SCHODACK SMART ROADSIDE INSPECTION SYSTEM

Final Report

Prepared for

THE NEW YORK STATE
ENERGY RESEARCH AND DEVELOPMENT AUTHORITY

AND

THE NEW YORK STATE
DEPARTMENT OF TRANSPORTATION

Albany, NY

Joe Tario, NYSERDA
Rick McDonough, NYSDOT
Program Managers

Prepared by

INTELLIGENT IMAGING SYSTEMS, INC.

4518 - 101 Street
Edmonton, AB T6E5G9

Abdul S. Hamadeh
Project Manager

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16. Abstract
Under an earlier NYSERDA Agreement (17420) Intelligent Imaging Systems (IIS) supplied and installed Smart Roadside network software and integrated new “connected vehicle” roadside devices into the Schodack Smart Roadside system. The Smart Roadside Inspection System (SRIS) Enterprise software platform was integrated with New York State DOT’s existing backend information systems including the NYS Commercial Vehicle Information Exchange Window (CVIEW) and NYS’ Connected Vehicle / Commercial Vehicle Infrastructure Integration (CVII) Program. The added roadside devices included an automated U.S. Department of Transportation (USDOT) Number reader (AUR), and an Overview Camera System (OVC) at the NYSDOT Schodack Commercial Vehicle (CV) electronic screening (e-screening) site. The initial existing NYSDOT inspection systems included Weigh-In-Motion (WIM), Automated License Plate Recognition (ALPR), 915 MHz North American Preclearance and Safety System (NORPASS) and 5.9 GHz dedicated short range communication (DSCR) as part of Automated Vehicle Identification (AVI) and legacy software components system. Under this NYSERDA Agreement IIS added trailer/rear ALPR, vehicle Overheight Detection (OHD), and a Hazardous Material placard reader (HAZMAT) to the existing suite of e-screening tools. Enforcement personnel, utilizing the automated mainline electronic screening system, are now automatically and in real-time identifying and providing notifications on vehicles.

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GLOSSARY OF TERMS

Abbreviation	Definition
ALPR	Automated License Plate Reader
AUR	Automated USDOT number Reader
AVI	Automated Vehicle Identification
CO_2	Carbon Dioxide
CV	commercial vehicle
CVIEW	Commercial Vehicle Information Exchange Window
CVII	Commercial Vehicle Infrastructure Integration
CVO	commercial vehicle operations
CVSA	Commercial Vehicle Safety Alliance
dB	decibel
DSRC	Dedicated Short Range Communication
FMCSA	The Federal Motor Carrier Safety Administration
FOV	Field of View
fps	frames per second
GHz	GigaHertz
HAZMAT	Hazardous Material placard reader
HC	Hydro-Carbons
hr	hour
HUT	Highway Use Tax
Hz	Hertz
IIS	Intelligent Imaging Systems
IP	internet protocol
IR	Infrared
IRD	International Road Dynamics
IT	Information Technology
JPEG	Joint Photographic Experts Group
LP	License Plate
LPR	license plate reader
MCO	MCO
mph	miles per hour
ms	millisecond
NORPASS	North American Preclearance and Safety System
NOx	Nitrogen Oxides
NYS	New York State
NYSDOT	New York State Department of Transportation
NYSERDA	New York State Energy Research and Development Authority
OCR	Optical Character Reader
OHD	vehicle Overheight Detection
OOS	Out of Service
OS/OW	Oversize/Overweight
OSCAR	One Stop Credentialing and Registration
OVC	Overview Camera
PON	Program Opportunity Notice
RWIS	Road Weather Information Station
SAFER	Safety And Fitness Electronic Records
SQL	Structured Query Language
SRIS	Smart Roadside Inspection System
UN	US Department of Transport Numbers
US	United States (of America)
USDOT	U.S. Department of Transport
WIM	Weigh In Motion

SUMMARY

The volume increase of commercial vehicles (CV) on the roads along with the application of non-technology based screening methods are the main contributing factors in preventing the CV enforcement sector from effectively improving the road safety, CVs' compliance levels with regulations, security, the environment, flow of goods, environmental and enforcement resources, and operational efficiency at the inspection points. By utilizing smart/"electronic screening (e-screening)" methods, enforcement can focus their limited resources on high-risk CVs in real time for inspection.

To achieve this improved inspection efficiency, Intelligent Imaging Systems (IIS), under an earlier NYSERDA Agreement (17420), successfully supplied and installed the Smart Roadside electronic screening software "network" platform, an automated U.S. Department of Transportation (USDOT) Number reader (AUR), and an Overview Camera System (OVC) at the existing Schodack, NY e-screening inspection site. Also, IIS has integrated the new software and new and existing roadside devices at the existing New York State Department of Transportation (NYSDOT) inspection system. The existing Schodack system included weigh in motion (WIM), automated license plate recognition (ALPR), automated vehicle 915 MHz and 5.9GHz dedicated short range communication (DSRC) identification (AVI), NYS' Commercial Vehicle Information Exchange Window (CVIEW) database, and software components. The SRIS software platform (server and software) has been installed in the NYSDOT main office and integrated with the existing NYSDOT central network, including the NYS backend commercial vehicle databases, NYS CVIEW and One Stop Credentialing and Registration (OSCAR). The network software allows full operational and informational integration of existing and added screening sites. Under this NYSERDA Agreement, IIS has successfully supplied, installed, and integrated a trailer/rear ALPR and vehicle Overheight Detection system (OHD). Also, IIS performed a USDOT reader upgrade to include a Hazardous Material placard reader (HAZMAT) and Smart Roadside Station service upgrade to include the new equipment. The system can generate real time alerts with regards to a particular violation by CV being electronically screened. The SRIS replaced the legacy software which was not network compatible. The NYS backend commercial vehicle databases, NYS CVIEW and One Stop Credentialing and Registration (OSCAR) have all been integrated into a smart roadside inspection system (SRIS) platform in order to be queried for the SRIS to generate real time alerts with regards to a particular violation by the CV being electronically screened.

