FOR UNKNOWN

scrMandatory | scrCommon | scrLocal | scrConfig
crListStrinc | scrVisio | scrDialog

INVESTIGATIVE - FATALITY REPORT

COUNTY	ON Road	CITY	DATE of Accident	☐ Fatal, narrative & diagram on fatal accident (required by State) ☐ Investigative Report	Page of /

STATE USE ONLY	INVESTIGATIVE DEPT.	TIME Occurred	Day	Invest. OFFICER	BADGE No.	Local Case Number

FATALITY DATA

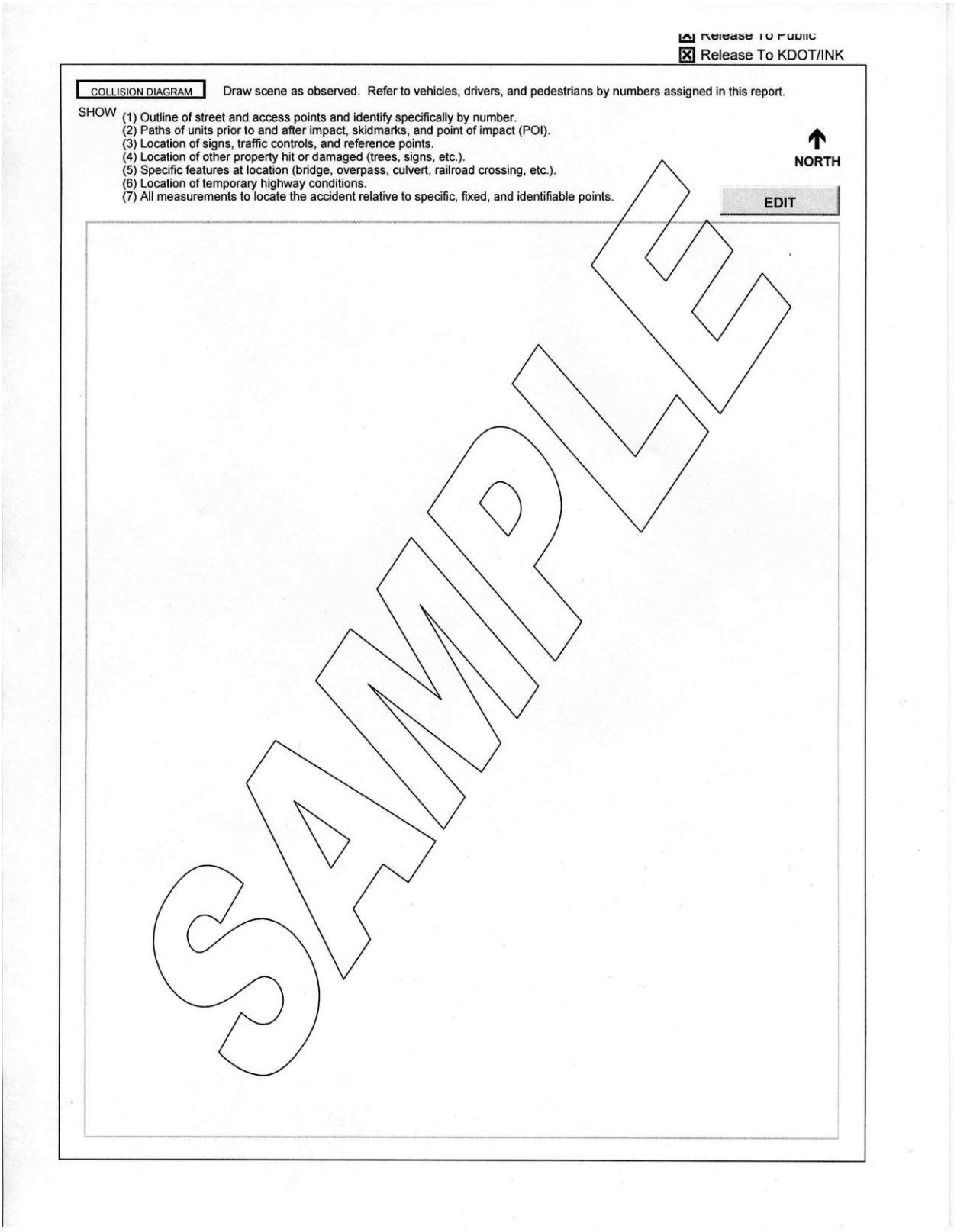
TIME EMS NOTIFIED	EXTRICATION WAS REQUIRED FOR THE FOLLOWING PERSONS	SPECIAL JURISDICTION	VEHICLE DAMAGE	VEHICLE DAMAGE
TIME EMS ARRIVED		00 Not Special 01 National Park Service 02 Military 03 Indian Reservation 04 College/University Campus 05 Other Federal properties 88 Other 99 Unknown	I = P = FRONT 12 1 2 3 4 5 6 7 8 9 10 11 ☐ Undercarriage ☐ No Damage ☐ Estimated Speed,MPH	I = P = FRONT 12 1 2 3 4 5 6 7 8 9 10 11 ☐ Undercarriage ☐ No Damage ☐ Estimated Speed,MPH
TIME EMS ARRIVED AT HOSPITAL				

IMPACT POINTS: Show initial impact point by arrow and label "I".
Show principal impact point by arrow and label "P".

