MN/WI AUTOMATIC OUT-OF-SERVICE VERIFICATION

OPERATIONAL TEST EVALUATION

FINAL REPORT

DRAFT

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I. SYSTEM DESCRIPTION

The project has created an automated, real-time system for access to data about commercial vehicles and/or drivers placed Out-of-Service (OOS) on a major interstate corridor between Minnesota and Wisconsin. State Patrol inspectors in both states have electronic access to OOS reports via a shared database so that the inspectors can detect vehicles or drivers operating in violation of OOS orders at the four inspection locations westbound along the corridor.

The automatic detection of OOS commercial vehicles and drivers along a 252 mile section of westbound 190-94 in Wisconsin and Minnesota is achieved with license plate scanning units at four inspection locations (safety and weight facilities) along the corridor. As shown in Figure 1, three of the inspection stations are located in Wisconsin: 1) the Utica station on I-90 south of Madison, 2) the Tomah station on 190-94 just south of the junction of I-90 from La Crosse and I-94 from Minneapolis and 3) the Rusk station on I-94 west of Eau Claire. The fourth inspection station, St. Croix, is located just west of the Minnesota-Wisconsin border on I-94. The Utica and Tomah stations only have static scales and thus have a limited ability to weigh all trucks when truck traffic is heavy. Inspectors at both stations must frequently close the scales to prevent spillback of trucks onto the freeway. The Rusk and St. Croix stations have weigh-in-motion capability so that a high volume of trucks can be weighed with little or no delay. The St. Croix station generally is open continuously. The stations in Wisconsin are typically open for eight hour shifts several days per week.

License plates read by the scanner are compared with the current OOS vehicle database using specially designed software on a PC at each station. When a match is found for an OOS vehicle, the PC sounds an alarm to inform the inspectors. The OOS vehicle database in Wisconsin is maintained on a mainframe computer that is linked to all inspection stations in the state in realtime. The OOS vehicle database on the PC is updated via a download from the mainframe at frequent enough intervals so that a truck that was put out-of-service at a downstream station and then left would be identified at the next upstream location.

II. EVALUATION MANAGEMENT STRUCTURE

The evaluation of the operational test is coordinated by the MOOSE Project Evaluation Committee. MOOSE stands for MCSAP Out-of-Service Enforcement and is the name given to the PC-based software that identifies OOS vehicles at the inspection stations. MCSAP stands for Motor Carrier Safety Assistance Program which is the umbrella program under which the safety inspection data are collected. The MOOSE Project Committee is composed of:

Project Coordinator	
Patrick Feman (after April 96)	Wisconsin DOT - Division of State Patrol
Lt. Stephen Gasper (retired in April 1996)	Wisconsin DOT - Division of State Patrol

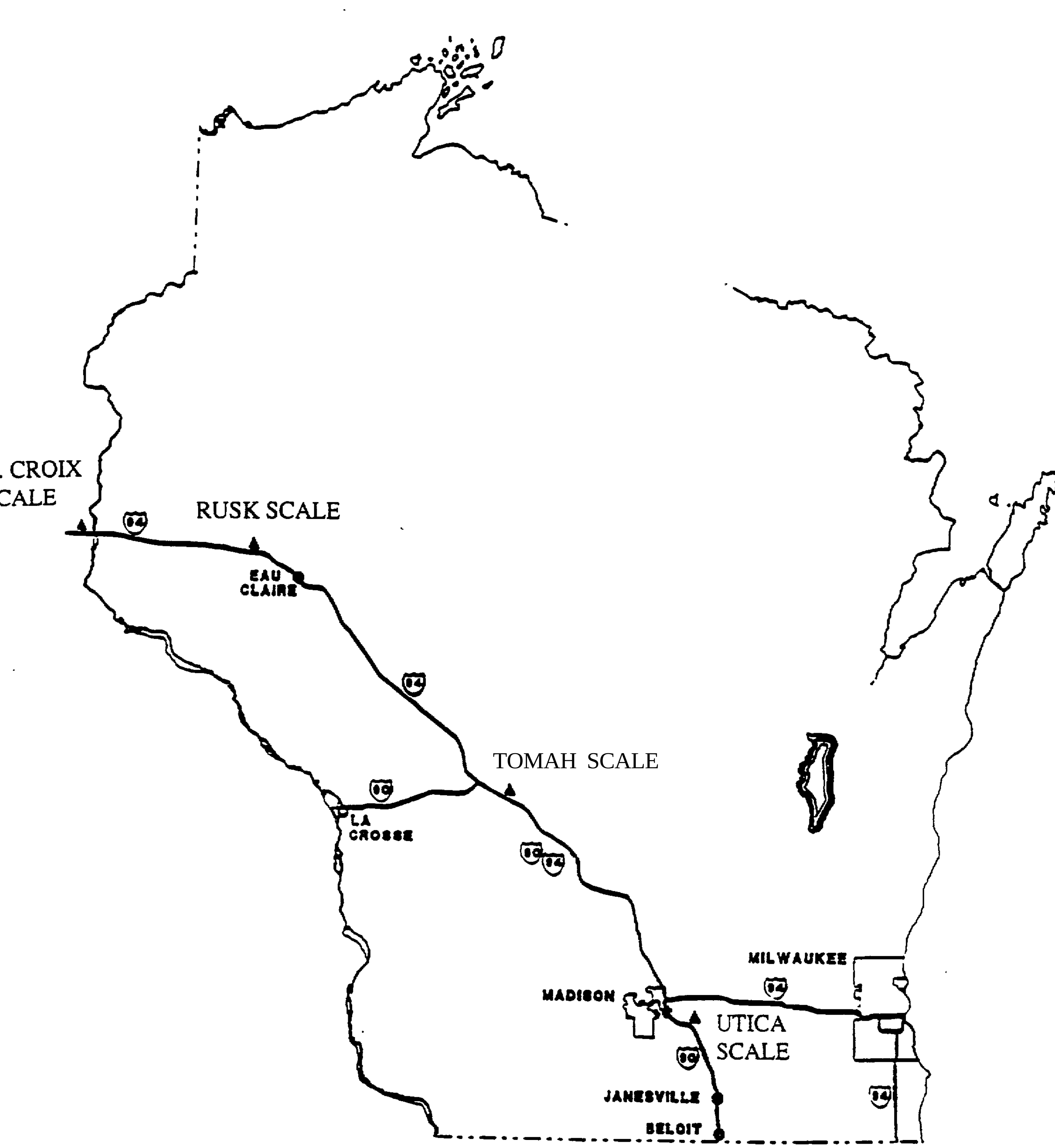

Fig. 1. - Location of Operational Test Inspection Stations

Assistant Project Coordinator Patrick Feman (until April 96)	Wisconsin DOT - Division of State Patrol

Participants

Cathy Erickson	Minnesota DOT
Sue Sheehan	Minnesota State Patrol
Sgt. Steve Peterson	Minnesota State Patrol
Sgt. Cheryl Wells	Wis State Patrol-District 1 (Utica Scale)
Sgt. Bob Defrang	Wis State Patrol-District 5 (Tomah Scale)
Inspector Michael Klingenberg	Wis State Patrol-District 6 (Rusk Scale)
Capt. Bob Young	Wisconsin State Patrol - Central Office
Jim Newton	Wisconsin DOT - Data Services
Jon Obenberger	Wisconsin DOT - ITS Office
Mark Hoines	FHWA - Wisconsin Office
Les White	FHWA - Region V Office
Prof. Robert L. Smith, Jr.	University of Wisconsin-Madison P.I. for Evaluation Contract

III. EVALUATION GOALS AND OBJECTIVES

Initial goals and objectives were developed as part of the operational test proposal to FHWA. The objectives for the three primary goals were refined and Measures of Effectiveness (MOEs) developed for each objective in January 1995. These goals, objectives and MOEs provided the basis for establishing baseline data collection efforts and beginning the Operational Test on July 1, 1995. A review of the data collected during the first four months of the Operational Test indicated a need to modify a few of the MOEs so that measurement was feasible and to add one MOE. The revised goals, objectives and MOEs were documented in the Evaluation Plan report (1). The report also identifies the primary source of the data for each of the MOEs where possible. The data sources, collection methods and management issues were documented in the Data Management Plan report (2).

The three primary goals for the project and the associated objectives are listed in Figure 2. The first project goal is to increase the effectiveness of OOS enforcement efforts. The primary focus of this project initially was on the detection of commercial vehicles and drivers that have been put out-of-service (OOS), but are continuing to operate. If a vehicle or driver is placed OOS at an inspection station that is in operation continuously, as is the case at the St. Croix station in Minnesota, then, an inspector is always available to reinspect the vehicle and monitor the driver to ensure that the OOS condition has been remedied. At the inspection stations in Wisconsin,

GOAL I. INCREASE EFFECTIVENESS OF OOS ENFORCEMENT EFFORTS

OBJECTIVE 1. Increase the Number of Vehicles Screened for Inspection.

OBJECTIVE 2. Increase the Effectiveness of Inspectors.

OBJECTIVE 3. Increase Compliance with OOS Orders

OBJECTIVE 4. Increase Direct Compliance with OOS Orders

OBJECTIVE 5. Reduce Delay in Compliance with OOS Notices

GOAL II. ESTABLISH A BI-STATE ENFORCEMENT PROGRAM

OBJECTIVE 1. Increase the Detection of OOS Violations between Wisconsin and Minnesota

OBJECTIVE 2. Increase Co-ordination between Agencies Across State Lines

OBJECTIVE 3. Create an Efficient Procedure for Sharing Data

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OBJECTIVE 1. Access National Databases such as SAFETYNET

OBJECTIVE 2. Evaluate the Potential for Expansion to Neighboring States and All of Wisconsin and Minnesota

OBJECTIVE 3. Measure the Effectiveness of License Plate Scanner Technology

OBJECTIVE 4. Estimate the Potential for Expansion to Other Commercial Vehicle Regulatory Issues. such as. Issues Relating to IRP. IFTA and Size and Weight Preclearances

OBJECTIVE 5. Identify the Feasibility of Collecting Planning-Related Data

OBJECTIVE 6. Estimate the Potential for Expansion to Other Inspection Sites

OBJECTIVE 7. Estimate the Potential Use in Mobile Weigh Stations

OBJECTIVE 8. (NEW) Estimate the Potential for Integration with the SAFER System

Fig. 2.--Evaluation Goals and Objectives for the Operational Test Evaluation

however, when a station closes at the end of the day, an 00S vehicle or driver is physically free to leave. Without the MOOSE system in place, the 00S vehicle/driver is not likely to be detected at the next inspection station since only a small fraction of the vehicles entering an inspection station are inspected manually. By automating the detection system, the MOOSE system greatly increases the chance that the 00S vehicle/driver will be detected and given a fine for "operating while 00S".

One problem for measuring the change in "00S vehicles/drivers that continue to operate while 00S" is that good baseline data on the number "operating while 00S" prior to the operational test are not available. The potential number of vehicle/drivers "operating while 00S" in the operational test corridor certainly is small since only those vehicles/drivers that remain 00S when the stations in Wisconsin end their shift for the day are candidates. The number is a maximum of one or two per day for each station that is open. The number of vehicles/drivers that "run" is not known since full after hours surveillance would be too expensive. 00s vehicles/drivers that do leave and "operate while 00S" could further reduce even the small risk of detection prior to MOOSE by avoiding subsequent inspection locations. What is clear from the data in Wisconsin on vehicles/drivers "operating while OOS" is that it is a rare event. Most commercial drivers are skilled at avoiding detection.

The second problem for measuring the change in "00S vehicles/drivers that continue to operate while OOS" is that the MOOSE system provides a strong incentive for drivers "operating while 00S" to avoid any subsequent inspection stations. Thus, after implementation of the MOOSE system in the 00S operational test, actual identification of vehicles/drivers "operating while 00S" was likely to remain a rare event. The evaluation results clearly show that our initial assumption was correct.

Given the expected problems with measuring any change in vehicles/drivers "operating while OOS", a number of broader objectives were developed under the overall goal of increasing the effectivess of 00S enforcement efforts (Goal I). Thus, we assumed that 00S enforcement would be more effective if "the number of vehicles screened for inspection" (Obj. 1) increased as the result of the MOOSE system. Similarly, we assumed that "increasing the effectiveness of the inspectors (broadly defmed)" will also make 00S enforcement more effective.

The second primary goal of the project was to establish a bi-state enforcement program. The main need for the involvement of Minnesota in the project was to permit detection of "operating while 00S" violaters from Wisconsin at the continuously operating St. Croix station in Minnesota. As with the first goal, the direct measurement of this goal is limited by the problems with measurement of "operating while 00S violators. Thus, we developed indirect measures as indicated by objective two which focuses on measuring coordination across state lines and objective three which addresses data sharing.

The third primary goal of the project was to identify potential future applications. The feasibility of future applications will depend in part on the ability of the license plate scanner technology to read license plates accurately. Thus, one of the objectives here was to measure the effectiveness of the scanner technology. The remaining six objectives all focus on expanded safety or other new applications of the MOOSE system.

IV. DATA COLLECTION AND MANAGEMENT

DATA OVERVIEW

The primary data needed for the evaluation are available from three sources: 1) the MCSAP Inspection database that is maintained on the Wisconsin DOT mainframe computer, 2) the MOOSE Log File that is created by the MOOSE software for recording the results of processing license plate records input from the scanner system, and 3) independent video tape recording of license plates that is made at about the same location as the scanner system video camera. The initial data collection plan is based on a monthly time period with summaries each quarter as appropriate. The first two databases are available directly in electronic form and in the case of the MCSAP inspection data accessible in summary form through standardized report generation software. Only the third database required specialized field data collection efforts.

Three secondary sources of data that are directly related to the project were available for the evaluation: 1) the MOOSE daily status report log book, 2) the certificate of repair data file and 3) Wisconsin's mainframe computer electronic transaction billing records. The MOOSE log book was a paper document created by the inspectors at each inspection station while the second and third sources are available in electronic format.

For operational test projects six data management procedures must be documented: 1) collection, 2) transfer, 3) storage, 4) security, 5) quality assurance, and 6) test conditions and configuration control. Issues relating to methodology, responsibility and timing also need to be addressed.

The first four data management procedures are straight forward because most of the data items of interest are part of existing standard Wisconsin DOT data collection efforts or are automated and under computer control. Similarly, quality assurance procedures are well established for existing Wisconsin DOT data collection efforts. For this project the primary quality assurance concern is the issue of sample size for the field data collection of license plate data using independent video tape recordings.

The last data management procedure, test conditions and configuration control, can be described in terms of system status, traffic and operating environment. The configuration of the system hardware and software may change several times over the one year operational test period. Since some of these changes may have a significant impact on the overall effectiveness of the project, these changes must be carefully documented. Changes in software versions may also change the type and amount of data that are available for system evaluation. Traffic data that may be useful include volume, speed, and headway. The operating environment includes weather and light conditions data. The "configuration control" part of the procedure provides for documenting the system status, traffic, operating environment and other relevant attributes whenever data are collected.