The IIS installation at Schodack took approximately 4 months from start to finish in all its stages and is considered to be the second of a two phase implementation. Findings from the complete deployment will assist law/transportation enforcement agencies to improve their operational performance by optimizing their existing inspection resources. Focusing enforcement efforts on high risk vehicles changes the screening model from quantity to quality. The benefits generated are substantial for all the stakeholders.

This final report details the critical aspects of the effort exerted into the realization of this project.

Section I
INTRODUCTION

In response to a Program Opportunity Notice (PON 1554) by the New York State Energy Research and Development Authority (NYSERDA) in 2009, Intelligent Imaging Systems submitted a project proposal to upgrade and improve the existing NYS e-screening program for commercial vehicles. The IIS response was selected under a competitive process and was awarded funds in the spring of 2010.

I.I. BACKGROUND

New York State's transportation sector in 2007 was responsible for 37% of greenhouse gas production and 71% of petroleum use, the single largest sector in either category. It is the policy of New York State that transportation goals for mobility, safety and the economy be viewed in conjunction with goals for energy use and environmental protection and enhancement. The transportation system has a major effect on energy use and the environment, making it important to take all reasonable measures to reduce fossil fuel consumption, increase energy efficiency and lower greenhouse gas production. New York State is fortunate to have the most energy-efficient transportation sector in the United States with energy consumption of roughly two-thirds that of the national average.

CV traffic volumes and traditional screening methods are straining law enforcement resources in their continued efforts to improve highway safety and the flow of commerce. A sole focus on increasing the number of random inspections to match the growth rate of CV traffic is not sustainable. The current methodology of forcing vehicles to stop at a weigh station/inspection site, regardless of compliance level, is very inefficient with increased costs to the operator, increased fuel use, increased emissions, and places tremendous pressure on law enforcement resources.

Voluntary CV preclearance programs such as NORPASS (North American Preclearance and Safety System) that use onboard AVI technologies, another method for identification of CVs at the roadside, are extremely limited in their application and deployment due to low participation rates ranging from 10% to 15% of all truck population. The Federal Motor Carrier Safety Administration (FMCSA) statistics show that just under 3.5 million roadside inspections were performed in the US in 2008[1] and there is now a wide consensus that the focus for participating agencies should be to no longer increase the number of inspections carried out, a quantity constrained by existing resources, but to increase the percentage of non-compliant vehicles stopped for inspection.

[1] Source: FMCSA A&I Online national statistics for roadside inspections

I.II. PROJECT BASICS

Automated mainline e-screening of CVs allows enforcement personnel to identify those trucks and carriers in compliance by allowing the agency to set notifications based on the information from data sources. This is achieved in SRIS by decoding the license plate and USDOT number and using these decodes to query State and Federal databases. This project is using the following data sources:

- FMCSA's SAFER (Safety and Fitness Electronic Records) system
- FMCSA's PRISM (Performance and Registration Information Systems) program
- NYS Tax and Finance's HUT (Highway Use Tax) credentials database
- NYSDOT's OS/OW (Oversize/Overweight) permits database

The NYSDOT has determined the definition, types and priority of the notifications. Notifications can indicate outstanding fines, existing Out of Service (OOS), legal issues with taxes, licenses and permits, and other categories. The initial deployment of SRIS contains the following notifications (the notifications can be modified, deleted and added).

SAFER and PRISM	HUT	OS/OW	
MCSIP – Carrier out of Service	HUT – No permit found	Overweight & has no DivLoad nor SpecHaul permit with this axle count	Overweight & SpecHaul permit matrix alert
MCSIP – Vehicle out of Service	VIN mismatch between HUT & SAFER	Overweight & has DivLoad permit for right number of axles & GVW > permit weight	Overweight & invalid permit
ISS – Inspection Suggested	No GVW & no T99 permit	Overweight & has single trip SpecHaul permit for right number of axles but GVW > permit weight	Has single trip SpecHaul permit for right number of axles but WiM spacing between 1st to last axles > OVERALL_WHEEL_BASE
ISS – Inspection Recommended	GVW > 18000 & no T99 permit	Overweight & has annual SpecHaul permit for right number of axles but GVW > permit weight	Has annual SpecHaul permit for right number of axles but WiM spacing between 1st to last axles > OVERALL_WHEEL_BASE
IFTA – Violation	GVW > permit weight	Overweight & has single trip SpecHaul permit for right number of axles but axle weight > permit weight for that axle	Valid Single SpecHaul permit
Registration - Violation	GVW > 4000 & no permit & vehicle class = (tractor w/ no trailer)	Overweight & has annual SpecHaul permit for right number of axles but axle weight > permit weight for that axle	Valid Annual SpecHaul permit
Unidentified Vehicle		Overweight & annual DivLoad permit matrix alert	Valid DivLoad permit

Table 1: Nature of Alerts

Section II
PROJECT OBJECTIVES

The objective of this project phase is to enhance the existing Schodack SRIS site by adding trailer/rear ALPR, vehicle OHD, and a HAZMAT placard reader to the existing suite of e-screening tools.

Currently, there is a pole and gantry extending over the right hand lane of the highway, which supports the 5.9 GHz DSRC (Dedicated Short Range Communications) equipment and the transceiver that communicates with transponders in vehicles. Also attached to this pole, is an ALPR Camera, an AUR Camera, an Overview Camera and some Automated Vehicle Identification equipment (AVI). Off to the side of the highway there is road side equipment cabinet for the DSRC equipment. In the highway asphalt there is a WIM scale.

