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An Evaluation of the Idaho State Police Emphasis
Patrols in Construction Zones



Idaho Statistical Analysis Center
Idaho State Police

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Introduction

Throughout the years, the Idaho State Police has been fortunate to receive grant funding through GARVEE bonds that fund overtime for Idaho State Troopers on various portions of Idaho roadways under road construction. These areas are then the staple for extra patrols to ensure traffic rules are being followed. Reducing crashes, DUI's, drugs on roadways, and reducing aggressive driving along with other goals was the purpose of funding overtime for Idaho's State Troopers. The thought was by increasing Trooper visibility everything above should follow.



Background

Although necessary, construction on Idaho's busy interstate and highway infrastructure can be dangerous to drivers and construction workers. Of the 332 traffic accidents in work zones throughout Idaho in 2013, 33% resulted in possible injuries and 3 fatalitiesⁱ. The Work Zone Safety and Mobility Program of the Idaho Transportation Department states that safe and efficient Temporary Traffic Control zones are an essential part of highway construction, maintenance operations, and the management of traffic incidents. The transportation department recommends, when appropriate, the use of "law enforcement assistance to enforce traffic laws, affect driver behavior, and help maintain appropriate speeds, improve driver alertness and help address other safety and mobility issues."ⁱⁱ Thus, the Idaho State Police has received several years of funding for costs associated with non-routine work of uniformed law enforcement personnel to help protect workers and drivers and to maintain safe and efficient travel through highway work zones.

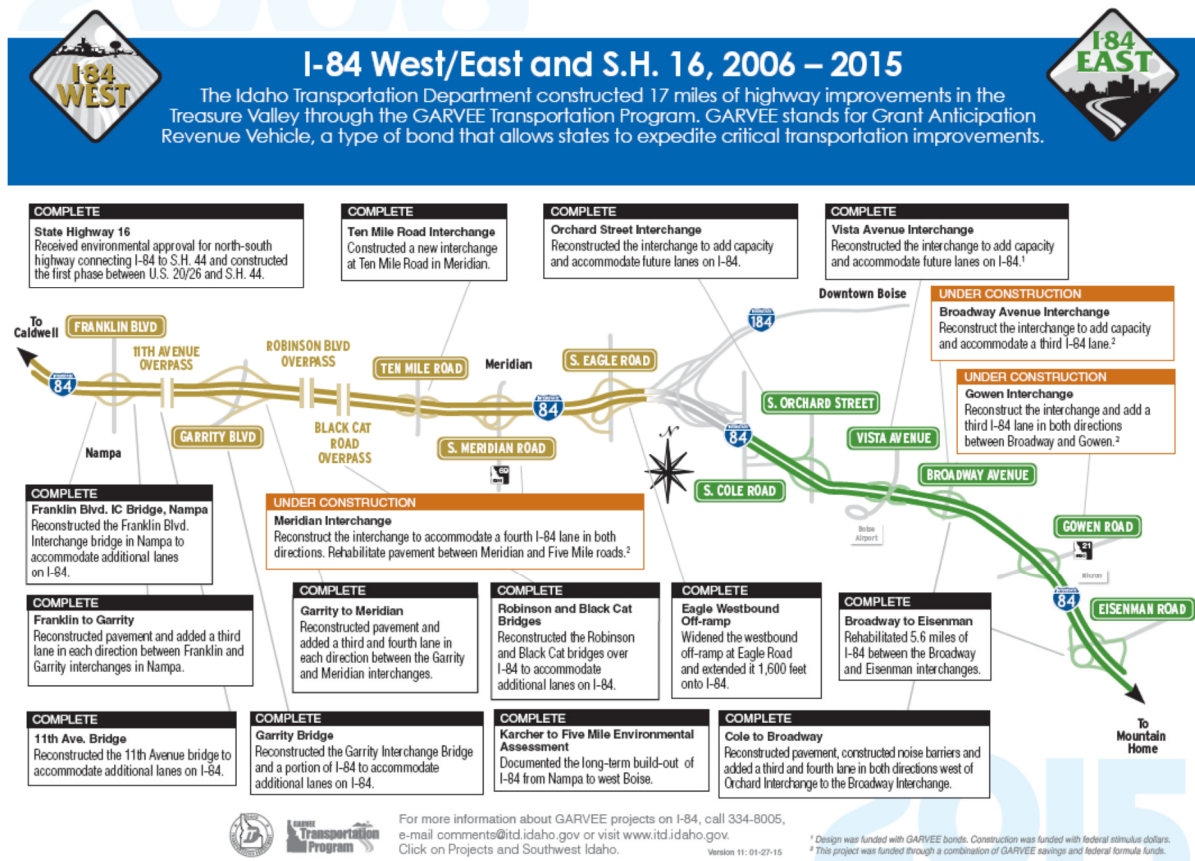
Since 2008, the state police has conducted high-visibility saturation patrols in five garvee project locations in Ada and Canyon County. The focus of their efforts are almost exclusively on preventing accidents through the enforcement of related traffic offenses (e.g., speeding, distracted driving, DUI's). At the request of the Idaho State Police, the Idaho Statistical Analysis Center applied for and received a