PRIMARY DATA SOURCES AND COLLECTION EFFORTS

MCSAP Inspection Database

Motor Carrier Safety Assistance Program (MCSAP) inspection data are stored in Wisconsin's Motor Carrier Enforcement System (MCES) database on a mainframe computer. All of the weigh stations and inspection sites have real-time computer links to the mainframe computer database. The MCSAP inspection data provide current information on whether or not a vehicle and/or driver is Out-of-Service (00S). The MCES database also provides historical data on MCSAP inspections and OOS data.

Collection Methodology The MCSAP inspection data are entered directly into the mainframe database whenever a MSCAP inspection is conducted. Standard reports of the MSCAP data can easily be generated for any timeperiod and location. Primary data items of interest include number of inspections and reinspections, OOS and other violation counts, and types of violations with particular focus on OOS violations. An example of the standard MCSAP count report is presented in Appendix A.

Transfer, Storage and Secuity. The MCSAP inspection data are only created and stored in an electronic form in the MCES database. The MCSAP inspection data are typically entered into the mainframe database in real time via a computer terminal in the weigh station. The data are maintained on-line until archived. Access to the MCSAP data is limited to authorized personnel using logon ids and passwords.

Quality Assurance The quality of the MCSAP inspection data is maintained at a high level by restricting data entry to only valid codes and by minimizing the need for data entry by inspectors through cross references to vehicle registration and driver's license databases. Sample size is not an issue since all inspections are entered into the mainframe database.

Test Conditions/Configuration Control. Because the MCES database system is a mature system, little change is expected in the computer software or hardware. Any changes in database codes are documented using standard database update procedures. Lii to traffic and operating environment attributes are possible using the timestamp associated with each inspection.

MOOSE Software Log File

The PC-based computer software that identifies OOS vehicles at the weigh stations is called the MCSAP OOS Enforcement (MOOSE) system. License plate data that are input from the Perceptics scanner is classified by the MOOSE system as either "Bad Read" or "Good Read". The MOOSE system compares each potentially valid license plate with the current OOS database that is resident on the PC. The results of the query of the OOS database are saved in the MOOSE Log file as an Evaluation Record. An example of the format of the Log file, a description of the Evaluation Codes and a full tabulation of all of the evaluation code results by month for each inspection location (scale) is presented in Appendix B.

Collection Methodology The generation of the MOOSE Log file is fully automated. The file is continuously updated as part of the normal operation of the MOOSE system.

Transfer.. In the version of MOOSE that is currently operational, the Log file must be downloaded to a diskette for subsequent analysis. File compression software may be needed to store the Log file on a single diskette. The Log file is downloaded to a diskette at approximately monthly intervals. A future version of MOOSE could incorporate automatic transfer to a central location via the link to the mainframe computer. Standard procedures for archiving the Log file need to be developed. Security is maintained by limiting the access to the MOOSE PC to authorized staff.

Quality Assurace. The quality of the MOOSE Log file is assured since the creation of the file is fully automated. Sample size is not an issue since all of the scanner data are recorded.

Test Conditions/Configuration Control One update of the MOOSE system has been implemented. The update resulted in the addition of an additional "evaluation result" record to the Log file for every valid license plate ("good read"). The date that the update was introduced is available from the time and date stamp on each Log file record. Links to traffic and operating environment data are possible by using the time and date stamps.

Independent Video Tape Recording of License Plates

The Perceptics Scanner System is not able to identify and correctly decode all of the vehicles that are scanned by the system. Consequently, a camcorder was used by the Evaluation Team during selected site visits to make an independent video tape of the license plates. The video output from the scanner was recorded at the same time on a separate video tape. The two video tapes were then compared visually to verify the results of the decoding of license plates by the scanner system. An example of the results of the "manual verification of scanner results" is presented in Appendix C.

Collection Methodology A video tape recording of vehicles passing through the inspections stations is made manually using a camcorder that is independent of the Perceptics scanning unit. Video output from the Perceptics scanner is recorded separately at the same time.

The video tapes are made during the monthly site visits to the inspection stations.

Transfer. The video tapes from the field data collection are labeled with the date, time and location. The license plate data are analyzed as soon as possible after the data are collected to minimize possible problems with loss of the tapes. Security is not an issue since the data are not proprietary and were collected at a public location.

~~Quality Assurance.~~ The quality of the video tapes was checked in the field after a sample of adequate size was obtained at each site. Since high quality camcorders and video recorders were used for the data collection, all of the video tapes produced images of license plates that were legible except for one or two cases where the natural lighting was adverse. In order to minimize errors in determining the scanner accuracy, a senior graduate student researcher conducted the manual verification of the results from the scanner.

Test Conditions/Configuration Control. Since the same graduate student researcher conducted all of the field data collection, nearly identical test conditions were maintained from month to month. Weather and light conditions were noted for each field data sample.

Sample Size The primary measure of the performance of the scanner system is the proportion of license plates that are scanned correctly. For evaluation purposes estimation of the proportion with an absolute error of 0.1 at the 95% level should be adequate. Assuming the worst case of a proportion of 0.5, the required sample size is a random sample of about 100 vehicles. If an absolute error of 0.2 is acceptable, then a sample size of only 64 is adequate. Thus, if the proportion of license plates that are read correctly by the scanner is found to be 0.5 based on a random sample of license plates from the video tape, then we can conclude that the actual proportion of license plates that would be read correctly if the entire population of vehicles were scanned would fall within 0.5 plus or minus 0.1 (that is in the range of 0.4 to 0.6) 95 times out of loo.

SECONDARY DATA SOURCES

MOOSE Daily Status Report Log Book

The MOOSE system only identifies vehicles for which the vehicle and/or driver may currently be OOS. In most cases the vehicles have been repaired, but not reinspected. The Log Book provides data on the actions taken by inspectors in response to potential OOS violations identifed by the MOOSE system. An example of the Log Book form is shown in Appendix D.

Collection Methodology The inspectors at each scale that is equipped with the MOOSE system are asked to make entries in the Log Book for each potential OOS vehicle identified by the MOOSE System (OOS "Hits") and complete the "Daily Summary" columns. The inspectors are also asked to "add summary comments and suggestions" such as operational problems, weather and other relevant conditions.

Transfer.. The log book forms are photocopied during each monthly site visit by the evaluation team. The log books are maintained on a continuous basis at the scales by the inspectors.

Quality Assurance. All of the inspectors at the scales were given instruction in how to complete the Log Book form. Supervisors at the scales are responsible for obtaining the cooperation of the inspectors. The completeness of the information was monitored during the monthly scale site visits by the evaluation team.

Test Conditions/Configuration Control.The log book provides the inspectors with the opportunity to identify operating conditions that may affect the operation of the MOOSE system. More explicit requests for information on operating conditions may be needed. If necessary, external sources of weather and light conditions can be correlated with the date and hour of shift data that are reported on the Log Book form.

V. OPERATIONAL TEST RESULTS

The Operational Test of automatic out-of-service (00S) verification in Minnesota and Wisconsin was conducted from July 1, 1995 to June 30, 1996. Some background data were collected during the three month Pre-Operational Test period from April to June 1995. The scanners, PCs and MOOSE software were installed beginning in April 1995 and made operational at all four inspection locations by the end of June at least in a test mode.

The actual time that the MOOSE system was operational at each inspection location is available from the MOOSE Log file. The number of days that the MOOSE system was in operation at each inspection location by month and the average hours of operation for each month are shown in Table 1. The Utica scale (inspection location) was not operating during November, December and January because the scanner system was struck by lightning. In Wisconsin the Utica scale typically only had staff assigned for one shift so that the average hours of operation per day were in the five to eight hour range for most months. In contrast, the Tomah scale had average hours per day typically in the 9 to 19 hour range reflecting the use of two or three shifts. The Rusk scale had average hours of operation reflecting one to two shifts.

In contrast to the Wisconsin scales, the MOOSE system did not become fully operational at St. Croix in Minnesota until February of 1996. From February on the system was typically operational 18 or more hours per day.

ACHIEVEMENT OF THE GOALS AND OBJECTIVES

TABLE 1

MOOSE Operation by Scale · Number of Days per Month and Average Hours per Day

Month	Utica		Tomah		Rusk		St. Croix	
	No. of Days	Avg. Hours	No. of Days	Avg. Hours	No. of Days	Avg. Hours	No. of Days	Avg. Hours
JUN 95	6	12.00	1	1 .00	8	7.25	1	10.00
JUL 95	12	7.50	8	4.38	3	1.33	3	3.67
AUG 95	22	11.77	21	9.24	15	9.33	1	3.00
SEP 95	19	9.05	17	5.83	20	9.05	5	6.00
OCT 95	7	5.29	18	10.94	24	12.21	7	8.71
NOV 95	0	0.00	23	14.48	22	13.86	9	10.66
DEC 95	0	0.00	12	14.25	22	8.32	4	7.00
JAN 98	0	0.00	14	15.93	9	276	2	13.00
FEB 96	3	3.00	26	19.15	9	6.78	21	16.86
MAR96	12	5.50	17	1253	20_	8.00	23	19.48
APR 95	19	5.34	11	5.62	18	6.56	20	11.05
MAY 96	20	6.75	24	17.21	22	11.50	31	22.74
JUN 95	19	6.90	23	18.96	24	11.71	28	22.54
JUL 96	17	8.47	25	21.60	20	10.20	25	23.12

Source: MOOSE Log Files

The degree to which the operational test met each of the broad goals was measured by the level of achievement of specific objectives for each goal. Documentation of the achievement of the objectives in terms of detailed measures of effectiveness (MOEs) is presented below. For each MOE the initial expected result is compared with the actual result from the operational test.

GOAL I. INCREASE EFFECTIVENESS OF OOS ENFORCEMENT EFFORTS

OBJECTIVE 1. Increase the Number of Vehicles Screened for Inspection.

MOE 1. Change in the number of requests for OOS data made to the OOS computer database.

Expected Result The automated reading of commercial vehicle license plates is expected to increase dramatically the number of queries to the OOS computer database to determine if a vehicle is in violation of OOS orders.

Actual A summary of the MOOSE Log File data for each scale is presented in Table 2. The table covers the entire time for which Log File data are available through the end of September 1996. The tabulation shows that the scanner tried to read the license plates on a large number of vehicles (Attempted Reads) ranging from over 61,000 vehicles at Utica to over 552,000 vehicles at St. Croix (MN). The scanner was able to decode a license plate ("Good Read") for approximately 50% of the "Attempted Reads" with the exception of the Rusk scale where over 75% "Good Reads" were obtained. The MOOSE system then used the "Good Reads" to query the OOS computer database resulting in "Evaluation Results".

The results shown in Table 2 must be interpreted in view of the manual validation of scanner read rates reported later (see Table 11). Based on analysis of samples from each scale, the scanner actually decoded correctly ("valid read") only 36 to 44 percent of the total attempted reads.

The results from the MOOSE Log File show that the MOOSE system was successful1 in meeting objective 1. Typically, 50 percent or more of the vehicles were screened for possible MCSAP violations. Because the number of vehicles entering the scales is large, the scanner system does not need to be highly accurate in reading license plates. At the typical 50 percent "Good Read" rate, the scanner still identifies a large number of vehicles. The same conclusion holds when the "Good Read" rate is adjusted downward to account for errors by the scanner in decoding the license plates.

The scanner system was configured so that nearly 100 percent of the trucks triggered the scanner. The scanner trigger was set to operate at minimum vehicle spacings of 1.8 seconds. In a few cases of "tailgating" by vehicles, the second vehicle would not be recognized. The more typical error by the scanner was triggering on components of a truck's trailer, particularly at slow speeds. Thus, the total "attempted reads" shown in Table 2 is perhaps as much as 5 percent larger than the actual number of vehicles passing the scanner.

TABLE 2

MOOSE LOG DATA SUMMARY

PERFORMANCE MEASURE		Scale UTICA	TOMAH	RUSK	ST. CROIX
DAYS IN OPERATION		189	313	270	233
BAD READ (BR)*		32124	42234	69851	285548
(% OF ATTEMPTED READS)		52.05%	48.54%	24.56%	51.65%
GOOD READ (GR)		29592	44777	214554	267268
(% OF ATTEMPTED READS)		47.95%	51.46%	75.44%	48.35%
ATTEMPTED READS (BR+GR)		61716	87011	284405	552816
(% OF ATTEMPTED READS)		100%	100%	100%	100%
NO PLATES FROM BR		31106	40630	68324	243776
EVALUATION RESULTS (ER)		27085	42516	212004	243822
MCSAP VEHICLE VIOLATIONS (FROM ER)	TYPE				
1B? (ALARM)	OOS	89	121	994	330
NC?	CLEAN	86	177	1522	3060
NO?	CLEAN	120	152	1717	1021
NM?	NON-OOS	344	507	4809	4190
N2?	CLEAN	75	110	1118	933
N3?	CLEAN	183	332	2689	2882
NB?	CLEAN		0	0	0
1?? (FALSE ALARM)	CLEAN		1		
13? (FALSE ALARM)	CLEAN			1	
1C? (FALSE ALARM)	CLEAN				2
MCSAP DRIVER VIOLATIONS (FROM ER)					
1?B (ALARM)	OOS	0	0	2	1
N?C	CLEAN	0	0	0	0
N?M	NON-OOS	0	0	0	0
N?5	CLEAN	0	0	0	0
		0			
MCSAP VEHICLE/DRIVER VIOLATIONS (FROM ER)					
1BC (ALARM)	OOS	3	11	48	65
1MB (ALARM)	OOS	2	8	21	18
1BB (ALARM)	OOS	0	5	9	15
13B (ALARM)	OOS	2	4	19	30
1BM (ALARM)	OOS	1	5	12	21
12B (ALARM)	OOS	0	3	16	27
1CB (ALARM)	OOS	1	1	21	38
1OB (ALARM)	OOS			8	11
NMC	NON-OOS	8	19	167	178
N3C	CLEAN	1	1	38	45
N2C	CLEAN	4	5	40	63
NCC	CLEAN	4	10	105	90
NCM	NON-OOS	0	5	22	34
N2M	NON-OOS	0	5	30	23
N3M	NON-OOS	0	11	49	51
NMM	NON-OOS	1	11	47	65
N5C	CLEAN			2	
NOM	NON-OOS			1	
SUMMARY OF MCSAP VIOLATIONS BY TYPE					
	CLEAN	473	788	7232	8096
	NON-OOS	353	558	5125	4541
	OOS	98	158	1150	556
	TOTAL MATCHES	924	1504	13507	13193
EVALUATION RESULTS (ER) SUMMARY					
NO VEHICLE OR DRIVER CONTACT / NO MATCH (N??)		26161	41012	198497	230629
(% OF ER)		96.59%	96.46%	93.63%	94.59%
ALL CONTACTS / TOTAL MATCHES		924	1504	13507	13193
(% OF ER)		3.41%	3.54%	6.37%	5.41%
TOTAL OOS ALARM (1XX)		98	159	1149	552
(%OOS OF GR)		0.33	0.36	0.54	0.21
(% OOS OF ATTEMPTED READ)		0.16	0.18	0.40	0.10

*BR - NO PLATE OR CANNOT DECODE LICENSE PLATE CHARACTERS
NOTE: DATA FOR JUNE 1995 TO SEPTEMBER 1996

TABLE 2 - CONTINUED

MOOSE LOG DATA SUMMARY

Code Definition for MOOSE Alarm Codes

Character 1. Alarm byte :

N = no alarm
l = alarm type l

Character 2. Vehicle byte:

C = a clean level 1 (complete), level 5 (vehicle only), or reinspection has happened within the last 90 days. ("C" for "clean": no vehicle defects)
0 = same as "C", but over 90 days ago ("0" for "old")
B = out of service vehicle defects found on last inspection ("B" for "bad")
M = Vehicle defects found on last inspection, but none were out of service. ("M" for "minor")
2 = only contact in last 90 days was a clean level 2 (walk-around) inspection
3 = only contact on file is a level 3 (driver only) inspection
? = no contact on file with a vehicle with this plate

Character 3. Driver byte:

C = a clean level 1, 2, 3 or reinspection within the last 4 days
B = out of service driver defects found on an inspection within last 4 days
M = drivers defects found on inspection in last 4 days, but none were OOS.
5 = only contact within last 4 days is a level 5 inspection
? = no contact within last 4 days with a vehicle with this plate

OBJECTIVE 2. Increase the Effectiveness of Inspectors.