Section III
PROJECT SCOPE

All activities were performed at the commercial vehicle e-screening inspection station located along westbound I-90 at Schodack, NY.

REQUIREMENTS	DELIVERED
Implemented all relevant/required civil work	Completed
Updated USDOT AUR to HAZMAT	Completed
Installed a trailer/rear ALPR	Completed
Installed OHD	Completed
Upgraded central software service to include Smart Status Dashboard	Completed
Provided data generated which will assist law/transportation enforcement agencies to better their operational performance by optimizing their existing inspection resources	Completed
Provided data to support the increase of road safety and cost effectiveness performance matrices as well	Completed

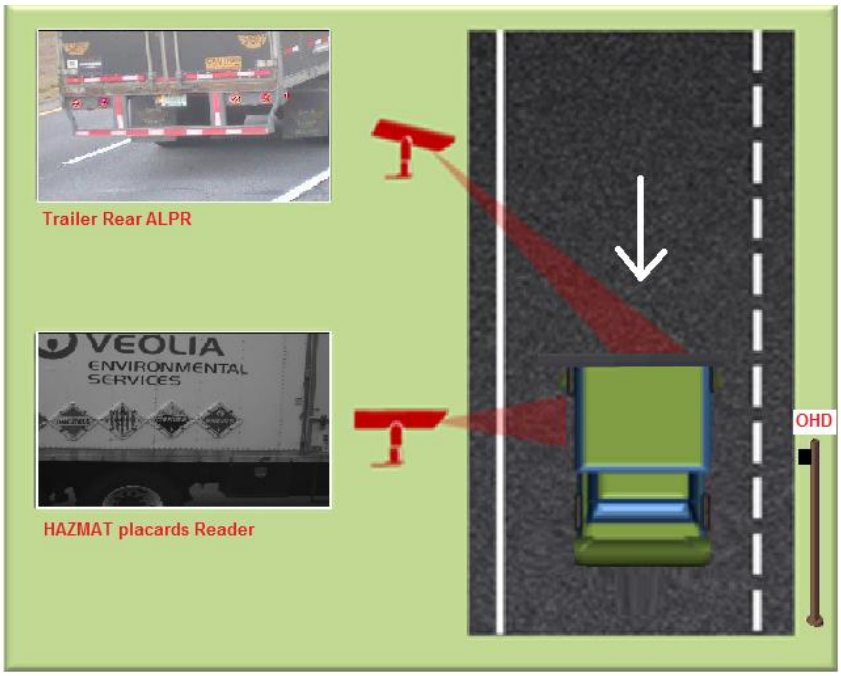

Figure 1. ALPR, HAZMAT, and OHD sensors

Section IV
PROJECT SCHEDULE

TASK NAME	DATE COMPLETED
Schodack Phase 2 Complete Installation	
Project Start and Planning	08/08/11
Implementation Study	05/09/11
Implementation	
Site Drawings	14/11/11
System Architecture	12/08/11
System Hardware	12/12/11
Construction and Installation	15/05/12
System Configuration and Test	22/08/12
Commissioning	26/10/12
Training	Not Determined

Section V
CONCEPT OF OPERATION

At Schodack, the SRIS uses multiple sensors positioned along the roadway for automated collection of data from passing CVs to assist enforcement during roadside safety inspections. The CV's identity is initially captured by detection of the 915 MHz or 5.9 GHz transponders. In addition, front and rear license plate readers obtain the license plates' numbers and a second camera captures the USDOT number from the side of the CV and identifies the HAZMAT placards, if any, as well. The cameras can be used in both daylight and at night. The IR illumination, for night time data capture, is eye safe and does not distract the drivers. An OHD was also added to the installation to detect vehicles that are over the allowed height.

All these data are then matched to each other forming one single vehicle record within the SRIS screening software. The various federal and state databases are then queried with this data to produce alert flags for enforcement operations.