Rev. 1-2003

D.O.T FORM NO. 851

I I P P IP IP Record Number


Release To Public
Release To KDOT/INK
COLLISION DIAGRAM
Draw scene as observed. Refer to vehicles, drivers, and pedestrians by numbers assigned in this report.
SHOW
(1) Outline of street and access points and identify specifically by number.
(2) Paths of units prior to and after impact, skidmarks, and point of impact (POI).
(3) Location of signs, traffic controls, and reference points.
(4) Location of other property hit or damaged (trees, signs, etc.).
(5) Specific features at location (bridge, overpass, culvert, railroad crossing, etc.).
(6) Location of temporary highway conditions.
(7) All measurements to locate the accident relative to specific, fixed, and identifiable points.
NORTH
EDIT
SAMPLE

TRUCK - BUS SUPPLEMENT

☐ Completed post-crash inspection

Supplement required for accidents involving trucks with at least 2 axles and 6 tires, OR buses with a seat capacity of 15 or more, OR any vehicle transporting hazardous material.

COUNTY	ON Road	CITY	DATE of Accident	TIME Occurred	Day	Traffic Unit No.	Page of /

STATE USE ONLY	Investigating Dept.	Investigating Officer	Badge No.	Local Case Number

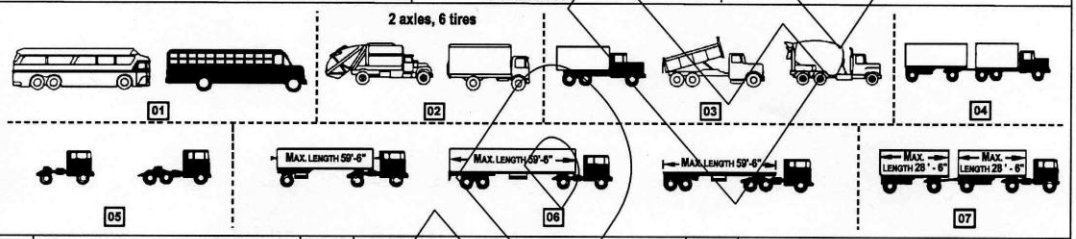
CARRIER NAME (CORPORATE BUSINESS NAME)

CARRIER ADDRESS CITY STATE ZIP CODE

KANSAS PERMITS (Issuer and Permit Number)
1. _____
2. _____
3. _____

U.S. GOVERNMENT PERMITS (Issuer and Number)
USDOT _____ ICC MC _____

SOURCE OF NAME (enter one only)
01 Side of vehicle 03 Driver
02 Shipping papers or manifest 04 Logbook



VEHICLE CONFIGURATION
01 Bus _____ (capacity)
02 Single-unit truck (2-axle, 6-tires)
03 Single-unit truck (3 or more axles)
04 Truck and trailer
05 Truck tractor (bobtail)
06 Truck tractor and semi-trailer
07 Truck tractor and double trailer
08 Truck tractor and triple trailer
09 Heavy truck, cannot classify

CAB TYPE (for single truck or tractor)
01 Cab behind engine
02 Cab over engine

CARGO BODY TYPE
01 Van or enclosed box
02 Hopper
03 Tank
04 Flatbed
05 Dump
06 Concrete mixer
07 Auto transporter
08 Garbage or refuse
88 Other _____

ON ROAD LANE TYPE
00 Undivided
01 One-way roadway
02 Divided roadway, medianstrip without barrier
03 Divided roadway, medianstrip with barrier

CARGO TYPE
00 Empty
01 Driveaway or towaway
02 Explosives
03 Farm and other animals
04 Farm products
05 Gases
06 General freight (packages)
07 Heavy machinery, objects
08 Household goods
09 Liquids (bulk)
10 Logs, poles, lumber
11 Metal (coils, sheets, etc.)
12 Mobile / Modular home
13 Motor vehicles
14 Refrigerated foods
15 Solids (bulk)
16 Rock, sand, gravel, salt
17 Food products
18 Plastic products
88 Other _____

ACCESS CONTROL
00 No control (unlimited access)
01 Full control (entry/exit only by ramp)
88 Other _____

SEQUENCE OF EVENTS (list up to 4)
1
2
3
4

00 Ran off road
11 Jackknife
12 Overturn
13 Downhill runaway
14 Cargo loss or shift
15 Explosion
16 Fire
17 Separation of units
18 Trailer swing

COLLISION WITH:
21 Pedestrian
22 Motor vehicle in transport
23 Parked motor vehicle
24 Train
25 Pedalcycle
26 Animal
27 Fixed object
28 Other object
88 Other event _____

TRAILERS			TOTALS				HAZARDOUS MATERIALS DATA		
	WIDTH (inches)	LENGTH (feet)	Total Length (feet)	No. of Axles	No. of Trailers	Gross Vehicle Weight	Material ID No.	Weight (pounds)	Spill or Release?
Trailer 1									
Trailer 2									
Trailer 3									

USE CODE "99" FOR UNKNOWN

Placard? Class:

Rev. 1-2003

D.O.T FORM NO. 852