MOE 1. Change in the proportion of OOS vehicle/driver violations identified from the total number of inspections done.

Expected Result. Inspectors will need to spend less time entering license plate numbers to determine if vehicles are in violation of OOS orders. Thus, they should be able to increase the percentage of inspections of vehicles and drivers with OOS conditions versus inspections of vehicles with no defects and drivers with no safety deficiencies.

Actual Prior to the MOOSE system being available, the inspectors at the scales typically did not enter license plate numbers into the on-line mainframe system for accessing MCSAP inspection data. The MCSAP database was accessed when a vehicle was selected for a MCSAP inspection. Thus, unless the MOOSE system provides the inspectors with information that would help them identify vehicles and drivers that are more likely to have OOS conditions, no change should be expected in proportion of OOS vehicle/driver violations found in the regular MCSAP inspections.

The primary target of the MOOSE system is vehicles and/or drivers that are operating while OOS (driving while OOS). As configured during the Operational Test, the MOOSE system only identified with an alarm the small number of vehicles or drivers who had a prior OOS condition and thus may be currently still OOS. As shown at the bottom of Table 2, the absolute number of vehicles or drivers identified as potentially OOS by the MOOSE system during 14 months from June 1995 to July 1996 was small ranging from 98 at the Utica scale to 1149 at the Rusk scale for a total of 1406. These small absolute numbers are also small as a percentage of the total vehicles scanned by the MOOSE system ("attempted reads") ranging from 0.10 to 0.40 percent of "attempted reads".

In order to identify any possible impact of the MOOSE system on the proportion of OOS violations found from MCSAP inspections, it is important to establish baseline data on possible statewide trends. Statewide MSCAP data for the results of MCSAP inspections over time are presented in Table 3. The MSCAP inspection data are classified into three categories: 1) no violation ("clean"), 2) OOS violation and 3) non-OOS Violations for mobile scales, fixed scales (weigh stations) and total. In looking for possible trends in the number of OOS violations for comparable quarters from the Pre-Test (Pre-Operational Test) to the Operational Test time period, no obvious trends exist for either the mobile or fixed scales. No obvious trend is also found for the OOS violations as a percentage of the total inspections.

What is surprising about the MSCAP inspection data is that OOS violations are found for a substantial proportion of the regular MCSAP inspections. For the fixed scales the OOS proportion is generally in the 30 to 35 percent range. For the mobile scales the OOS proportion is typically somewhat smaller in the 24 to 34 percent range with one outlier at 73 percent. An even larger proportion of the MCSAP inspections find non-OOS violations. Typically, only about 20 percent or fewer of the vehicles or drivers have no violations.

Table 3 also gives baseline statewide data on MCSAP inspections that found "OOS drivers" (drivers who were potentially driving while OOS or driving a vehicle that was OOS) as shown

Statewide Safety Inspections (MCSAP) for Mobile versus Fixed Sites

MCSAP VIOLATION	Pre-Test																				Operational Test												Post-Test			
	1994 Q3				1994 Q4				1995 Q1				1995 Q2				1995 Q3				1995 Q4				1996 Q1				1996 Q2				1996 Q3			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
MOBILE SITES																																				
TOTAL	2080	4	2	2	2080	4	3	1	1972	2	2	0	2901	5	4	1	3041	23	17	6	2274	4	3	1	2155	3	2	1	2958	2	0	2	2770	6	5	1
NO VIOLATION	323				357				342				556				534				450				442				457				379			
(%)	15.5				17.2				17.3				19.2				17.6				19.8				20.5				15.4				13.7			
OOS VIO.	702				614				524				881				946				1653				518				850				897			
(%)	33.8				29 5				26.6				30.4				31.1				72.7				24.0				28.7				32.4			
NON-OOS VIO.	1055				1109				1106				1464				1561				171				1195				1651				1494			
(%)	50.7				53.3				56.1				50.5				51.3				7.5				55.5				55.8				53.9			
FIXED SITES																																				
TOTAL	4711	5	2	3	3999	1	1	0	4169	1	0	1	5623	0	0	0	5779	2	1	1	5331	1	1	0	4541	2	1	1	5322	0	0	0	4398	1	0	1
NO VIOLATION	930				864				881				1123				1059				1184				1027				1007				730			
(%)	19.7				21.6				21.1				20.0				18.3				22.2				22.6				18.9				16.6			
OOS VIO.	1666				1310				1266				1967				2172				702				1433				1768				1522			
(%)	35.4				32.8				30.4				35.0				37.6				13.2				31.6				33.2				34.6			
NON-OOS VIO.	2115				1825				2064				2533				2548				3445				2081				2547				2146			
(%)	44.9				45.6				49.5				45.0				44.1				64.6				45.8				47.9				48.8			
ALL SITES																																				
TOTAL	6791	9	4	5	6079	5	4	1	6141	3	2	1	8524	5	4	1	8820	25	18	7	7605	5	4	1	6696	5	3	2	8280	2	0	2	7168	7	5	2
NO VIOLATION	1253				1221				1223				1679				1593				1634				1469				1464				1109			
(%)	18.5				20.1				19.9				19.7				18.1				21.5				21.9				17.7				15.5			
OOS VIO.	2368				1924				1790				2848				3118				2355				1951				2618				2419			
(%)	34.9				31.6				29.1				33.4				35.4				31.0				29.1				31.6				33.7			
NON-OOS VIO.	3170				2934				3170				3997				4109				3616				3276				4198				3640			
(%)	46.7				48 3				51.6				46.9				46.6				47.5				48.9				50.7				50.8			

Note: A: TOTAL INSPECTION COUNT
B: OOS DRIVER (DRIVING WHILE OOS)
C: OOS INSPECTION WITH OOS
D: OOS INSPECTION WITHOUT OOS

ource: Wisconsin State Patrol Batch System - MCSAPCNT in column B for each quarter. Upon inspection these "OOS drivers" were either found to be still OOS (column C) or no longer OOS (column D). For the fixed scales the "OOS drivers" were a rare event both "pre-test" and during the Operational Test. The maximum number of "OOS drivers" statewide was five during the third quarter of 1994, but only two were actually found to be OOS (Column C). Similar results are found for the mobile scales with the exception of the third quarter of 1995 with 23 "OOS drivers", but even that is a small number compared to the total number of OOS violations that are found each quarter (less than one percent of the 3 118 statewide OOS violations for that quarter). The MOOSE system clearly did not have an impact on identifying the "driving while OOS drivers" ("OOS drivers") at the statewide level.

More specific data on the proportion of OOS violations found during MCSAP inspections at the three Operational Test scales in Wisconsin (Utica, Tomah and Rusk) are presented in Table 4. In contrast to all the other fixed scales in the state, the proportion of OOS violations found at the Operational Test scales during the Operational Test increased compared to the same quarter one year ago. The percentage point increases range from 2.1 to 5.2. The non-OOS violations found at the Operational Test scales also increased during the Operational Test which was not generally the case for the non-Operational Test scales. One possible explanation for this result is that the Operational Test activities encouraged the inspectors at the Operational Test scales to be more rigorous in making their MCSAP inspections.

MOE 2. Change in the number of citations issued for OOS and other violations.

Expected Result Initially, this MOE should increase because of the increased ability to identify OOS violations; however, over a longer time period the OOS violations should decrease because violators will become aware of the much higher chance of being detected and thus, increase their compliance.

Actual Results. Table 4 shows that the total number of MCSAP inspections in each quarter of the Operational Test increased substantially at the Operational Test scales compared to the year prior quarters. Additional MCSAP inspections were also made at the non-Operational Test scales compared to the year prior quarters for three of the four Operational Test quarters, but the percent increases were not nearly as large as those for the Operational Test scales. This increased level of MCSAP inspection activity accounts for some of the increase in the absolute number of OOS violations identified at the Operational Test scales during the Operational Test period compared to the pre-test period; but, as discussed under MOE 1. above, the proportion of OOS violations increased consistently as well. Again, one explanation is the potential for the inspectors at the Operational Test scales to conduct more rigorous inspections as the result of the emphasis on the Operational Test activities.

Extended Over the long term the effectiveness of the MOOSE system will depend on the relevance of the information provided to the inspectors. Table 5 summarizes the detailed MOOSE log file data tbat was itemized in Table 2. Of the total license plates read by the MOOSE system, only a small percentage result in matches with the MOOSE MCSAP database indicating that the vehicle had a MCSAP inspection at some prior time (3.4 to 6.4 percent of the

TABLE 4

Statewide Safety Inspections (MCSAP) - Operational Test Sites versus All Other Fixed Sites

			Pre-Test			*Operational Test*			*Post-Test*
QUARTER	***1994 Q3***	***1994 Q4***	***1995 Q1***	***1995 Q2***	***1995 Q3***	***1995 Q4***	***1996 Q1***	***1996 Q2***	***1996 Q3***
Operational Test Sites (Utica, Tomah and Rusk Scales)									
INSPECTIONS	907	901	915	1200	1476	1577	1214	1569	1007
NO VIOLATION	207	189	237	236	219	295	271	254	146
(%)	22.8	*21.0*	25.9	*19.7*	*14.8*	*18.7*	22.3	*16.2*	*14.5*
OOS VIO.	329	280	274	411	612	554	388	608	390
(%)	36.3	*31.1*	29.9	34.3	*41.5*	35.1	32.0	38.8	38.7
NON-OOS VIO.	371	432	404	553	645	728	555	707	471
(%)	*40.9*	*47.9*	44.2	*46.1*	*43.7*	*46.2*	*45.7*	*45.1*	*46.8*
All other Scales									
INSPECTIONS	5884	5178	5226	7324	7344	6028	5482	6711	6161
NO VIOLATION	1046	1032	986	1443	1374	1339	1198	1210	963
(%)	*17.8*	*19.9*	*18.9*	*19.7*	*18.7*	22.2	*21.9*	*18.0*	*15.6*
OOS VIO.	2039	1644	1516	2437	2506	1801	1563	2010	2029
(%)	*34.7*	*31.7*	*29.0*	*33.3*	*34.1*	*29.9*	*28.5*	*30.0*	*32.9*
NON-OOS VIO.	2799	2502	2766	3444	3464	2888	2721	3491	3169
(%)	*47.6*	*48.3*	*52.9*	*47.0*	*47.2*	*47.9*	*49.6*	*52.0*	*51.4*

TABLE 5

Summary of MOOSE Log File Data
MCSAP Matches by Prior Violation Status, Evaluation Results and Attempted Reads

Scale	***MCSAP* Database Matches *Prior* Violation Status** ***None*** ***(% of TM)***	***Non-00S*** ***(% of TM)***	***0 0 S*** ***(% of TM)***	Total Matches (TM) ***(% of TM)*** ***(% of ER)***	Evaluation ***Results*** (ER) ***(% of AR)***	Attempted Reads (AR) ***(% of AR)***
Utica	473 51.19%	353 38.20%	98 10.61%	924 100.00% 3.41%	27085 43.89%	61716 100.00%
Tomah	788 52.39%	558 37.10%	158 10.51%	1504 100.00% 3.54%	42516 48.86%	87011 100.00%
Rusk	7232 53.54%	5125 37.94%	1150 8.51%	13507 100.00% 6.37%	212004 74.54%	284405 100.00%
St. Croix	8096 61.37%	4541 34.42%	556 4.21%	13193 100.00% 5.41%	243822 44.11%	552816 100.00%

TABLE 6

MCSAP Inspection Results during the **Opeationai** Test by Scale

	MCSAP Violation Status ***None*** ***(% of Total)***	Non-00S ***(% of Total)***	0 0 S ***(% of Total)***	Total ***MCSAP Inspections*** ***(% of Total)***
Utica	336 14.23%	995 41.88%	1043 43.90%	2376 100.00%
Tomah	48 5.14%	368 39.19%	520 55.67%	934 100.00%
Rusk	653 25.85%	1274 50.44%	599 23.71%	2526 100.00%

Source: Wisconsin State Patrol Batch System - MCSAPCNT license plates that could be read successfully and thus generate an "evaluation result"). Of immediate interest here is the distribution of MSCAP database matches in terms of the "prior violation status" of: 1) none, 2) non-OOS violation and 3) OOS violation. As shown in Table 5 for the Wisconsin scales, the proportion of vehicles identified by the MOOSE system as having a prior OOS violation is small (on the order of 10 percent). Furthermore, almost none of these "prior OOS" vehicles (or drivers) were found to have a current OOS violation, at least as reported in the mainframe MCSAP database. Table 6 shows the actual percentage of the standard MCSAP inspections for the Operational Test scales that resulted in an OOS violation. The percentages range from 24 percent at Rusk to 56 percent at Tomah. Comparison of the actual MCSAP OOS violation percentage with the OOS violation matches from MOOSE log file suggests that vehicles with prior OOS violations tend to avoid the scales and thus appear as a much smaller percentage in the MOOSE log file. More extensive use of mobile inspection units would be needed to detect vehicles that may be operating while OOS.

In terms of identifying vehicles and drivers that have an OOS violation, the MOOSE system essentially identifies vehicles that are unlikely to have a current OOS violation. This is useful information that could be used by the inspectors to increase their success rate in identifying OOS violations during their regular MCSAP inspections. The sampling frame for the MCSAP inspections then would be only those vehicles that were not identified by the MOOSE system as having been inspected previously. The potential impact of using this sampling strategy is outlined in Tables 7 and 8. First, Table 7 shows in the right-most column the number of license plates read by the MOOSE system that match the MCSAP database (Total Matches) as a percentage of license plates that were attempted to be read by the MOOSE system (Attempted Reads). This percentage is calculated as the product of the first two columns in Table 7. Thus, this percentage could be increased if the accuracy of the MOOSE system license plate scanner could be improved so that the ratio of the Evaluation Results (successful reads) to Attempted Reads (vehicles entering scale) were increased.