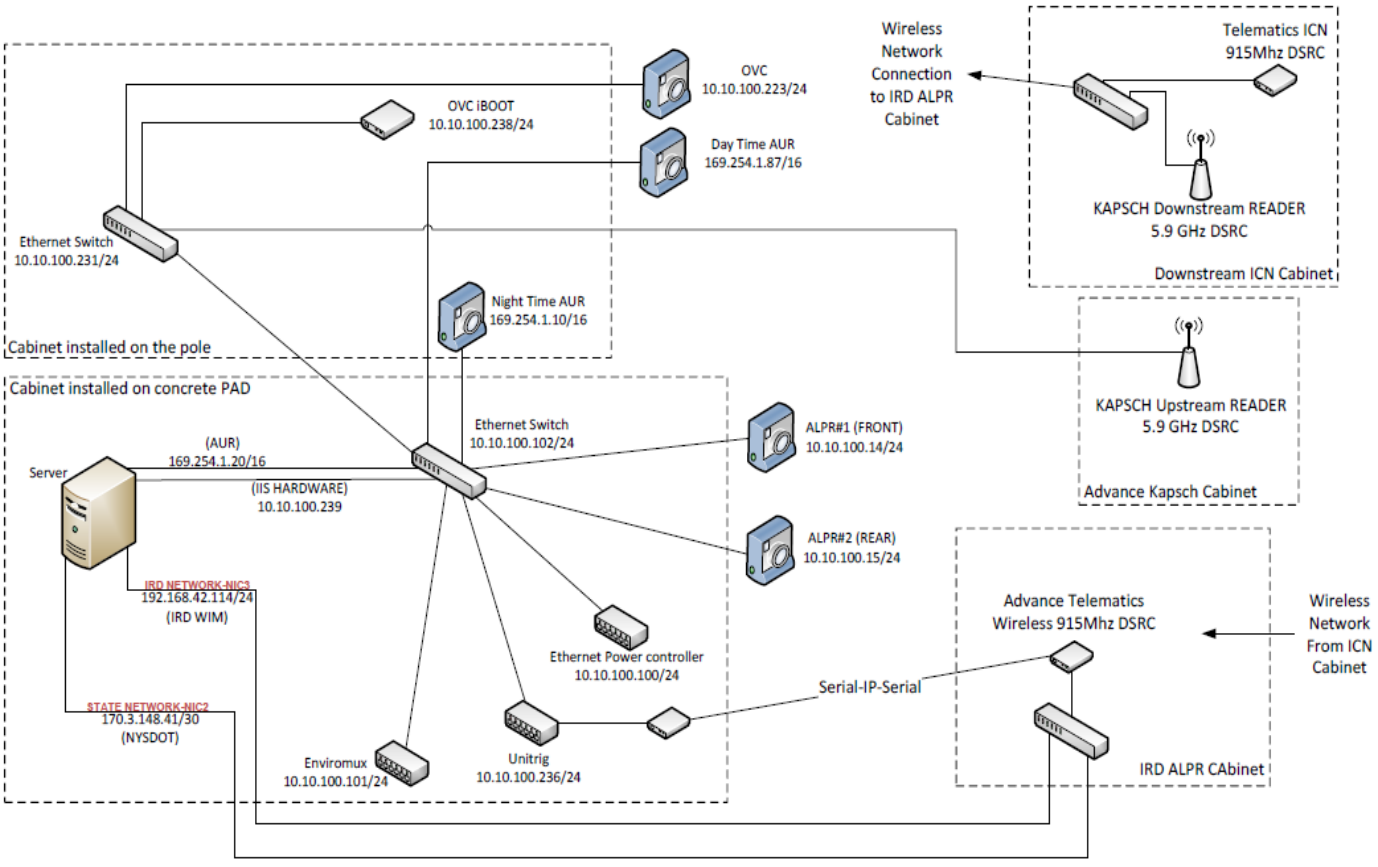

Figure 2: System Architecture and Network Diagram

Section VI
TESTING AND IMPLEMENTATION

VI.I. SOFTWARE

IIS upgraded the SRIS system for NYS to include the HAZMAT placard reader, trailer/rear ALPR, and the OHD. Once all the coding elements were successfully completed, the testing of the components and the system integration was performed. IIS configured the subsystems as per the NYSDOT requirements.

VI.II. HARDWARE

After the hardware had been installed at the site, IIS commenced testing of both the equipment and the software. Testing took place to validate the read rates, decode the accuracy and the time taken to retrieve database information. The testing confirmed that all triggers were accurate and produced matching vehicle data. The testing showed that these data where matched to the correct vehicle.

VI.III. IMPLEMENTATION ISSUES

The reasons for malfunctions were attended to by IIS personnel, diagnosed, and rectified to ensure optimal system operation upon system handover.

THE IMPLEMENTATION ISSUES	
ITEM IN CONCERN	CORRECTIVE ACTION
Upgrade of existing hardware to complete the installation and to allow for better maintenance	Rewired the existing subsystems into the new 2020X roadside cabinet
To be able to recognize HAZMAT placards for both nighttime and daytime	Replaced the existing USDOT AUR with an upgraded model

Section VII
FINDINGS

Data analysis was conducted on the vehicle records. Between December 6, 2012 and December 7, 2012, for the last 10 minutes of every hour, samples of vehicle records were taken during both daytime and nighttime hours. There are a total of 240 vehicles in the dataset. For each vehicle record, the technical performance of the trailer/rear ALPR and AUR/HAZMAT systems were analyzed. The rear ALPR and AUR/HAZMAT data collected to generate the test results in this section can be found in Section XIII.I.

	Read Nature	AUR/HAZMAT Reads	Rear ALPR Reads
Daytime and Nighttime	Correct	169	105
	Incorrect	19	76
	No read	51	59
	Read rate (%)	70.71	43.75
Daytime	Correct	83	56
	Incorrect	10	38
	No read	26	26
	Missing	1	0
	Day rate (%)	69.75	46.67
Nighttime	Correct	86	49
	Incorrect	9	38
	No read	25	33
	Missing	0	0
	Night rate (%)	71.67	40.83

Table 2: AUR/HAZMAT and Trailer/Rear ALPR reads

The OHD was installed as per the manufacturer's recommendations and as per the NYSDOT requirements as well.

Section VIII
BENEFITS AND SAVINGS

This section will summarize the benefits and savings that were outlined in the original proposal. These benefits and savings are still valid as long as enforcement utilizes the SRIS system to identify high risk vehicles.

VIII.I. MOBILITY AND RELIABILITY

Compliant carriers will be able to bypass weigh stations or roadside inspection areas. Also, CVs that are pulled-in will move faster given lower congestion at the weigh station or inspection area. If enforcement personnel have the capacity to inspect 20 vehicles per day, and SRIS is assumed to improve the out-of-service rate from 20% to 90%, then the 70% reduction in needless inspections multiplied by 1 hour per inspection saves the industry 14 hours of travel time per day at a single inspection point. Over one year this works out to 5,110 hours at an hourly trucking rate of $75 or a total travel-time savings of $383,250.

VIII.II. INSPECTOR PRODUCTIVITY AND EFFICIENCY

Substantial NYSDOT economic gains can be produced by the elimination of needless CV inspections. CV inspectors, with the use of SRIS and current resources, will have the capability of placing 90% of the 20 trucks inspected per day Out-Of-Service (OOS). This translates into an annual total of 6,570 trucks placed OOS out of a total of 7,300 trucks inspected. The number of total inspections required to place 6,570 trucks OOS using traditional inspection methods, based on an existing 20% OOS rate, is 32,850. SRIS gains to the agency's efficiency and effectiveness can then be calculated at the 25,550 (32,850-7,300) saved roadside inspections needed to place 6,570 trucks OOS. At an average inspection time of 1 hour and an average agency personnel cost of $45/hr, total agency gains from roadside operations are calculated at $1,149,750.