federal grant to research the relationship between enforcement of traffic laws and driver behavior. The primary purpose of this study was to determine if increased patrols changed driver behavior.

Methods

The Idaho Criminal Justice Commission, the Idaho Criminal Justice Research Sub-Committee, and the upper command staff of the Idaho State Police desired to understand the relationship between enforcement of traffic laws and driver behavior. The request was given to the Idaho Statistical Analysis Center to complete the research project. Data was collected and analyzed from several sources:

- Trooper law enforcement activities –Troopers working overtime shifts paid by Garvee Bonds were required to complete activity logs for garvee locations. Information collected concerned the hours worked, number of contacts with drivers, overtime hours, total miles traveled, the number of citations and reasons for the citations, the number and type of warning, crashes investigated, agency assists, motorist assists, warrant arrests, abandoned vehicles, drug-related arrests, cash seizures, and property seizures.
- The second data source consisted of gathering E-ticket information as well as court information given by the Idaho Supreme Court to determine the number of contacts between ISP officers and the public, and any consequential increases or decreases in numbers of criminal offenses within the target emphasis areas.
- All commissioned officer timesheet data containing the day, hours worked, and the grant or general fund paying for the officers time was obtained to identify citations written by officers being paid with garvee funds. This allows garvee paid citations to be compared to non-garvee citations, all in hope of determining whether or not the emphasis was effective.
- Crash data – The Idaho Department of Transportation provided the study with crash data by road segment and mile post for the garvee project areas and the time periods before, during, and after the projects. This data described each accident, including the number of vehicles, injuries, fatalities, road and weather conditions, severity of accident (property damage or class of injury), and the contributing factors to the crash.



*From the Garvee I84 factsheet, published by the Idaho Transportation Department, 2015

ISP Activity Sheets

Activity sheets were completed by the Idaho State Troopers every time they participated in overtime for the garvee project. Since 2008 there were five garvee projects that focused on different sections of roadway in Idaho. Each activity sheet was specific to the garvee project as was the location of the emphasis patrol. The activity sheet tracked a number of items including: total hours, overtime hours, number of contacts, total miles covered, citations (for speeding, following too close, seat belt violations etc.), warnings (for speeding, following too close, seat belt violations etc.), number of crashes including property damage and personal injury as well as location, also number of agency assists and many more. The majority of the activity sheets that we received were monthly totals for that project so an analysis based on month was used for comparison.

Table 1. Garvee Grant					
Project Code	Approx. Start Date	Approx. End Date	Months Active	Area Emphasized	Grant Amount
Garvee08	8/1/2008	12/31/2009	17	Garvee West - I84:Garrity to Meridian (Mp38-44)	\$ 375,000
Garvee10	1/1/2010	3/24/2012	27	Garvee West II - I84:Franklin to Garrity (Mp 29-38)	\$ 600,000
Garvee09	7/1/2009	6/30/2011	24	Garvee East - I84:Cole to Broadway (Mp 46-56)	\$ 475,000
Garvee13	2/1/2013	8/30/2014	19	SH 16, SH 44, SH, 26	\$ 450,000
Garvee14	8/14/2013	8/30/2015	10	I-84- Broadway to Meridian (Mp 44-57)	\$ 254,156

The above table shows the dates in which the projects started as well as ended, how many months the projects were active, the area in which the projects emphasized, and the grant amount. It is important to note that one limitation we found in working with this data was the actual data we received. Some projects were missing activity sheets for months within the start and end date, for reasons unknown, which may skew the results. Garvee13 is missing the September 2013 activity report and Garvee14 is missing August 2013- February of 2014. Garvee14 will also conclude August 2015 so the data for those months have not been collected.