Next, Table 8 shows how the Percent MOOSE Matches (Total Matches/Attempted Reads) from Table 7 can potentially be used to increase the Percent OOS (%OOS) violations detected from the standard MCSAP inspections. The first column of Table 8 shows the Percent OOS MCSAP violations found during the one year Operational Test at each Operational Test scale (see Table 6). The second column shows the Percent Non-OOS violations (calculated as 100%-%OOS). The MOOSE system provides information on a small fraction of the Percent Non-OOS violations, the %MOOSE Matches, that should not be sampled for the regular MCSAP inspections. Thus, the %MOOSE Matches is subtracted from the %Non-OOS to give the "Revised %Non-OOS". The "New %OOS" is calculated as:

$$\text{New \%OOS} = \text{\% OOS}/(\text{\% OOS} + \text{Revised \% Non-OOS})$$

As shown in the last column of Table 8, the "New %OOS" is increased by 1.5 to 5.0 percent compared to the observed %OOS. If the accuracy of the license plate scanner could be increased, there would be a corresponding increase in the "New %OOS".

The potential improvement in the ability of the inspectors to identify OOS violations by using the MCSAP matches generated by the MOOSE system (the Change in %OOS shown in

TABLE 7

MOOSE MCSAP Matches Relative to Evaluation Results and Attempted Reads

Scale	Total Matches / Evaluation Results (TM/ER*100%)	Evaluation Results / Attempted Reads (ER/AR*1 00%)	Total Matches / Attempted Reads (TM/AR*1 00%)
Utica	3.4%	43.9%	1.5%
Tomah	3.5%	48.9%	1.7%
Rusk	6.4%	74.5%	4.8%

TABLE 8

Estimation of Change in MCSAP-based OOS Violation Detection Resulting from not Sampling MOOSE MCSAP Database Matches

Scale	% OOS	% Non-OOS	% MOOSE Matches	Revised % Non-OOS	New % OOS	Change in % OOS
Utica	43.9%	56.1%	1.5%	54.6%	44.6%	+1.5%
Tomah	55.7%	44.3%	1.7%	42.6%	56.7%	+1.7%
Rusk	23.7%	76.3%	4.8%	71.5%	24.9%	+5.0%

Table 8) is quite small. A much greater potential benefit from the MOOSE system should be possible from using the MOOSE license plate data as input to the SAFER system. The SAFER system analyzes MCSAP data nationwide to generate safety ratings of motor carrier firms. The potential use of the SAFER system is discussed under Goal III. Identify Potential Future Applications (under the new Objective 8.).

MOE 3. Change in number of reinspections for prior OOS violations

Expected Result In many cases when a vehicle is put out-of-service, the MCSAP inspection staff go off duty before the vehicle defect is repaired or the driver's condition changes. Thus, the vehicle and/or driver is not reinspected to verify that the OOS violation(s) has been addressed. With the license plate scanner these OOS vehicles and/or drivers that have not been reinspected can easily be identified and then reinspected.

Actual In general, the reinspections at a scale result from vehicle and/or drivers put OOS at the same scale during the current shift. If the number of OOS inspections increases, then we would expect the number of reinspections to increase. Thus, the reinspections should be measured relative to the number of OOS inspections. As shown in Table 9, there is no conclusive trend in the reinspections as a percentage of OOS inspections (% of OOS) across the three Operational Test scales between the Pre-Test and Operational Test time periods. The percent reinspections increased from the Pm-Test to the Operational Test time periods for the Utica scale, but decreased for the Tomah and Rusk scales. The same pattern occurred for the Operational Test to the Post-Test (one quarter) time periods. A substantial increase in the number of OOS inspections from the Pre-Test to the Operational Test time period occurred for two of the three scales. Overall, the MOOSE system does not appear to have had a significant impact on MCSAP inspections.

OBJECTIVE 3. Increase Compliance with OOS Orders

MOE 1. Change in the proportion of vehicles identified as previously cited for an OOS violation that still have an OOS violation (operating while OOS as a percentage of vehicles with prior OOS violations that are identified by the scanner system)

Expected Result. As drivers become aware of the operation of the scanner, the proportion of vehicles that are still OOS should become very small. Drivers that are still OOS will attempt to bypass the scales with the scanners.

Actual The aggregate data on OOS drivers who were found driving while OOS was presented earlier in Table 3 by quarter for the Pre-Test, Operational Test and Post-Test (one quarter) time periods. The same basic data are presented in Table 10 for the individual fixed scales and well as the mobile scales. Of the very few OOS drivers found during all the quarters covered in Table 10, only two were found at any of the three Operational Test scales (Utica, Tomah and Rusk) and one of the two drivers was found upon inspection to be no longer OOS.

TABLE 9

MCSAP Reinspactions and OOS Total by Time Period and Scale

MCSAP Activities	Pre-Test	Operational Test [1]	Post-Test [2]
Utica Scale			
Reinspections (% of OOS)	168 (34.8%)	457 (43.8%)	97 (45.5%)
OOS Total (% of Inspections)	483 (40.8%)	1043 (43.9%)	213 (42.5%)
Tomah Scale			
Reinspections (% of OOS)	139 (59.1%)	201 (41.7%)	28 (27.2%)
OOS Total (% of Inspections)	235 (51.3%)	482 (52.2%)	103 (51.5%)
Rusk Scale			
Reinspections (% of OOS)	215 (37.3%)	169 (28.2%)	44 (23.0%)
OOS Total (% of Inspections)	576 (25.3%)	599 (23.7%)	191 (33.3%)

[1] Operational Test period from July 1, 1995 to June 30. 1996
[2] Based on only one quarter (3rd Quarter, 1996)

TABLE 10

MCSAP Inspections and Driving While Out-of-Service

LOCATION	Pre-Test															Operational Test									Post-Test		
	1994 Q3			1994 Q4			1995 Q1			1995 Q2			1995 Q3			1995 Q4			1996 Q1			1996 Q2			1996 Q3		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
MOBILE SCALES																											
B2				2						2			2			1											
MO	2069	4	2	2078	4	3	1972	2	2	2872	5	4	3011	23	17	2259	4	3	2155	3	2	2958	2	0	2736	6	5
01	11									27			28			14									34		
SUBTOTAL	*2080*	*4*	*2*	*2080*	*4*	*3*	*1972*	*2*	*2*	*2901*	*5*	*4*	*3041*	*23*	*17*	*2274*	*4*	*3*	*2155*	*3*	*2*	*2958*	*2*	*0*	*2770*	*6*	*5*
FIXED SCALES																											
S11	252			293			363			251			304			142			185			166			188		
S16	712			228			152			250			383	1	1	259			257	1	0	260			233	1	0
S17 - Utica	447			73			268			398			737			571			437			631			501		
S18	251	1	1	369			287			379			467			449			392	1	1	279			175		
S21	383			435			279			766			687			597			345			567			773		
S22	487	3	0	233			197			362			438			294			303			329			368		
S31	146			96			111			134			73			112			134			143			130		
S34	309			160			86			245			291			188			143			160			128		
S35	218			102			130			49			177			177			183			160			92		
S41	281			278			409			430			353			308			338			334			171		
S42	8			19			13			85			85			53			38			89			8		
S43	15			27			33			119			100														
S44	195			234			278			193			193			313			240			423			166		
S51 - Tomah	103			97			136			126			216			245			224			249			200		
S52	55			54			131	1	0	81			3			1			4			5			5		
S53	155			188			373			402			180			155			249			344			198		
S61	134			172			249			508			392			483			399			308			213		
S63 - Rusk	357			731			519			676			523	1		761	1	1	553			689			574		
S71	203	1	1	210	1	1	155			169			177			223			117			186			275		
SUBTOTAL	*4711*	*5*	*2*	*3999*	*1*	*1*	*4169*	*1*	*0*	*5623*	*0*	*0*	*5779*	*2*	*1*	*5331*	*1*	*1*	*4541*	*2*	*1*	*5322*	*0*	*0*	*4398*	*1*	*0*
TOTAL	*6791*	*9*	*4*	*6079*	*5*	*4*	*6141*	*3*	*2*	*8524*	*5*	*4*	*8820*	*25*	*18*	*7605*	*5*	*4*	*6696*	*5*	*3*	*8280*	*2*	*0*	*7168*	*7*	*5*

Note: A: TOTAL INSPECTION COUNT
B: OOS DRIVER (DRIVING WHILE OOS)
C: OOS DRIVER - INSPECTION WITH OOS

Operational Test Scales. S17 Utica, S51-Tomah and S63-Rusk
Source: Wisconsin State Patrol Batch System - MCSAPCNT

Thus, the MOOSE system has not had a significant impact on the identification of 00S drivers who are driving while 00S. If drivers are driving while OOS, they clearly are avoiding the three Operational Test scales.

MOE 2. Changes in the results of follow-up inspections of vehicles with a current 00S deficiency focusing on the types of violations found and the types most likely to go unrepaired.

~~Expected Result.~~ We expect easy to repair causes of violations to occur less frequently as the result of the scanner system.

Actual The MCSAP summary data from the Wisconsin State Patrol MCSAP database for the entire Pre-Test through Post-Test time period did not show any inspections for 00S vehicles (driving while 00S). Thus, this MOE is not relevant to the objective.

OBJECTIVE 4. Increase Direct Compliance with 00S Orders

MOE 1. Change in the number of vehicles with previous 00S inspections that failed to return or improperly completed the Certificate of Repair.

Expected Result With increased emphasis on 00S compliance we expect compliance with the Certificate of Repair requirements will increase.

Actual Certificate of Repair data were analyzed, but no clear trends could be identified.

MOE 3. Change in the proportion of vehicles inspected that are reinspected before leaving the inspection site.

Expected Result The proportion should remain about the same. If for some reason the proportion reinspected increases, then the population of 00S vehicles that potentially can be detected with the scanner system will be smaller.

Actual Result This MOE was not measured. The amount of effort required to obtain the data would have been excessive.

OBJECTIVE 5. Reduce delay in compliance with 00S notices

MOE 1. Change in average time to file Certificate of Repair that verifies compliance with 00S orders.

~~Expected Result.~~ The scanner system is expected to generate more prompt repair of 00S violations. This should lead in turn to earlier filing of the Certificate of Repair.

Actual Result The Certificate of Repair data were too aggregate to permit identification of any trends that may have resulted from the three Operational Test scale inspections.

GOAL II. ESTABLISH A BI-STATE ENFORCEMENT PROGRAM

OBJECTIVE 1. Increase the Detection of OOS Violations between Wisconsin and Minnesota

MOE 1. Change in the number of Wisconsin OOS inspection violations detected at the Minnesota inspection site.

Expected Result Initially, we expect an increase in the number of violations detected; but over time as information on the high probability of detection becomes available to commercial vehicle operators, the number of violations should decrease.

Actual Result The MOOSE system at the St. Croix scale in Minnesota used the Wisconsin MCSAP database of vehicles that had been inspected at Wisconsin scales. Thus, data from the MOOSE log file at the St. Croix scale will measure "Wisconsin OOS inspection violations". As shown earlier in Table 2, the MOOSE "OOS alarm" was generated by 552 vehicles at the St. Croix scale. The MOOSE "OOS alarm" codes indentify vehicles and/or drivers that had OOS violations on the last inspection. In nearly all cases, however, the OOS violations were found to have already been corrected. Overall, the "OOS alarm" vehicles represented only 0.21 percent of the "good reads" (license plates that could be decoded for comparison with the MCSAP database). Month to month trends in the number of "OOS alarm" vehicles and the "OOS alarm" vehicles as a percent of good reads are shown in Appendix B. Once the MOOSE system at the St. Croix scale was fully operational in February of 1996, the percent "OOS alarm" vehicles increased initially and then stabilized at about 0.28 percent.

OBJECTIVE 2. Increase Co-ordination between Agencies Across State Lines

MOE 1. Level of use of Wisconsin's OOS databases by Minnesota enforcement agencies.

Expected Result The number of queries of Wisconsin's mainframe OOS database by Minnesota agencies can be recorded automatically and tabulated for specified time periods.

Actual A more relevant measure of the use of Wisconsin's OOS databases by Minnesota is provided by the MOOSE log file data. Minnesota inspectors at least had the ability to query the Wisconsin mainframe MCSAP database to follow-up on the 552 MOOSE OOS alarms that were generated by the MOOSE system.

MOE 2. Ratings of ease of use and usefulness of specific OOS data and administrative procedures between Wisconsin and Minnesota.

Expected Result Minnesota inspectors who will use Wisconsin OOS data and procedures will be surveyed to obtain their ratings of the data and procedures.

Actual A formal survey of Minnesota inspectors was not conducted. In practice the use of the MOOSE OOS alarms was limited because the MOOSE system was not integrated with the St. Croix weigh-in-motion system. Under normal operation vehicles are directed to the weigh-in-motion lane and are traveling at a speed of about 35 miles per hour. If the MOOSE OOS alarm sounds, the inspector often did not have enough time to change the variable message signs to direct the correct vehicle to the inspection area.

OBJECTIVE 3. Create an Efficient Procedure for Sharing Data

MOE 1. Cost of OOS data transmission and access between Minnesota and Wisconsin per OOS violation detected.

Expected Result Access to the OOS database on Wisconsin's mainframe computer is charged on a per unit access basis. Thus, the costs of data transmission and access can be recorded automatically. The cost for maintaining a data communications link between Minnesota and Wisconsin also needs to be included. For the operational test the dedicated phone line costs are high. More cost-effective communication links are available for permanent installations.

Actual Result The largest cost for maintaining the real-time data link between the Wisconsin DOT mainframe and MOOSE system at the St. Croix scale probably was the dedicated data-quality phone line. The Operational Test revealed that the real-time connection to the Wisconsin DOT mainframe was not really essential to the basic functioning of the MOOSE system. Drivers who were put OOS at a Wisconsin scale and left after the scale closed (without being reinspected) clearly avoided the St. Croix scale. Thus, the MOOSE system MCSAP database did not need to be updated frequently. The MCSAP database could have been updated via modem and a standard phone line at a fraction of the cost of the dedicated phone line.

MOE 2. Percent of time that the access link to the OOS database in Wisconsin is available to Minnesota.

Expected Result. To be fully effective, Minnesota should have continuous access to Wisconsin's OOS database.

Actual Result As explained above for MOE 1.) real-time access to Wisconsin's mainframe MCSAP database was not essential to the effective operation of the MOOSE system. Nevertheless, the communication link to Wisconsin's mainframe MCSAP database did function effectively with minimal time without access.

To be fully effective in identifying vehicles that leave any of the Wisconsin scales and are "operating while OOS", the MOOSE system at the St. Croix scale must be in operation 24 hours per day. As shown earlier in Table 1, the MOOSE system was not in operation for more than an average of 18 hours per day over a one month period until February of 1996. In general, the MOOSE system at the Wisconsin scales was in operation for many fewer hours per day than the St. Croix scale when it was in full operation (from February 1996 on).

MOE 3. Percent of current Wisconsin OOS inspection records that are detected by the scanner at the St. Croix Inspection Station in Minnesota.

Expected Result The percentage provides an indicator of the relative level of importance of sharing OOS data. The percentage should be reasonably stable over time although seasonal variations may exist.

Actual Result. As shown in Table 2 previously, the number of matches of license plates at the St. Croix scale with the MOOSE MCSAP database as a percentage of all attempted matches (evaluation result) was 5.4 percent. This degree of match was exceeded only by the Rusk scale with a match rate of 6.4 percent.