VIII.III. FUEL CONSUMPTION

Increased energy efficiency for commercial transportation is obtained through reduced fuel use and associated emissions. The time savings of CV travel will create fuel savings. Eliminating the speed changes and the idle time in inspection stations will result in fuel savings for the bypassing CVs, while the reduced waiting time in inspection stations will reduce the fuel usage of the pulled-in CVs.

Fuel savings per bypass CV would be 0.13 gallons in rural areas[2]. Since 14 trucks on average per day are saved from needless inspections (reference Section VIII.I.); 1.85 gallons of fuel savings per day, per vehicle are achieved by allowing those vehicles to bypass the inspection station. At a fuel cost of $2.50/gallon, this translates into an annual bypass savings of 2,555 gallons or $6,387.50.

Fuel savings from eliminating the 25,550 roadside inspections required to meet the above-estimated SRIS performance levels using traditional screening methods is calculated by multiplying 1 hour per saved inspection by 1 gallon per hour fuel consumption for an annual total of 25,550 saved gallons. At $2.50 per gallon, this translates to $89,425 of fuel consumption savings from avoided needless inspections.

VIII.IV. GREENHOUSE EMISSIONS

The average time for performing needless Commercial Vehicle Safety Alliance (CVSA) Level 1 inspections on compliant CVs has a huge impact on not only CV fuel costs, but also on the environment as inspections can take upwards of one hour each. The emissions of CVs include air pollutants and greenhouse gases. Carbon Dioxide (CO2), Nitrogen Oxides (NOx) and Hydro-Carbons (HC) are the major air pollutants released by CVs. Their emission factors are 129.08 grams/hr., 106.00 grams/hr., and 21.88 grams/hr. respectively. Multiplying the above-calculated total 25,550 saved needless inspection hours by a combined emissions level of 256.96 grams/hr. produces a total annual emission savings from enforcement effectiveness of 6.57 metric tonnes. Considering air pollution unit costs for the different pollutants (i.e. HC $13,188 per tonne in rural areas) reduced annual emissions can be estimated at $86,645.

VIII.V. ROAD SAFETY AND ENFORCEMENT EFFECTIVENESS

General public benefits from safer streets and highways are gained as SRIS targets only high-risk vehicles. A 2008 FMCSA study on e-screening systems made reference to a 600% improvement in crash avoidance, and an 800% reduction in fatalities, when compared to traditional screening methods.

[2] 2008 UBC BITSAF report

VIII.VI. OTHERS

- Improved quantity and quality of data reporting from existing infrastructure for both commercial vehicles and general traffic.
- High profile safety program for law enforcement agencies.
- Increased general public awareness of enforcement efforts.
- Increased exposure to new uses of known technology.
- Increased multi-agency collaboration.
- Increased inspector satisfaction.

VIII.VII. SUMMARY OF THE COST SAVING BENEFITS

The values listed below represent the dollar value saved by utilizing a single SRIS supported Inspection Location / Site in a single year.

Mobility and Reliability	$ 383,250
Inspector Productivity and Efficiency	$1,149,750
Greenhouse Emissions	$ 86,645
Fuel Consumption	$ 89,425
TOTAL	**$1,709,070 US**

Table 3: Summary of Cost Savings Benefits

Section IX
ARCHIVING

It is NYSDOT's requirement that data is not archived. Vehicle records are kept indefinitely; however, for privacy reasons vehicle images are deleted after 120 days. The duration that vehicle images are kept is configurable and can be adjusted by New York State according to the capacity of the storage systems.

Section X
SECURITY ACCESS

Access to the network is controlled by the NYSDOT IT department and thus, follows the rules of NYSDOT IT.

User access to the SRIS system is secured by a password established by NYSDOT administrators and staff. Password security is only as good as the password, and as such IIS recommends using password containing both alpha and numeric, upper and lower case and special characters (e.g. those accessed by shift number).

Section XI
TRAINING

Phase 1 training was conducted onsite for SRIS Administrators and users on January 17, 2012.

Phase 1 training consisted of a live presentation accompanied by printed documentation.

Training for the new system upgrades performed in Phase 2 of this project can be arranged for if required.

Section XII
CONCLUSIONS AND RECOMMENDATIONS

XII.I. CONCLUSIONS

1. The addition of the trailer/rear ALPR added more credibility to the exiting e-screening suite; now, both the CVs and the hauled trailers, if any, can be identified to the inspectors.
2. The HAZMAT placard reader upgrade to the exiting AURs and in association with the two ALPRs and the USDOT readers provides CV inspectors with the added tool of identifying a list of required placards from the driver. The HAZMAT placards can be captured with high resolution in motion and at high speeds.
3. The vehicle OHD device provides CV inspectors with added assurance to visually identify overheight CVs.
4. It is estimated the new installation at Schodack will result in direct cost savings and benefits in the amount of $1,709,070 US annually to the State of New York.
5. With the installation of the Smart Roadside Inspection System, New York State now has an e-screening system that is centralized and will support network based operations.
6. Within the Intelligent Imaging Systems Smart Roadside Inspection System Software, e-screening rules have been established to generate alerts that are directly applicable to the operations of the New York State Department of Transportation.

Focusing enforcement efforts on non-compliant vehicles changes the screening paradigm from quantity to quality. The benefits generated are tremendous for both CV enforcement agencies and the transportation industry. In addition to removing more high-risk vehicles, the flow, predictability and efficiency of highway transportation system is improved while reduced congestion, slowdowns and idling time provide quantifiable returns in reduced fuel consumption and greenhouse gas emissions.

XII.II. RECOMMENDATIONS

The data generated and information collected from this site's operations can be utilized to its maximum intended potential with the addition of more sites equipped with automated roadside inspection systems around the state.

Section XIII
APPENDICES
READ DATA

XIII.I. Trailer/Rear ALPR and AUR/HAZMAT DATA

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
1	06-Dec-12	12:56:35	1	1	1	0	1	Class 3 Flammable
2	06-Dec-12	12:56:00	1	1	0	0	0	
3	06-Dec-12	12:55:50	1	0	1	1	0	
4	06-Dec-12	12:55:23	0	0	1	1	0	
5	06-Dec-12	12:53:36	1	1	1	1	0	
6	06-Dec-12	12:53:08	1	0	1	1	0	
7	06-Dec-12	12:52:34	1	0	1	1	0	
8	06-Dec-12	12:52:18	1	1	1	0	0	Last USDOT digit covered/partial

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
9	06-Dec-12	12:52:06	1	1	1	0	0	Last USDOT digit missed
10	06-Dec-12	12:51:34	0	0	1	1	0	
11	06-Dec-12	13:59:58	1	1	0	0	0	
12	06-Dec-12	13:58:45	1	0	1	1	0	
13	06-Dec-12	13:55:05	1	1	1	1	0	
14	06-Dec-12	13:54:18	1	0	1	1	0	
15	06-Dec-12	13:53:32	1	1	1	1	0	
16	06-Dec-12	13:53:28	1	1	1	1	0	
17	06-Dec-12	13:53:25	1	0	1	1	0	
18	06-Dec-12	13:52:54	1	0	1	1	0	
19	06-Dec-12	13:52:40	0	0	0	0	0	
20	06-Dec-12	13:47:29	1	1	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
21	06-Dec-12	14:59:59	0	0	1	1	0	
22	06-Dec-12	14:59:31	1	0	1	1	0	
23	06-Dec-12	14:58:46	1	1	1	1	1	Class 7 Radioactive
24	06-Dec-12	14:58:18	0	0	1	1	0	
25	06-Dec-12	14:58:13	1	1	1	1	0	
26	06-Dec-12	14:56:37	1	0	1	1	0	
27	06-Dec-12	14:55:34	1	1	0	0	0	
28	06-Dec-12	14:55:07	1	1	1	1	0	
29	06-Dec-12	14:53:51	1	1	1	1	0	
30	06-Dec-12	14:51:27	1	1	1	1	0	
31	06-Dec-12	15:58:38	1	1	1	1	0	
32	06-Dec-12	15:58:19	1	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
33	06-Dec-12	15:58:08	1	1	1	1	0	
34	06-Dec-12	15:57:37	1	1	1	1	0	
35	06-Dec-12	15:56:45	1	0	1	1	0	
36	06-Dec-12	15:55:58	1	0	1	1	0	
37	06-Dec-12	15:55:45	1	1	1	0	0	Difficult USDOT font
38	06-Dec-12	15:54:24	1	1	1	1	0	
39	06-Dec-12	15:54:15	1	1	1	1	0	
40	06-Dec-12	15:53:26	0	0	1	1	0	
41	06-Dec-12	16:58:39	0	0	1	1	0	
42	06-Dec-12	16:58:34	1	0	0	0	0	
43	06-Dec-12	16:54:56	1	0	1	1	0	
44	06-Dec-12	16:54:40	1	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
45	06-Dec-12	16:53:24	0	0	1	1	0	
46	06-Dec-12	16:52:10	1	1	1	1	0	
47	06-Dec-12	16:52:04	1	0	1	1	0	
48	06-Dec-12	16:51:57	1	0	0	0	0	
49	06-Dec-12	16:51:43	0	0	0	0	0	
50	06-Dec-12	16:51:40	0	0	1	1	0	
51	06-Dec-12	17:59:50	1	0	0	0	0	
52	06-Dec-12	17:58:13	1	1	1	1	0	
53	06-Dec-12	17:56:51	1	1	1	1	0	
54	06-Dec-12	17:55:41	1	1	1	1	0	
55	06-Dec-12	17:55:18	1	1	1	1	0	
56	06-Dec-12	17:55:04	1	1	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
57	06-Dec-12	17:54:38	0	0	1	1	0	
58	06-Dec-12	17:54:27	1	1	1	1	0	
59	06-Dec-12	17:53:45	1	0	0	0	0	
60	06-Dec-12	17:52:43	1	0	1	1	0	
61	06-Dec-12	18:59:20	1	0	1	1	0	
62	06-Dec-12	18:59:00	1	1	1	1	0	
63	06-Dec-12	18:58:36	1	1	1	1	0	
64	06-Dec-12	18:58:30	1	0	0	0	0	USDOT no. missing
65	06-Dec-12	18:58:26	1	1	0	0	0	
66	06-Dec-12	18:58:22	0	0	1	1	0	
67	06-Dec-12	18:56:59	1	1	1	1	0	
68	06-Dec-12	18:56:30	0	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
69	06-Dec-12	18:56:27	1	0	1	1	0	
70	06-Dec-12	18:56:11	1	1	1	1	0	
71	06-Dec-12	19:56:10	1	1	1	1	0	
72	06-Dec-12	19:55:21	1	0	0	0	0	
73	06-Dec-12	19:52:49	1	0	1	1	0	
74	06-Dec-12	19:52:28	1	0	1	0	0	
75	06-Dec-12	19:51:58	1	1	1	0	0	
76	06-Dec-12	19:48:07	1	1	1	1	0	
77	06-Dec-12	19:46:55	1	1	1	1	0	
78	06-Dec-12	19:46:45	0	0	1	1	0	
79	06-Dec-12	19:44:42	1	0	1	1	0	
80	06-Dec-12	19:43:07	1	1	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
81	06-Dec-12	20:58:05	1	1	1	1	0	
82	06-Dec-12	20:56:38	1	1	0	0	0	
83	06-Dec-12	20:55:52	1	0	1	1	0	