GOAL III. IDENTIFY POTENTIAL FUTURE APPLICATIONS

OBJECTIVE 1. Access National Databases such as SAFETYNET

MOE 1. Number of OOS violations detected from a pilot test of access to SAFETYNET.

MOE 2. Cost of SAFETYNET access per OOS violation detected.

Actual Results Not done. Since the MOOSE system did not appear to generate substantial increases in the OOS violations detected, little additional improvement would likely to be obtained from use of SAFETYNET data for other states. For many states SAFETYNET data on MCSAP violations may be several months old. A more viable alternative is to integrate the new SAFER system with the MOOSE system. This alternative is considered under the new Objective 8 below.

OBJECTIVE 2. Evaluate the Potential for Expansion to Neighboring States and All of Wisconsin and Minnesota

MOE 1. Estimate the number of OOS violations entered in Minnesota that would likely be detected across state lines.

MOE 2. Cost of expansion per estimated additional OOS violation detected.

Actual Not done. The greatest potential for expansion of the MOOSE system is to integrate it with the new SAFER system as considered under the new Objective 8 below.

OBJECTIVE 3. Measure the Effectiveness of License Plate Scanner Technology

MOE 1. Percent of Minnesota and Wisconsin commercial vehicle license plates that are read successfully (valid read).

Actual Results. In order to evaluate the accuracy of the license plate scanner, license plate data were collected monthly at one or more of the scales using an independent video recorder. The actual license plate number from the independent video was then compared manually with the number generated by the MOOSE system. The full results by month are presented in Appendix E. The overall results for each scale are summarized in Table 11.

The "valid read rates" by state shown in Table 11 are based on only those license plates that could be "read" by the scanner. From 24 to 30 percent of the vehicles either had no visible license plate or the license plate was so dirty or damaged so that it could not be interperted by the scanner. Wisconsin had the highest "valid read rate" ranging from 74 to 84 percent. Illinois was the next highest in the 61 to 69 percent range. The scanner had difficulty reading Minnesota license plates with valid read rates only in the 22 to 37 percent range for data collected at the Wisconsin scales. The scanner at the St. Croix scale was fine-tuned for Minnesota license plates, but still only had an overall valid read rate of 53 percent.

MOE 2. Percent of all commercial vehicle license plates that are read successfully (valid read).

Actual Results As shown in Table 11, two measures of "valid reads" are available. The first measure is the "valid reads" as a percentage of all vehicles entering the scale. The range in "valid reads" as a percent of the total vehicles is 36 to 43 percent. If the scanner can identify a license plate to interpret, the "valid reads" as a percentage of license plates "read", increases to the 5 1 to 60 percent level.

MOE 3. Maximum processing rate per lane for commercial vehicle license plate successful reads.

Actual Results The trigger mechanism for the license plate scanner does not work properly if the vehicle headway is too small. Small headways occur when the vehicles are delayed in a queue that extends beyond the scanner video camera location on the entry ramp to a scale. Queues often formed at the Utica and Tomah scale since these scales do not have weigh-m-motion. The "short headway" problem probably accounts for the five percentage point higher level of license plates that could not be read by the scanner ("no physical plates or bad plates") for the Utica and Tomah scales compared with the Rusk and St. Croix scales (30% versus 25 %).

MOE 4. Percent successful license plate reads as a function of vehicle speed.

Actual Results The St. Croix scale has the highest vehicle speeds in the range of 30 to 35 mph. The accuracy of the scanner did not appear to be affected by the higher speeds. As shown in Table 11, the "valid read" rates for the St. Croix scale are similar to the other scales.

TABLE 11

Validation of Scanner Read Rates with Independent Video by Scale

	Scale			
	Utica	Tomah	Rusk	St. Croix, MN
Total Attempted Reads	723	852	897	988
No Physical Plates or Bad Plates	218	254	222	240
% of Total	30.2%	29.8%	24.7%	24.3%
Read by Scanner - Total "Good Read"	505	598	675	748
% of Total Attempted Read	69.8%	70.2%	75.3%	75.7%
Read by Scanner but Invalid Read	245	238	285	345
% of Total Attempted Reads	33.9%	27.9%	31.8%	34.9%
% of Read by Scanner	48.5%	39.8%	42.2%	46.1%
Valid Read	260	360	390	403
% of Total Attempted Reads	36.0%	42.3%	43.5%	40.8%
% of Read by Scanner	51.5%	60.2%	57.8%	53.9%
Valid Read Rate by State				
Wisconsin (%) of Read by Scanner	76.8%	80.4%	84.0%	73.7%
Illinois (%) of Read by Scanner	68.9%	61.2%	64.0%	61.7%
Minnesota (%) of Read by Scanner	22.4%	37.8%	36.9%	53.0%

OBJECTIVE 4. Estimate the Potential for Expansion to Other Commercial Vehicle Regulatory Issues, such as, Issues Relating to IRP, IFTA and Size and Weight Preclearances

MOE 1. Comparison of the benefits and costs of system implementation for each issue.

Actual Exploration of these issues was beyond the scope of the work program.

OBJECTIVE 5. Identify the Feasibility of Collecting Planning-Related Data

MOE 1. Success of pilot study to determine commercial vehicle origins and destinations.

Actual In order to track commercial vehicle origins and destinations along the I-90/94 corridor, the schedules for the scales must be arranged so that all of the scales are open during a reasonable window of time for west-bound vehicles. A special data collection station was established at the last toll plaza on the Illinois Tollway at East Beloit on the Wisconsin stateline. Table 12 shows the time period during which vehicles were tracked at each station (scale) along the corridor from Beloit to St. Croix. An additional station was also added near Tomah to capture the vehicles traveling west on I-90 towards Lacrosse at that point.

The pilot study to track vehicles along the corridor was successful. The results of the manual matching of license plates for vehicles traveling from one station to another are presented in Table 13. Table 13 shows for each Origin-Destination (OD) pair the vehicles that begin at the Origin station that are observed at the Destination station as well as the number of these vehicles that are identified at intermediate stations. For example, for the Beloit to St. Croix OD pair there were 178 vehicles of which 168 were identified at Utica, 154 at Tomah and 155 at Rusk. Thus, only a few of the 178 vehicles traveling between Beloit and St. Croix did not use the Interstate highway.

The OD data from the pilot study should be useful for statewide freight planning purposes, but a substantial amount of staff time was required for the manual matching of license plates between pairs of scales. The potential for automating the data collection using the MOOSE system has not yet been evaluated.

MOE 2. Success of pilot study to determine commercial vehicle truck miles by weight classification.

Actual Results Not done. The amount of effort required to add vehicle weight data to the MOOSE log file even on a sample basis was beyond the scope of this evaluation. Such a study would be a logical extension of the successful origin and destination pilot study.

OBJECTIVE 6. Estimate the Potential for Expansion to Other Inspection Sites

MOE 1. Number of Wisconsin inspection sites with space and geometrics that will accomodate the scanner technology.

TABLE 12

Data Summary for One-day License Plate OD Matching

Station	Starting Time	Ending Time	Total Time	Number of Trucks	Ratio
Beloit	06:00:00 AM	02:00:00 PM	08:00:00	2557	
Utica	07:10:33 AM	03:09:27 PM	07:58:54	1785	
Tomah	08:29:00 AM	04:36:53 PM	08:07:53	1630	100%
Tomah Split on I-94	09:03AM	04:46:00 PM	07:43:00	951	58.34%
Rusk	10:39:56 AM	06:46:10 PM	08:06:14	1241	
St. Croix, MN	12:01:39 PM	06:46:00 PM	06:44:21	1166	

TABLE 13

One Day License **Plate Matching** for Scale Origin
Destination Pairs **and intermediate Scale Matches**

OD Pair	*Beloit (1)*	*Utica (2)*	*Tomah (3)*	*Rusk (4)*	*St. Croix, MN (5)*
1-5	178	168	154	155	178
1-4	131	114	93	131	—
1-3	246	226	246		
1-2	596	596	—	—	—
2-5		53	45	38	53
2-4	—	33	30	33	—
2-3	—	69	69	—	—
3-5	—		185	153	185
3-4	—	—	87	87	—
4-5	—	—	—	260	260
Total	**1151**	1259	909	857	676

Summary Data

Total Observation	2557	1785	1630	1241	1165
% of Total Observation	100%	100%	100%	100%	100%
Non-00 Pair Observation	1350	470	692	361	460
% of Total Observation	52.8%	26.3%	42.5%	29.1%	39.5%
OD Pair Observation	1151	1259	909	857	676
% of Total Observation	45.0%	70.5%	55.8%	69.1%	58.0%
Number of No Plate	56	56	29	23	29
% of Total Observation	2.2%	3.2%	1.7%	1.8%	2.5%

Actual Results. The scanner system is relatively compact. Thus, expansion to other scales is not constrained by space and geometric considerations.

OBJECTIVE 7. Estimate the Potential Use in Mobile Size-Weight Enforcement

MOE 1. Capital and operating cost per mobile weigh station divided by the expected additional OOS violation detections.

Actual The full scanner-based MOOSE system was difficult to implement in the field in conjunction with the mobile weigh stations. To the extent that OOS vehicles are by-passing the regular scales, implementation of the MOOSE system using mobile weigh stations should be highly effective in identifying OOS vehicles. A lap-top computer version of MOOSE that uses manual entry of license plate numbers would be more easily integrated into the mobile enforcement operations.

OBJECTIVE 8. (NEW) Estimate the Potential for Integration with the SAFER System

MOE 1. Proportion of vehicles that have "safety rating" (Inspection Value) scores that may warrant a MCSAP inspection.

Actual The SAFER system has recently been implemented through PC-based software called the Inspection Selection System (ISS). In order to obtain an "inspection value" score from the ISS software, either a USDOT or a MC number is required. Also, the ISS software is based on manual entry of the USDOT or MC number. A batch processing version of the software is not currently available. Thus, a pilot study to generate ISS "inspection value" scores for a sample of Wisconsin license plates required extensive manual data entry. The flow diagram for the process used to obtain the ISS scores is shown in Figure 3. In order to provide a comparable source of data for all of the scales, the video data collected for the origin and destination pilot study was used.

The results of the pilot study are shown in Table 14. The initial national level guidelines for use of the ISS scores are to complete a MCSAP inspection for scores of 90 and above with inspection optional for scores between 80 and 90. The results for recommending inspection (ISS score of 90 or more) at the four scales are reasonably consistent with percentages of vehicles ranging from 10 to 13 percent. The Beloit entry point to Wisconsin on I-90 is an outlier at only 4 percent. When ISS scores of 80 and above are considered, the percentages of vehicles in that range is highly consistent across all of the locations ranging from 25 to 27 percent.

The next step would be to link the ISS scores to actual MCSAP inspection results in Wisconsin If the ISS scores are found to be a reliable indicator of OOS and other safety violations, then the ISS software could easily be incorporated into the MOOSE system. The integration would then make the MOOSE system much more useful for identifying safety violations.

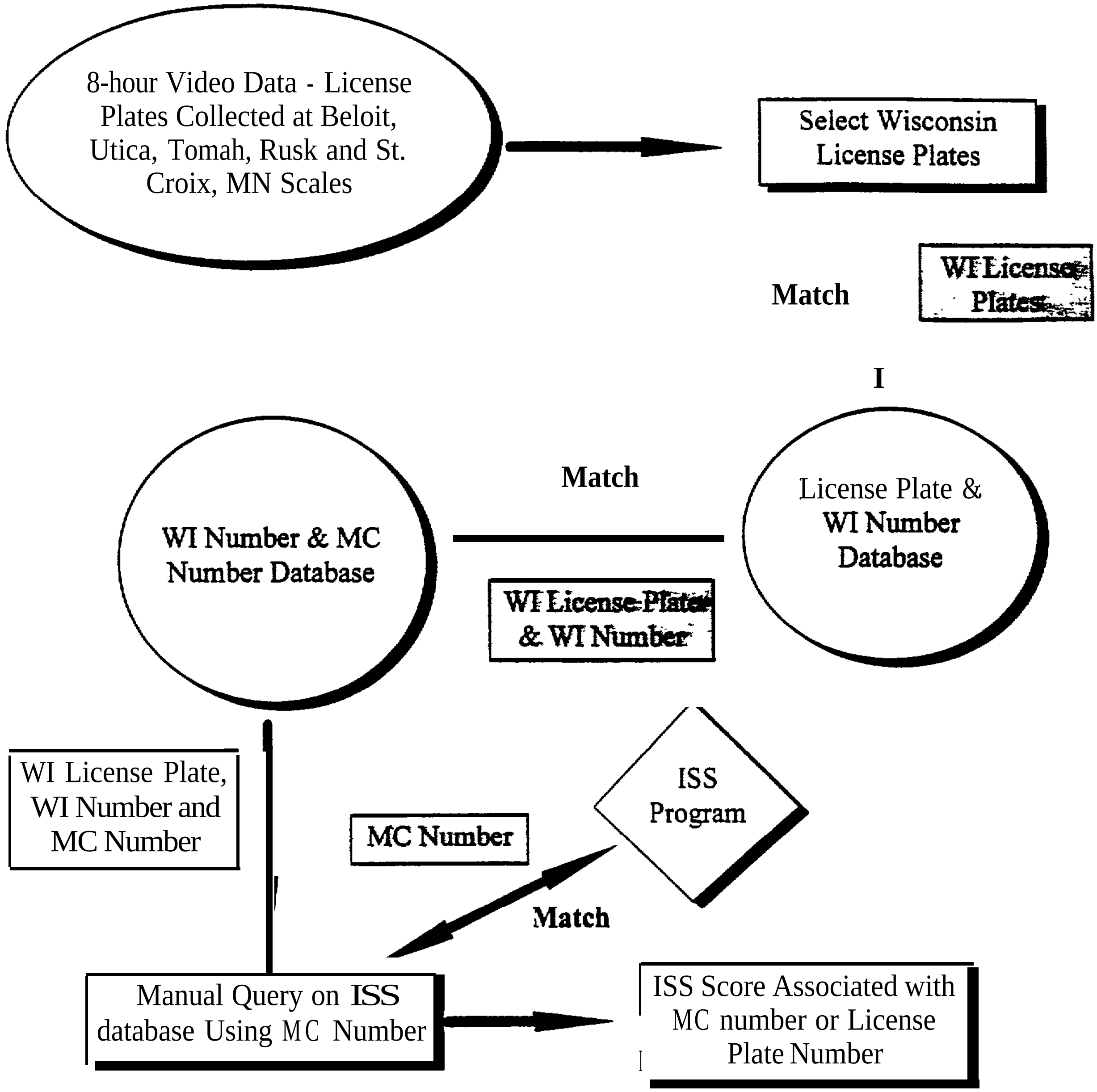

Fig. 3. - Procedure to Obtain ISS Score Using License Plates Captured from an 8-hour License Plate Survey

TABLE 14

IS!3 Evaluation Results - Summary

Scale	Avg. ISS Scores (Conditions)	<70 (Pass)	70-79 (Pass)	80-89 (Optional)	go-100 (inspection)	No WI or MC No.	Not in ISS database (X)	No ISS Info. (N)	Total
Beloit	78.91	31	220	145	23	164	43	3	629
		4.93%	34.98%	23.05%	3.66%	26.07%	6.84%	0.48%	100.00%
Utica	78.84	20	160	56	59	119	28	3	445
		4.49%	35.96%	12.58%	13.26%	26.74%	6.29%	0.67%	100.00%
Tomah	78.89	15	138	60	49	103	36	1	402
		3.73%	34.33%	14.93%	12.19%	25.62%	8.96%	0.25%	100.00%
Rusk	78.26	9	99	33	26	59	11	2	239
		3.77%	41.42%	13.81%	10.88%	24.69%	4.60%	0.84%	100.60%
St. Croix, MN	79.04	2	63	26	16	50	7	2	166
		1.20%	37.95%	15.66%	9.64%	30.12%	4.22%	1.20%	100.00%

VI. SUMMARY AND CONCLUSIONS

The Operational Test program had three primary goals: 1) increase the effectiveness of OOS enforcement efforts, 2) establish a bi-state enforcement program and 3) identify potential future applications. The extent to which the Operational Test was successful in meeting these three goals is summarized below.