84	06-Dec-12	20:54:22	1	1	1	1	0	
85	06-Dec-12	20:53:47	1	1	1	1	0	
86	06-Dec-12	20:48:47	1	1	1	1	0	
87	06-Dec-12	20:47:49	1	0	1	1	0	
88	06-Dec-12	20:45:43	0	0	0	0	0	
89	06-Dec-12	20:44:52	1	1	1	1	0	
90	06-Dec-12	20:43:46	1	1	1	1	0	
91	06-Dec-12	21:58:07	1	1	1	1	0	
92	06-Dec-12	21:57:46	0	0	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
93	06-Dec-12	21:52:55	1	0	1	1	0	
94	06-Dec-12	21:49:43	0	0	1	1	0	
95	06-Dec-12	21:47:51	1	0	0	0	0	
96	06-Dec-12	21:47:24	1	1	1	1	0	
97	06-Dec-12	21:44:43	1	0	0	0	0	
98	06-Dec-12	21:43:37	1	0	1	1	0	
99	06-Dec-12	21:43:17	1	1	0	0	0	
100	06-Dec-12	21:41:23	0	0	0	0	0	
101	06-Dec-12	22:58:09	0	0	1	1	0	
102	06-Dec-12	22:58:08	1	0	1	1	0	
103	06-Dec-12	22:57:13	1	1	1	1	0	
104	06-Dec-12	22:56:38	1	0	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
105	06-Dec-12	22:55:22	1	1	1	0	0	N at the end of USDOT read as 1
106	06-Dec-12	22:54:05	1	0	1	1	0	
107	06-Dec-12	22:53:55	0	0	1	1	0	
108	06-Dec-12	22:52:36	1	0	1	1	0	
109	06-Dec-12	22:50:48	0	0	1	0	0	Last USDOT no. o was read as 8
110	06-Dec-12	22:49:45	1	1	0	0	0	
111	06-Dec-12	23:58:54	1	0	1	1	0	
112	06-Dec-12	23:58:29	1	1	0	0	0	
113	06-Dec-12	23:57:20	1	1	0	0	0	
114	06-Dec-12	23:54:30	1	1	1	1	0	
115	06-Dec-12	23:52:35	1	0	0	0	0	
116	06-Dec-12	23:49:59	1	1	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
117	06-Dec-12	23:49:48	0	0	0	0	0	
118	06-Dec-12	23:49:45	1	0	0	0	0	
119	06-Dec-12	23:48:51	0	0	1	0	0	Difficult USDOT font
120	06-Dec-12	23:45:23	1	1	0	0	0	
121	06-Dec-12	0:59:22	0	0	0	0	0	
122	06-Dec-12	0:59:17	1	0	1	1	0	
123	06-Dec-12	0:58:53	0	0	1	1	0	
124	06-Dec-12	0:56:50	0	0	1	1	0	
125	06-Dec-12	0:56:14	1	0	1	1	0	
126	06-Dec-12	0:54:52	1	0	1	1	0	
127	06-Dec-12	0:47:22	1	0	1	1	0	
128	06-Dec-12	0:45:51	0	0	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
129	06-Dec-12	0:45:36	1	1	1	1	0	
130	06-Dec-12	0:43:56	1	1	1	0	0	
131	07-Dec-12	1:52:29	1	0	1	1	0	
132	07-Dec-12	1:52:22	1	1	0	0	1	Class 3 Flammable
133	07-Dec-12	1:51:49	0	0	1	1	0	
134	07-Dec-12	1:51:31	1	0	1	1	0	
135	07-Dec-12	1:51:21	1	1	1	1	0	
136	07-Dec-12	1:49:31	0	0	1	1	1	Class 8 Corrosive, Dangerous
137	07-Dec-12	1:49:02	1	1	1	1	0	
138	07-Dec-12	1:46:30	0	0	1	0	0	USDOT no. N is read as 1
139	07-Dec-12	1:44:45	1	0	1	1	0	
140	07-Dec-12	1:44:05	1	1	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
141	07-Dec-12	2:59:41	1	1	1	1	0	
142	07-Dec-12	2:57:43	1	1	1	1	0	
143	07-Dec-12	2:55:47	1	1	1	1	0	
144	07-Dec-12	2:54:23	0	0	1	1	0	
145	07-Dec-12	2:53:32	1	0	1	1	0	
146	07-Dec-12	2:53:28	1	1	1	1	0	
147	07-Dec-12	2:51:57	1	1	1	1	0	
148	07-Dec-12	2:48:28	1	1	1	1	0	
149	07-Dec-12	2:42:29	0	0	1	0	0	Difficult USDOT font
150	07-Dec-12	2:41:21	1	0	1	1	0	
151	07-Dec-12	3:59:09	0	0	1	1	0	
152	07-Dec-12	3:59:01	1	1	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
153	07-Dec-12	3:57:44	1	1	1	1	0	
154	07-Dec-12	3:57:31	0	0	0	0	0	
155	07-Dec-12	3:54:54	0	0	1	1	0	
156	07-Dec-12	3:54:33	0	0	1	1	0	
157	07-Dec-12	3:51:25	1	1	0	0	0	
158	07-Dec-12	3:48:38	1	1	1	1	0	
159	07-Dec-12	3:48:11	1	0	1	1	0	
160	07-Dec-12	3:47:01	0	0	1	1	0	
161	07-Dec-12	4:58:09	0	0	1	1	0	
162	07-Dec-12	4:54:27	1	1	1	1	0	
163	07-Dec-12	4:54:04	1	1	1	1	0	
164	07-Dec-12	4:53:59	1	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
165	07-Dec-12	4:53:18	0	0	1	1	0	
166	07-Dec-12	4:49:12	0	0	0	0	0	
167	07-Dec-12	4:48:50	1	1	1	1	0	
168	07-Dec-12	4:48:12	0	0	1	1	0	
169	07-Dec-12	4:47:36	0	0	1	1	0	
170	07-Dec-12	4:45:41	1	0	1	1	0	
171	07-Dec-12	5:59:02	1	1	1	1	0	
172	07-Dec-12	5:58:48	1	0	1	1	0	
173	07-Dec-12	5:58:35	1	0	0	0	0	
174	07-Dec-12	5:57:51	0	0	1	1	0	
175	07-Dec-12	5:57:36	1	0	1	1	0	
176	07-Dec-12	5:57:23	1	1	1	0	0	Difficult USDOT font