GOAL I. INCREASE THE EFFECTIVENESS OF OOS ENFORCEMENT EFFORTS

The initial focus of the Operational Test was on the detection of drivers/vehicles that were operating while Out-of-Service (OOS). The three inspection stations (scales) in Wisconsin that were involved in the Operational Test typically do not operate 24 hours per day. Thus, drivers and/or vehicles that were put OOS during a shift, but are not reinspected prior to the end of the shift, are physically free to leave when the shift ends. After hours monitoring of these OOS drivers/vehicles to prevent the drivers from "running" would be very costly. The license plate scanner and the associated software for identifying current safety violations, the MOOSE system, was designed to identify the "runners" if they entered a subsequent scale. Prior to the Operational Test, the statewide MCSAP data on OOS violations showed that drivers and vehicles identified as "operating while OOS" was a rare event. While some "runners" may have entered scales prior to the Operational Test, most "runners" probably used by-pass routes to avoid entering subsequent scales. With the MOOSE system operational there was even more incentive for the "runners" to use by-pass routes. The direct result of the MOOSE system was that "operating while OOS" as reported in the MCSAP inspection data continued to be a rare event.

Although possibly not the direct result of the MOOSE system, the effectiveness of the OOS enforcement efforts at the three Operational Test scales in Wisconsin did increase by a small amount as measured by the proportion of OOS violations found during MCSAP inspections. The proportion of OOS violations increased by 2.1 to 5.2 percentage points. The proportion of non-OOS safety violations also increased at the three scales.

The MOOSE system could potentially be used to increase the proportion of OOS violations found under the regular MCSAP inspection process. This would be accomplished by using the information provided by MOOSE to modify the selection process for the regular MCSAP inspections. MOOSE identifies vehicles that have received a prior MCSAP inspection. Since these vehicles are unlikely to have a current OOS violation, the chance of selecting vehicles that have an OOS violation can be improved by not considering the vehicles with a prior MCSAP inspection. Improvements in the percentage of OOS violations that could be detected were estimated to be in the 1.5 to 5 .O percent range.

GOAL II. ESTABLISH A BI-STATE ENFORCEMENT PROGRAM

The MOOSE system was successfully installed at the St. Croix scale in Minnesota and a real-time communication link to Wisconsin's mainframe MCSAP database maintained with no problems. As for the Wisconsin scales with the MOOSE system, a substantial number of vehicles that had previously been placed OOS were identified, but essentially none of these vehicles were found to be still OOS. Since the St. Croix scale typically operates 24 hours a day, drivers who are still OOS are even more likely than in Wisconsin to use by-pass routes.

The Operational Test results suggest that a costly real-time communication link to Wisconsin's mainframe MCSAP database was not essential for the effective use of the MOOSE system at the St. Croix scale. The MOOSE system's MCSAP database could be updated periodically via modem and a standard phone line at a fraction of the cost of a dedicated data-quality phone line.

The MOOSE system at the St. Croix scale did generate a level of matches with the MOOSE MCSAP database of 5.4 percent of all attempted matches which is similar to the level found at the Wisconsin scales. Thus, the data sharing effort creates most of the same opportunities as in Wisconsin. In particular, the St. Croix scale could use the MOOSE data to increase the percentage of OOS violations obtained from their regular MCSAP inspections.

GOAL III. IDENTIFY POTENTIAL FUTURE APPLICATIONS

The largest potential benefit from the MOOSE system is likely to be the benefit from integrating the SAFER system with MOOSE. Currently, about 95 percent of the license plates that are read by MOOSE provide no information about the status of the vehicle or driver. By creating a link to the SAFER system, many of these license plates could be used to provide a safety rating (ISS) score. Inspectors could then select vehicles for inspection that have a higher probability of being OOS or having other safety violations.

The other future application with the greatest potential is to collect planning-related data with the MOOSE system. By scheduling the times of operation of the scales appropriately, the MOOSE license plate data can be tabulated to generate the pattern of origins and destinations along the corridor. In the future vehicle weights could be added to the MOOSE database so that vehicle miles of travel by weight category could be estimated.

Considerable effort was made during the Operational Test to evaluate the accuracy of the license plate scanners at each scale. The overall level of "valid reads" as a percentage of all vehicles was only 36 to 43 percent which is substantially less than expected. StiIl, even this level of accuracy generates a large number of valid license plates that can be used for improving safety inspections and for many other applications.

VII. RECOMMENDATIONS FOR ADDITIONAL RESEARCH

Additional research is needed on how the license plate data provided by the MOOSE system can be used to improve safety inspection efforts and to develop other applications. Research on how best to integrate the SAFER system with MOOSE should be initiated immediately. The MOOSE system will effectively automate the use of the SAFER system to provide safety rating scores for a large proportion of the vehicles entering a scale. Research is needed to determine relationships between the safety rating scores and actual MCSAP inspection results. Once these relationships are established the regular MCSAP inspections should generate a much higher proportion of OOS and other safety violations.

Research on the benefits of collecting planning-related data should also be highly productive. A primary issue to be addressed by the research would be how extension of the MOOSE system to other scales would help to improve the usefulness of the origin and destination and other planning-related data.

Other productive research areas include: 1) evaluation of the potential for expansion to other commercial vehicle regulatory issues, 2) evaluation of the potential for expansion to other scales and 3) development of an effective methodology for use in mobile motor carrier enforcement.

VIII. ACKNOWLEDGEMENTS

The authors would like to thank the staff of the Wisconsin State Patrol in the Central Office, in the Districts and on the front line in the weigh stations for their support and cooperation in making this evaluation possible: The techical support of Mr. Jim Newton in creating the MOOSE software and providing large amounts of data for the evaluation are very much appreciated. The support and cooperation of the Minnesota State Patrol and the Minnesota DOT staff were also important to the success of this evaluation effort.

IX. REFERENCES

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2. Smith, Robert L., Jr., MN/WI Automatic Out-of-Service Verification Operational Test Evaluation - Data Management Plan University of Wisconsin-Madison, Department of Civil and Environmental Engineering, Madison, December 1995.

APPENDICES

A. Example of Standard MCSAP Inspection Count Report - Quarterly Summary

B. MOOSE Log File Format, Evaluation Codes and Evaluation results

C. Example of the Manual Verification of Scanner Results

D. Example of MOOSE Daily Status Report Log Book Form

E. Summary of Manual Verification of Scanner Results by Scale

DISTRICT 6 LOCATION S63
1995-07-01 1995-09-30

MCSAP INSPECTIONS ISSUED	INSP CNT	TWIN CNT	REINSP CNT	# REPAIRED	# TOWED	# FAILED	# OTHER
FIXED PLATFORM STATE SCALES	523	163	38	36	1	1	0
MOBILE MOTOR CARRIER ENFORCEMENT	0	0	0	0	0	0	0
PORTABLE WHEEL WEIGHER DETAILS	0	0	0	0	0	0	0
OTHER	0	0	0	0	0	0	0
TOTAL MCSAP INSPECTIONS ISSUED	523	163	38	36	1	1	0

WITH HAZMAT	12	
INTERSTATE		11
INTRASTATE		1
WITHOUT HAZMAT	511	
INTERSTATE		477
INTRASTATE		34

	WITHOUT HAZMAT	WITH HAZMAT
NO VIOLATIONS	105	5
BOTH VEHICLE AND DRIVER OOS	8	0
DRIVER OOS -- VEHICLE NOT OOS	72	1
VEHICLE OOS -- DRIVER NOT OOS	69	0
SOME VIOLATIONS -- NONE OOS	257	6
INSPECTION WITH VEHICLE VIOLATIONS ONLY	170	5
INSPECTION WITH DRIVER VIOLATIONS ONLY	25	0

INSPECTION LEVELS (DURATION IN MINUTES)	DURATION	COUNTS	(only)C TANK	(only)HAZMAT	BOTH
LEVEL 1	11019	339	0	0	0
LEVEL 2	3791	141			
LEVEL 3	1168	43			
LEVEL 4	0	0			
LEVEL 5	0	0			
LEVEL OTHER	0	0			
TOTAL INSPECTION LEVELS	15978	523			

VIOLATIONS ISSUED	
FIXED PLATFORM STATE SCALES	1,030
MOBILE MOTOR CARRIER ENFORCEMENT	0
PORTABLE WHEEL WEIGHER DETAILS	0
OTHER	0
TOTAL VIOLATIONS ISSUED	1,030

TOTAL CITATION	52	$8,355.40

VIOLATION BREAKDOWN	TOTAL INSP CNT	INSP W/OOS	(OOS VIO)	(NOT OOS VIO)	INSP WO/OOS	(NOT OOS VIO)	
VEHICLE							
TIRES	71	13	20	4	58	80	
BRAKES	131	43	127	12	88	110	
LIGHTS	105	19	31	24	86	106	
FRAMES	2	0	0	0	2	2	
SUSPENSION	19	7	8	1	12	17	
WHEELS	2	0	0	0	2	2	
STEERING	3	1	1	0	2	2	
SECUREMENT	1	1	2	0	0	0	
OTHER VEHICLE	135	4	4	4	131	176	
			-------	-------		-------	
TOTAL VEHICLE			193	45		495	
DRIVER							CIT COUNT
HOURS	32	29	30	1	3	4	9
LOGBOOK	193	46	46	4	147	159	30
QUALIFICATIONS	2	2	2	0	0	0	0
PHYSICAL QUALIFICATIONS	18	0	0	0	18	18	0
DRUG	0	0	0	0	0	0	0
ALCOHOL	2	2	4	0	0	0	3
O/S DRIVER (DRIVING WHILE)	1	0	0	0	1	1	1
O/S VEH (DRIVING WHILE)	0	0	0	0	0	0	0
CDL	0	0	0	0	0	0	0
SECUREMENT	6	3	3	0	3	3	0
OTHER DRIVER	22	2	2	0	20	20	5
			-------	-------		-------	-------
TOTAL DRIVER			87	5		205	48
HAZMAT							
VEHICLE	0		0	0			
DRIVER	0		0	0			
			-------	-------			
TOTAL HAZMAT			0	0			

MOOSE LOG File Data Items

Scale	Read	Year	Month	Day	Hour	Minute	Second	Split	License # / Alarm Code	State
WI63	GR	1995	8	4	23	13	55	1	PRU1161	MN
WI63	ER	1995	8	4	23	13	55	1	N??	
WI63	GR	1995	8	4	23	15	3	1	61180	WI
WI63	ER	1995	8	4	23	15	3	1	N??	
WI63	GR	1995	8	4	23	15	25	1	AA705	WI
WI63	ER	1995	8	4	23	15	25	1	N??	
WI63	GR	1995	8	4	23	15	42	1	19243	WI
WI63	ER	1995	8	4	23	15	42	1	N??	
WI63	BR	1995	8	4	23	19	1	1	No Plate	
WI63	BR	1995	8	4	23	22	44	1	No Plate	
WI63	GR	1995	8	4	23	23	12	1	F106877	IL
WI63	ER	1995	8	4	23	23	12	1	N??	
WI63	GR	1995	8	4	23	25	11	1	HC4127	WI
WI63	ER	1995	8	4	23	25	11	1	N??	
WI63	GR	1995	8	4	23	25	21	1	63873	WI
WI63	ER	1995	8	4	23	25	21	1	N??	
WI63	GR	1995	8	4	23	27	19	1	30858	WI
WI63	ER	1995	8	4	23	27	19	1	N??	
WI63	GR	1995	8	4	23	27	29	1	30860	WI
WI63	ER	1995	8	4	23	27	29	1	N??	
WI63	GR	1995	8	4	23	27	38	1	37688	WI
WI63	ER	1995	8	4	23	27	38	1	N??	
WI63	GR	1995	8	4	23	27	47	1	34468	WI
WI63	ER	1995	8	4	23	27	47	1	N??	
WI63	GR	1995	8	4	23	27	59	1	37257	WI
WI63	ER	1995	8	4	23	27	59	1	N??	
WI63	GR	1995	8	4	23	29	1	1	55109	WI
WI63	ER	1995	8	4	23	29	1	1	N??	
WI63	GR	1995	8	4	23	31	23	1	H600	
WI63	ER	1995	8	4	23	31	23	1	N??	
WI63	GR	1995	8	4	23	31	33	1	P123612	IL
WI63	ER	1995	8	4	23	31	33	1	N??	
WI63	BR	1995	8	4	23	31	50	1	No Plate	
WI63	GR	1995	8	4	23	32	7	1	75835	WI
WI63	ER	1995	8	4	23	32	7	1	N??	
WI63	GR	1995	8	4	23	33	5	1	NY50	
WI63	ER	1995	8	4	23	33	5	1	N??	
WI63	GR	1995	8	4	23	35	9	1	3RYX	
WI63	ER	1995	8	4	23	35	9	1	N??	
WI63	GR	1995	8	4	23	36	26	1	58638	WI
WI63	ER	1995	8	4	23	36	26	1	N??	
WI63	GR	1995	8	4	23	36	35	1	PRC7413	MN
WI63	ER	1995	8	4	23	36	35	1	N??	
WI63	GR	1995	8	4	23	36	46	1	39508	WI
WI63	ER	1995	8	4	23	36	46	1	NO?	
WI63	BR	1995	8	4	23	37	45	1	No Plate	
WI63	BR	1995	8	4	23	37	57	1	No Plate	
WI63	BR	1995	8	4	23	38	41	1	No Plate	
WI63	GR	1995	8	4	23	41	44	1	YXY4	
WI63	ER	1995	8	4	23	41	44	1	N??	
WI63	GR	1995	8	4	23	42	46	1	P94291	IL
WI63	ER	1995	8	4	23	42	46	1	N??	
WI63	GR	1995	8	4	23	46	0	1	AA141	WI
WI63	ER	1995	8	4	23	46	0	1	N??	
WI63	GR	1995	8	4	23	46	48	1	A143	
WI63	ER	1995	8	4	23	46	48	1	N??	
WI63	GR	1995	8	4	23	47	44	1	71F3	
WI63	ER	1995	8	4	23	47	44	1	N??	
WI63	GR	1995	8	4	23	48	21	1	PRF7746	MN
WI63	ER	1995	8	4	23	48	21	1	N??	

Code Definition for MOOSE Alarm Codes

Character 1. Alarm byte

N = no alarm

1 = alarm type 1

Character 2. Vehicle byte:

C = a clean level 1 (complete), level 5 (vehicle only), or reinspection has happened within the last 90 days. ((‘C” for “clean”: no vehicle defects)

O = same as “c”, but over 90 days ago (“0” for “old”)

B = out of service vehicle defects found on last inspection ("B” for “bad”)

M = Vehicle defects found on last inspection, but none were out of service. ("M" for "Minor")

2 = only contact in last 90 days was a clean level 2 (walk-around) inspection

3 = only contact on file is a level 3 (driver only) inspection

? = no contact on file with a vehicle with this plate

Character 3. Driver byte:

C = a clean level 1,2,3 or reinspection within the last 4 days

B = out of service driver defects found on an inspection within last 4 days

M = drivers defects found on inspection in last 4 days, but none were OOS.

5 = only contact within last 4 days **is** a level 5 inspection

? = no contact within last 4 days with a vehicle with this plate

UTICA SCALE MOOSE LOG DATA SUMMARY

MONTH	JUN 1995	JUL 1995	AUG 1995	SEP 1995	OCT 1995	NOV 1995	DEC 1995	JAN 1996	FEB 1996	MAR 1996	APR 1996	MAY 1996	JUN 1996	JUL 1996	AUG 1996	SEP 1996	TOTAL
DAYS IN OPERATION	6	12	22	19	7	0	0	0	4	12	19	20	19	23	12	14	189
BAD READ (BR)*	1643	9623	2030	3949	2175	0	0	0	1358	658	1374	1406	1251	1874	1310	3473	32124
(% OF ATTEMPTED READS)	45.97	88.94	46.53	59.05	49.07	0.00	0.00	0.00	81.81	32.08	30.84	29.97	31.30	36.84	30.22	62.44	52.05
*NO PLATE OR CANNOT DECODE LICENSE PLATE CHARACTERS																	
GOOD READ (GR)	1931	1197	2333	2739	2257	0	0	0	302	1393	3081	3286	2746	3213	3025	2089	29592
(% OF ATTEMPTED READS)	54.03	11.06	53.47	40.95	50.93	0.00	0.00	0.00	18.19	67.92	69.16	70.03	68.70	63.16	69.78	37.56	47.95
ATTEMPTED READS (BR+GR)	3574	10820	4363	6688	4432	0	0	0	1660	2051	4455	4692	3997	5087	4335	5562	61716
NO PLATES FROM BR	1438	9517	1953	3837	2163	0	0	0	1352	626	1309	1309	1180	1775	1222	3425	31106
EVALUATION RESULTS (ER)	0	871	2332	2739	2257	0	0	0	298	1202	3035	3276	2746	3213	3026	2090	27085
VEHICLE VIOLATIONS (FROM ER)																	
1B? (ALARM)		2	31	27	3					2	7	10	4	3			89
NC?		1	20	20	1				1	3	14	15	10	1			86
NO?		3	11	22	4						3	10	16	15	23	13	120
NM?		7	32	53	8				2	10	32	41	41	37	50	31	344
N2?			7	8	2					7	25	15	5	6			75
N3?		3	16	32	5				3	5	20	22	30	19	15	13	183
N??		855	2210	2576	2234				292	1174	2925	3154	2640	3132	2936	2033	26161
NB?																	
DRIVER VIOLATIONS (FROM ER)																	
1?B																	0
N?C																	0
N?M																	0
N?5																	0
																	0
VEHICLE/DRIVER VIOLATIONS (FROM ER)																	
1BC (ALARM)			2								1						3
1MB (ALARM)											1	1					2
1BB (ALARM)																	0
13B (ALARM)															2		2
1BM (ALARM)			1														1
12B (ALARM)																	0
1CB (ALARM)											1						1
NMC										1	2	5					8
N3C												1					1
N2C			1								2	1					4
NCC			1	1							2						4
NCM																	0
N2M																	0
N3M																	0
NMM												1					1
																	0
TOTAL OOS ALARM (1XX)	0	2	34	27	3	0	0	0	0	2	10	11	4	3	2	0	98
(%OOS OF GR)	0.00	0.17	1.46	0.99	0.13	0.00	0.00	0.00	0.00	0.14	0.32	0.33	0.15	0.09	0.07	0.00	0.33
(% OOS OF ATTEMPTED READ)	0.00	0.02	0.78	0.40	0.07	0.00	0.00	0.00	0.00	0.10	0.22	0.23	0.10	0.06	0.05	0.00	0.16

TOMAH SCALE MOOSE LOG DATA SUMMARY

MONTH	1995 JUN	JUL	AUG	SEP	OCT	NOV	DEC	1996 JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN OPERATION	9	21	17	17	18	23	12	14	26	17	12	24	23	31	16	33	313
BAD READ (BR)*	410	2023	803	1259	1943	2689	717	1264	10852	3395	467	2743	3693	6081	2570	1325	42234
(% OF ATTEMPTED READS)	37.10	40.70	30.73	30.38	33.41	33.89	33.27	57.82	72.27	58.83	30.70	38.95	47.73	61.60	42.30	43.39	48.54
*NO PLATE OR CANNOT DECODE LICENSE PLATE CHARACTERS																	
GOOD READ (GR)	695	2948	1810	2885	3872	5246	1438	922	4163	2376	1054	4299	4045	3790	3505	1729	44777
(% OF ATTEMPTED READS)	62.90	59.30	69.27	69.62	66.59	66.11	66.73	42.18	27.73	41.17	69.30	61.05	52.27	38.40	57.70	56.61	51.46
ATTEMPTED READS (BR+GR)	1105	4971	2613	4144	5815	7935	2155	2186	15015	5771	1521	7042	7738	9871	6075	3054	87011
NO PLATES FROM BR	394	1898	736	1139	1816	2488	652	1195	10700	3318	436	2621	3583	5955	2435	1264	40630
EVALUATION RESULTS (ER)	0	1792	1809	2885	3873	5246	1438	887	4066	2156	997	4298	4045	3790	3505	1729	42516
VEHICLE VIOLATIONS (FROM ER)																	
1B? (ALARM)		13	13	15	44	1	1		1	2		3	12	5	8	3	121
NC?		13	12	14	19	3	2	3	7	10	5	12	19	29	21	8	177
NO?		5	11	19	42	1					2	16	15	17	17	7	152
NM?		28	39	65	97	10	3	3	14	13	6	37	43	49	70	30	507
N2?		3	9	13	16	2	1	2	13	7	4	13	9	7	10	1	110
N3?		9	15	39	53	1	2	1	12	8	2	35	52	36	45	22	332
N??		1720	1704	2717	3593	5222	1429	877	4005	2111	972	4167	3881	3640	3319	1655	41012
NB?																	0
1?? (FALSE ALARM)											1						1
DRIVER VIOLATIONS (FROM ER)																	
1?B																	0
N?C																	0
N?M																	0
N?5																	0
VEHICLE/DRIVER VIOLATIONS (FROM ER)																	
1BC (ALARM)				1	1							1	3		4	1	11
1MB (ALARM)			1		1	1			3			1			1		8
1BB (ALARM)				1	1					1	1		1				5
13B (ALARM)					1							1	1	1			4
1BM (ALARM)			1						1			1	1	1			5
12B (ALARM)						1							2				3
1CB (ALARM)																1	1
NMC			1		3				3		2	2	2	2	4		19
N3C										1							1
N2C									1			3			1		5
NCC		1	1		1				1	1		2	1		2		10
NCM			1					1			1		1	1			5
N2M									2	1		1			1		5
N3M			1			3			1	1		3	1	1			11
NMM				1	1	1			2		1		1	1	2	1	11
																	0
TOTAL OOS ALARM (1XX)	0	13	15	17	48	3	1	0	5	3	2	7	20	7	13	5	159
(%OOS OF GR)	0.00	0.44	0.83	0.59	1.24	0.00	0.00	0.00	0.12	0.13	0.19	0.16	0.49	0.18	0.37	0.29	0.36
(% OOS OF ATTEMPTED READ)	0.00	0.26	0.57	0.41	0.83	0.00	0.00	0.00	0.03	0.05	0.13	0.10	0.26	0.07	0.21	0.16	0.18

RUSK SCALE MOOSE LOG DATA SUMMARY

	1995									1996						
MONTH	JUN/JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN OPERATION	14	15	21	24	22	22	9	10	20	18	22	25	22	13	13	270
BAD READ (BR)*	2740	3928	4919	7949	8727	924	924	2286	7614	3151	7160	6867	5979	2993	3690	69851
(% OF ATTEMPTED READS)	75.67	23.22	24.50	27.71	25.25	6.13	48.35	33.21	38.12	25.83	20.90	21.77	21.12	22.80	21.38	24.56
*NO PLATE OR CANNOT DECODE LICENSE PLATE CHARACTERS																
GOOD READ (GR)	881	12990	15155	20736	25838	14153	987	4597	12359	9048	27104	24670	22337	10132	13567	214554
(% OF ATTEMPTED READS)	24.33	76.78	75.50	72.29	74.75	93.87	51.65	66.79	61.88	74.17	79.10	78.23	78.88	77.20	78.62	75.44
ATTEMPTED READS (BR+GR)	3621	16918	20074	28685	34565	15077	1911	6883	19973	12199	34264	31537	28316	13125	17257	284405
NO PLATES FROM BR	2700	3502	4379	7311	7879	5515	878	2124	7171	2862	6494	6151	5377	2686	3295	68324
EVALUATION RESULTS (ER)	0	13000	15180	20770	25880	14179	403	4597	12359	7835	27097	24662	22339	10136	13567	212004
VEHICLE VIOLATIONS (FROM ER)																
1B? (ALARM)		104	111	179	247	141	1	1	5	10	41	57	41	17	39	994
NC?		167	139	120	178	73	1	11	48	40	151	187	204	94	109	1522
NO?		120	183	278	393	240	1		3	5	70	111	127	77	109	1717
NM?		274	437	590	806	422	4	31	91	93	465	505	464	248	379	4809
N2?		55	66	85	141	67	4	17	77	56	205	150	119	33	43	1118
N3?		147	190	283	393	267	2	14	69	52	303	300	306	154	209	2689
N??		12100	14025	19185	23672	12949	390	4498	12024	7532	25724	23273	20998	9483	12644	198497
NB?																0
13? (FALSE ALARM)											1					1
DRIVER VIOLATIONS (FROM ER)																
1?B														2		2
N?C																0
N?M																0
N?5																0
VEHICLE/DRIVER VIOLATIONS (FROM ER)																
1BC (ALARM)		5	2	3		2		4	1	1	12	5	8	3	2	48
1MB (ALARM)		1		1	2			1		2	7	1	3	1	2	21
1BB (ALARM)					2			1	1	1	2	1	1			9
13B (ALARM)			1	1		1		2	1	3	3	2	3	1	1	19
1BM (ALARM)			1	2				1	1	1	1	2		3		12
12B (ALARM)			1	1	4				2	3	1	3			1	16
1CB (ALARM)				1	1				1		7	5	4		2	21
1OB (ALARM)														3	5	8
N5C														2		2
NMC		13	7	12	20	6		9	10	10	37	19	9	5	10	167
N3C		1	3	2	3			2	3	5	9	4	6			38
N2C		2		2	2	2			6	5	10	3	6	1	1	40
NCC		5	3	10	7	1		3	6	6	22	16	18	4	4	105
NCM		2		1	2				1	2	6	2	5		1	22
N2M		2		6	1	3		1	4	2	4	2	3		2	30
N3M		2	9	1	4	3			4	6	8	4	5	1	2	49
NMM			2	7	2	2		1	1		8	9	9	4	2	47
NOM												1				
TOTAL OOS ALARM (1XX)	0	110	116	188	258	144	1	10	12	21	75	76	60	28	52	1149
(%OOS OF GR)	0.00	0.85	0.77	0.91	0.00	0.00	0.00	0.22	0.10	0.23	0.28	0.31	0.27	0.28	0.38	0.54
(% OOS OF ATTEMPTED READ)	0.00	0.65	0.58	0.66	0.00	0.00	0.00	0.15	0.06	0.17	0.22	0.24	0.21	0.21	0.30	0.40

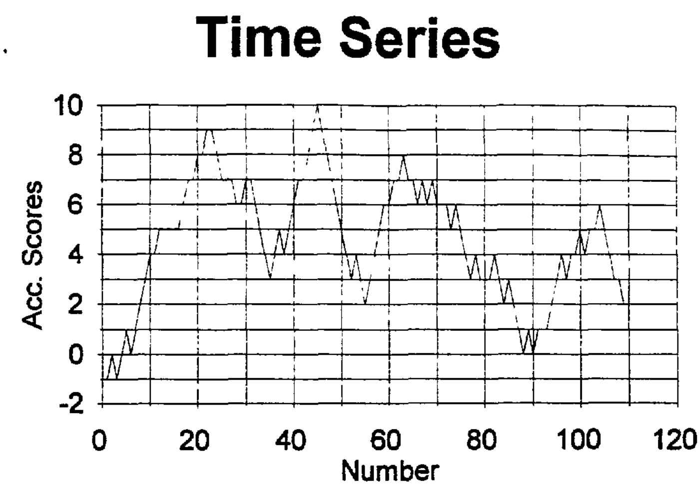
ST. CROIX SCALE MOOSE LOG DATA SUMMARY

	1995								1996								
MONTH	JUN	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
DAYS IN OPERATION	2	3	1	5	7	9	4	2	21	23	20	31	28	31	30	16	233
BAD READ (BR)*	1567	450	112	1092	5937	8673	4164	939	27034	34995	12973	26555	60440	42406	42546	15665	285548
(% OF ATTEMPTED READS)	28.32	27.88	77.78	48.04	82.17	99.98	100.00	100.00	66.52	64.21	36.92	39.63	58.78	45.60	47.72	39.17	51.65
*NO PLATE OR CANNOT DECODE LICENSE PLATE CHARACTERS																	
GOOD READ (GR)	3967	1164	32	1181	1288	2	0	0	13609	19504	22163	40449	42381	50593	46606	24329	267268
(% OF ATTEMPTED READS)	71.68	72.12	22.22	51.96	17.83	0.02	0.00	0.00	33.48	35.79	63.08	60.37	41.22	54.40	52.28	60.83	48.35
ATTEMPTED READS (BR+GR)	5534	1614	144	2273	7225	8675	4164	939	40643	54499	35136	67004	102821	92999	89152	39994	552816
NO PLATES FROM BR	779	223	112	968	5795	8673	4164	939	25221	32159	9056	18024	54529	35303	35656	12175	243776
EVALUATION RESULTS (ER)	3950	1151	32	1182	1289	2	0	0	5579	8878	17405	40446	42380	50593	46606	24329	243822
VEHICLE VIOLATIONS (FROM ER)																	
1B? (ALARM)	4	5		6	5	1			2	10	15	57	59	51	55	60	330
NC?	6	6		10	6				18	34	1811	207	233	342	275	112	3060
NO?				16	20				7	4	14	102	169	233	269	187	1021
NM?				28	32				52	73	192	557	778	965	950	563	4190
N2?				12	4				23	57	102	220	135	188	131	61	933
N3?			1	14	16				39	45	145	475	534	634	642	337	2882
N??	3940	1140	26	1094	1206	1			5413	8625	15053	38651	40348	48078	44104	22950	230629
NB?																	0
1C? (FALSE ALARM)															2		2
DRIVER VIOLATIONS (FROM ER)																	
1?B															1		1
N?C																	0
N?M																	0
N?5																	0
VEHICLE/DRIVER VIOLATIONS (FROM ER)																	
1BC (ALARM)			1						1	2	3	13	1	3	38	3	65
1MB (ALARM)									2		3		6	4	3		18
1BB (ALARM)									1		3	2	3	3	3		15
13B (ALARM)			2						1		2	6	4	8	6	1	30
1BM (ALARM)											3	5	4		8	1	21
12B (ALARM)										2	7	3	7	1	6	1	27
1CB (ALARM)										1	1	12	14	9	1		38
1OB (ALARM)														2	7	2	11
N5C																	0
NMC				2					4	10	10	39	28	16	47	22	178
N3C									2	2	4	18	4	7	8		45
N2C									5	7	11	14	5	9	5	7	63
NCC			2						4	3	6	20	13	17	14	11	90
NCM										1	4	10	10	1	5	3	34
N2M									1	2	3	4	5	3	5		23
N3M									1		7	20	7	8	6	2	51
NMM									3		6	11	13	11	15	6	65
NOM																	
TOTAL OOS ALARM (1XX)	4		3	6	5	1	0	0	7	15	37	98	98	81	129	68	552
(%OOS OF GR)	0.10		9.38	0.51	0.39	0.00	0.00	0.00	0.05	0.08	0.17	0.24	0.23	0.16	0.28	0.28	0.21
(% OOS OF ATTEMPTED READ)	0.07		2.08	0.26	0.07	0.00	0.00	0.00	0.02	0.03	0.11	0.15	0.10	0.09	0.14	0.17	0.10