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
177	07-Dec-12	5:51:58	1	1	1	1	0	
178	07-Dec-12	5:48:11	1	0	1	1	0	
179	07-Dec-12	5:47:16	1	0	1	1	0	
180	07-Dec-12	5:46:48	0	0	1	1	1	Class 3 Flammable
181	07-Dec-12	6:58:51	1	1	1	1	0	
182	07-Dec-12	6:57:53	1	0	1	1	0	
183	07-Dec-12	6:57:25	1	1	1	1	0	
184	07-Dec-12	6:57:19	0	0	1	1	0	
185	07-Dec-12	6:56:53	1	0	1	1	0	
186	07-Dec-12	6:53:57	1	1	1	1	0	
187	07-Dec-12	6:51:05	1	0	1	1	0	
188	07-Dec-12	6:49:34	1	1	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
189	07-Dec-12	6:46:46	1	0	1	1	0	
190	07-Dec-12	6:46:22	0	0	1	1	0	
191	07-Dec-12	7:59:51	0	0	1	1	0	
192	07-Dec-12	7:57:37	0	0	1	1	0	
193	07-Dec-12	7:57:30	1	1	0	0	0	
194	07-Dec-12	7:57:24	0	0	1	1	0	
195	07-Dec-12	7:56:26	0	0	1	1	0	
196	07-Dec-12	7:55:17	1	0	1	1	0	
197	07-Dec-12	7:52:16	1	0	1	0	0	Difficult USDOT font
198	07-Dec-12	7:52:08	1	0	1	1	1	Dangerous
199	07-Dec-12	7:50:25	1	0	1	0	0	Difficult USDOT no. to read
200	07-Dec-12	7:50:16	0	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
201	07-Dec-12	8:59:47	1	1	1	1	0	
202	07-Dec-12	8:59:02	1	0	1	1	0	
203	07-Dec-12	8:58:54	1	0	1	1	0	
204	07-Dec-12	8:58:15	1	0	1	1	0	
205	07-Dec-12	8:58:10	1	1	0	0	0	
206	07-Dec-12	8:53:28	1	0	1	1	0	
207	07-Dec-12	8:52:38	1	1	1	1	0	
208	07-Dec-12	8:50:52	1	0	0	0	0	
209	07-Dec-12	8:49:19	1	1	1	1	0	
210	07-Dec-12	8:48:39	1	1	1	1	0	
211	07-Dec-12	9:58:55	1	1	0	0	0	
212	07-Dec-12	9:56:43	0	0	1	1	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
213	07-Dec-12	9:52:57	1	0	1	1	0	
214	07-Dec-12	9:52:00	1	0	1	1	0	
215	07-Dec-12	9:50:32	1	1	1	1	0	
216	07-Dec-12	9:48:47	1	1	0	0	0	
217	07-Dec-12	9:48:04	1	1	1	1	0	
218	07-Dec-12	9:44:12	0	0	1	1	0	
219	07-Dec-12	9:42:41	0	0	1	1	1	Class 3 Flammable
220	07-Dec-12	9:42:29	1	0	0	0	0	
221	07-Dec-12	10:59:40	1	1	1	1	0	
222	07-Dec-12	10:58:56	1	1	0	0	0	
223	07-Dec-12	10:58:45	0	0	1	1	0	
224	07-Dec-12	10:55:13	1	1	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
225	07-Dec-12	10:53:56	1	1	1	1	0	
226	07-Dec-12	10:52:17	1	1	1	1	0	
227	07-Dec-12	10:52:09	1	1	1	1	0	
228	07-Dec-12	10:50:32	0	0	1	0	0	
229	07-Dec-12	10:50:06	1	0	1	1	0	
230	07-Dec-12	10:49:39	1	1	1	0	0	
231	07-Dec-12	11:58:37	1	0	0	0	0	
232	07-Dec-12	11:58:26	0	0	1	0	0	
233	07-Dec-12	11:58:04	0	0	0	0	0	
234	07-Dec-12	11:57:34	1	0	1	0	0	Zero missing at end from USDOT no.
235	07-Dec-12	11:55:46	1	1	0	0	0	
236	07-Dec-12	11:54:45	1	1	0	0	0	

Vehicle Count	Date	Time	Rear ALPR		AUR/HAZMAT			Comments
			LP detected	Correct decode	DOT detected	Correct decode	HAZMAT placard detected	
237	07-Dec-12	11:54:24	1	1	0	0	0	
238	07-Dec-12	11:53:19	1	1	1	1	0	
239	07-Dec-12	11:52:45	1	1	0	0	0	
240	07-Dec-12	11:52:41	1	0	0	0	0	