Manual Verification of Scanner Results Based on Videotape of the Scanner Output

UTICA 8/28/96

NO	Actual	Scanner	Scores	Acc.
1	6142HZ	N	-1	-1
2	58234	S	1	0
3	AA751R	751R	-1	-1
4	P60812	S	1	0
5	59202	S	1	1
6	NJF666	1JF666	-1	0
7	P211346	S	1	1
8	PL9579	S	1	2
9	P41813	S	1	3
10	P187127	S	1	4
11	N	N	0	4
12	P151611	S	1	5
13	B	N	0	5
14	P	N	0	5
15	P	AA5401	0	5
16	N	V11U	0	5
17	P17744	S	1	6
18	P213833	S	1	7
19	N	N	0	7
20	P227205	S	1	8
21	N	N	0	8
22	P200193	S	1	9
23	N	N	0	9
24	P146724	P146721	-1	8
25	NIA893	1IA893	-1	7
26	P	AA201	0	7
27	N	N	0	7
28	P9517	AA9517	-1	6
29	M	N	0	6
30	P33098	S	1	7
31	N	N	0	7
32	P50968	5088	-1	6
33	5371HZ	5111	-1	5
34	NP5510	1PS510	-1	4
35	NPU838	1PU838	-1	3
36	P15660	S	1	4
37	P136331	S	1	5
38	PRG4184	F4KR4	-1	4
39	P70901	S	1	5
40	68812	S	1	6
41	76830	S	1	7
42	N	H1CA	0	7
43	56846	S	1	8
44	LE6930	S	1	9
45	59353	S	1	10
46	P152302	P152342	-1	9
47	P72559	P7115	-1	8
48	4398AT	4398	-1	7
49	P5W68W	HCUW	-1	6
50	P5L85Q	54052	-1	5
51	4540	AA4540	-1	4
52	40402	N	-1	3
53	44692	S	1	4
54	6589	AA6589	-1	3
55	R957HV	N	-1	2



Summary

	Number	%	
Total Attempted Reads	110	100.00	
No Physical Plates / "Bad Read"	26	23.64	
		% of Total	% of Read
Read by Scanner / "Good Read"	84	76.36	100.00
Read by Scanner but Invalid Read	41	37.27	48.81
Valid Read	43	39.09	51.19

State	Read by Scanner	Valid Read	%
WI	16	13	81.25
IL	35	24	68.57
MN	10	1	10.00

Socre: Meaning

0 No legible plate or have multiple plates
-1 Invalid read or no read (if there is a legible plate)
1 Valid read (if there is a legible plate)

Abbreviation:

B: Bad license plates
M: Multiple license plates
N: No license plate
P: Partial plate
S: Successful read (that is, valid read)

56	P187376	S	1	3
57	PJ5489	S	1	4
58	PI24234	S	1	5
59	P229224	s	1	6
60	N	N	0	6
61	PRG1501	S	1	7
62	N	N	0	7
63	P214228	S	1	8
64	NFY086	IFY086	-1	7
65	N	N	0	7
66	M4208	4208	-1	6
67	47283	S	1	7
68	PRF9632	PRYL?l	-1	6
69	74524	S	1	7
70	PRG5669	PRG5642	-1	6
71	N	N	0	6
72	N	N	0	6
73	69049	N	-1	5
74	1HA811	S	1	6
75	8104AX	81040	-1	5
76	PRJ7007	11F1	-1	4
77	PRJ1930	N	-1	3
78	P215763	S	1	4
79	PRJ3347	6F15	-1	3
80	P	21495	0	3
81	B	N	0	3
82	PRG7221	S	1	4
83	904974	90494	-1	3
84	P19722	Y 19722	-1	2
85	P70330	S	1	3
86	PRJ7497	K111	-1	2
87	PI07771	P107772	-1	1
88	P148672	N	-1	0
89	77405	s	1	1
90	63646	41C7	-1	0
91	74462	S	1	1
92	M	AA148	0	1
93	M	Y199	0	1
94	69971	S	1	2
95	P185877	S	1	3
96	P179273	S	1	4
97	AB51271	AB5127	-1	3
98	P166809	S	1	4
99	P	RH57	0	4
100	P209548	S	1	5
101	P29426	00?0	-1	4
102	P29684	S	1	5
103	B	N	0	5
104	67811	S	1	6
105	P27350	P27354	-1	5
106	PRJ2383	N	-1	4
107	P31664	64FI	-1	3
108	P	N	0	3
109	AR46620	46620	-1	2
110	N	N	0	2

MOOSE Daily Status Report Log Book Form

DAILY Today's Date & Hour Shift Began		Scanner System Working OK? (Yes/No)	SUMMARY Number of OOS Vehicles and Drivers Identified by Scanner During Your Shift		OOS "Hits" License Plate Number Driver/Vehicle			Identify Action Taken on Each "Hit" and Results of Inspections. At End of Shift Please Add Summary Comments and Suggestions
Date	Hour		Vehicles	Drivers	Number	State	D/V	
9-18-95	7AM	YES	1		PL4145/DDE120	IA	V	INSPECTED BRAKES ON TRLR OUT OF ADJUSTMENT
9-18-95	7Am	YES	1		56044/10757	WI	V	DIFFERANT TRAILER, SEE # 173848m.
10-1-95	1Pm	yes						
10-3-95	7:00A	yes	2					
10-3-95	3:00P	yes						
10-17-95	7:00A	yes	0					APPROX. 45% READ CORRECT. WHEN BACKED UP APPROX. 10% CORREC
10/18/95	7:00A	YES			270842/WI	WI	V.	REINSPECTED PLACED OUT OF SERVICE FOR CRACKED FRAME (SAME VIOS. B
10/24/95	3:00P	YES	2	0	63643/WI	WI	V	REINSPECTED PLACED OUT OF SERVICE. A LOT OF SAME VIOS.
10/25/95	7:00A	yes	0	0				
10/26/95	7:00A	YES	2	0	44522/WI	WI	V	REINSP. AND CITED PREVIOUS VIOLATION.
10/27/95	6A	yes	2					ReinsP & OK
10/28/95	6A	yes	1	1	52933/APO	WI	■	VEHICLE VERIFIED AS NO VALID CDL FOR DRIVER / DIFFERENT DRV.
10/28		Y	1	0	P55488	IA	V	RECHECKED O.O.S. VIOLATION.
10/31	7Am	Y	1					
11/20	SITE VISIT — UNIT OPERATIONAL BUT HAS NOT BEEN DOWNLOADING from main Server correctly since Oct 30. 'Download connection active but CECS' Fetched 530 Inspection records this morning — "Download Bypass" "modify the last update timestamp to bypass records"							
11/20	6AM	YES	0	0	→			NO RECORD
11/20	2PM	yes	0	0	→			NO OOS HITS
11/21	6Am	yes	0	0				NO OOS HITS.
11/21	2Pm	yes	0	0			D	from yesterday DRV OK.
11-22	6AM	YES	0	0				
11-22	2Pm	NO						NO ENTRIES SHOWING UP ON SCREEN
11-27	3pm	NO	0	0				SNOW DAY. FRONT OF UNITS COVERED.
11-27	3pm	YES	0	?				No ENTRIES
11-28	7:00A	"	0	0				

Utica Scale Video Analyses

	9/29/95	3/17/96	5/3/96	6/28/96	7/25/96	8/28/96	9/23/96
Total Attempted Reads	92	65	117	110	107	110	122
No Physical Plates or Bad Plates	40	25	38	32	36	26	21
(% of **Total**)	43.5	38.5	32.5	29.1	33.6	23.6	17.2
Read by Scanner	52	40	79	78	71	84	101
% of **Total**	56.5	61.5	67.5	70.9	66.4	76.4	82.8
Read by Scanner but Bad Read	29	15	37	34	37	41	52
% of **Total**	31.5	23.1	31.6	30.9	34.6	37.3	42.6
% of *Read*	55.8	37.5	46.8	43.6	52.1	48.8	51.5
Good Read	23	25	42	44	34	43	49
% of **Total**	25.0	38.5	35.9	40.0	31.8	39.1	40.2
% of *Read*	48.1	62.5	53.2	56.4	47.9	51.2	48.5
Successful Read Rate by State							
Wisconsin (%)		79.0	89.3	72.7	69.6	81.3	68.8
Illinois (%)		66.7	54.6	60.0	90.0	68.6	73.7
Minnesota (%)		57.1	27.3	16.7	0.0	10.0	23.1

Note: Actual plates, which were videotaped directly from truck traffic, were compared with the plates read by license plate reader for the "9/23/96" data. The rate of "no plate" is lower than those in other columns.

Tomah Scale Video Analyses

	10/19/95	12/15/95	3/15/96	4/23/96	5/23/96	6/28/96 (mobile)	7/25/96	9/16/96
Total Attempted Reads	78	108	97	121	121	90	125	112
No Physical Plates or Bad Plates	22	41	28	52	52	25	22	12
(% of **Total**)	28.2	38.0	28.9	43.0	43.0	27.8	17.6	10.7
Read by Scanner	56	67	69	69	69	65	103	100
% of **Total**	71.8	62.0	71.1	57.0	57.0	72.2	82.4	89.3
Read by Scanner but Bad Read	22	26	25	22	22	26	45	50
% of **Total**	28.2	24.1	25.8	18.2	18.2	28.9	36.0	44.6
% of *Read*	39.3	38.8	36.2	31.9	31.9	40.0	43.7	50.0
Good Read	34	41	44	47	47	39	58	50
% of **Total**	43.6	38.0	45.4	38.8	38.8	43.3	46.4	44.6
% of *Read*	60.7	61.2	63.8	68.1	68.1	60.0	56.3	50.0
Successful Read Rate by State								
Wisconsin (%)	87.0	69.0	83.3	89.7	89.7	70.4	83.9	70.4
Illinois (%)	57.1	50.0	66.7	72.7	72.7	45.5	64.3	60.9
Minnesota (%)	22.2	61.5	50.0	40.0	40.0	40.0	17.7	31.3

Note: Actual plates, which were videotaped directly from truck traffic, were compared with the plates read by license plate reader for the "9/16/96" data. The rate of "no plate" is lower than those in other columns.

Rusk Scale Video Analyses

	10/19/95	3/15/96	4/23/96	5/23/96	6/28/96	7/25/96	8/28/96	9/16/96
Total Attempted Reads	103	115	112	115	117	121	104	110
No Physical Plates or Bad Plates	23	38	32	27	30	36	20	16
(% of **Total**)	22.3	33.0	28.6	23.48	25.6	29.8	19.2	14.6
Read by Scanner	80	77	80	88	87	85	84	94
% of **Total**	77.7	67.0	71.4	76.5	74.4	70.3	80.8	85.45
Read by Scanner but Bad Read	38	29	35	37	32	36	34	44
% of **Total**	36.9	25.2	31.3	32.2	27.4	29.8	32.7	40.0
% of *Read*	47.5	37.7	43.8	42.1	36.8	42.4	40.5	46.8
Good Read	42	48	45	51	55	49	50	50
% of **Total**	40.8	41.7	40.2	44.4	47	40.5	48.1	45.5
% of *Read*	52.5	62.3	56.3	58.0	63.2	57.7	59.5	53.2
Successful Read Rate by State								
Wisconsin (%)	60.0	94.4	81.0	87.5	84.6	85.0	94.1	85.7
Illinois (%)	50.0	36.7	62.5	64.3	86.7	75.0	86.7	50.0
Minnesota(%)	53.3	45.0	30.8	55.0	31.3	38.1	27.3	14.3

Note: Actual plates, which were videotaped directly from truck traffic, were compared with the plates read by license plate reader for the "9/16/96" data. The rate of "no plate" is lower than those in other columns.

St. Croix Scale Video Analyses

	2/16/96	3/15/96	4/23/96	5/23/96	6/28/96	7/25/96	8/28/96	9/16/96
Total Attempted Reads	124	198	99	105	117	114	119	112
No Physical Plates or Bad Plates	51	50	30	24	32	27	20	6
(% of **Total**)	41.1	25.3	30.3	22.9	27.4	23.7	16.81	5.4
Read by Scanner	73	148	69	81	85	87	99	106
% of **Total**	58.9	76.3	69.7	77.1	72.7	76.3	83.2	94.6
Read by Scanner but Bad Read	35	67	29	28	35	33	53	65
% of **Total**	28.2	33.8	23.3	26.7	29.9	29.0	44.5	58.0
% of *Read*	48.0	45.3	42.0	34.6	41.2	37.9	53.5	61.3
Good Read	38	81	40	53	50	54	46	41
% of **Total**	30.7	40.9	40.4	50.5	42.7	47.4	38.7	36.6
% of *Read*	52.1	54.7	58.0	65.4	58.9	62.1	46.5	36.7
Successful Read Rate by State								
Wisconsin (%)	62.5	64.0	70.6	72.7	79.2	100.0	75.0	65.4
Illinois (%)	57.1	52.4	50.0	66.7	76.9	87.5	33.3	70.0
Minnesota (%)	45.8	61.8	54.2	73.3	42.3	62.1	52.4	32.4

Note: Actual plates, which were videotaped directly from truck traffic, were compared with the plates read by license plate reader for the "9116196" data. The rate of "no plate " is lower than those in other columns.