The majority of the activity sheets were by each month, however for the first five (Aug-Dec) months of Garvee08 the total for all the categories was combined in the activity sheet we received. Without knowing how many occurred in each month separately, the average for those months had to be taken so we could continue to analyze by the month (n=97).

Garvee by Year

Chart 1 shows total citations, warnings and contacts by the year. Some projects overlapped which may explain why 2010 was so high for all three categories, in particular total contacts. Garvee10 and Garvee09 were both in 2010 and the activity sheets received for both were complete from start to finish. In 2012 only Garvee10 was active and it only lasted three months (Jan-March), providing some insight as to why it was so low. Garvee10 was also active the most months (27), followed by Garvee09 (24). In Garvee08 and Garvee10 total citations were more prevalent than warnings, but with Garvee09, 13 and Garvee14 total warnings increased more than citations for unknown reasons.

For the purpose of this project we defined contacts as any interaction between troopers and the citizens whether through a traffic stop or an accident etc.

Chart 2 shows total crashes and DUI's by year. The dip in 2012 can again be attributed to the three months that Garvee10 was active. Garvee13 was active the majority of 2013 and with missing the 2013 data from Garvee14 it is safe to say that one possible explanation why 2013 was so low for DUIs and crashes may have been due to the fact Garvee13 took place on state highways rather than Interstate 84, where traffic is higher.

Chart 1. Total Citations/Warnings and Contacts by Project Code

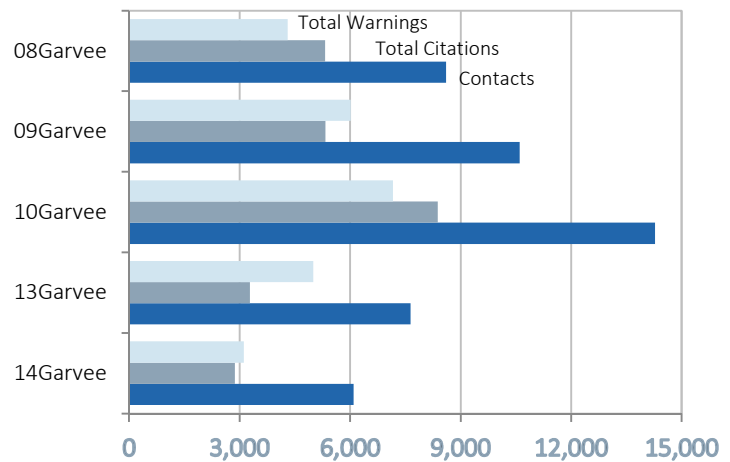
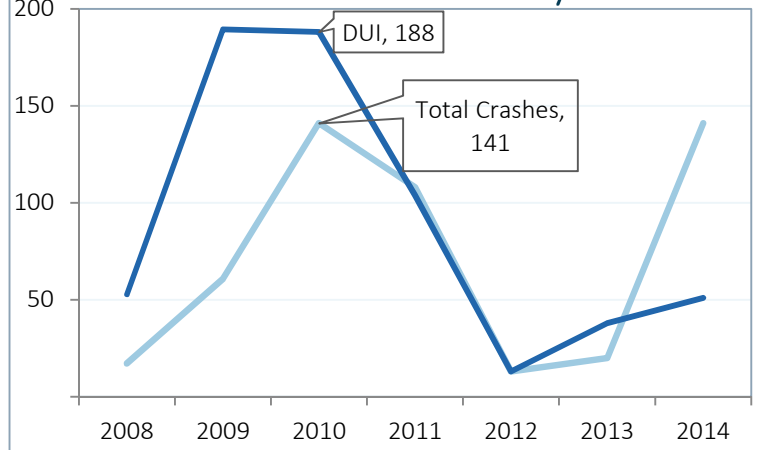


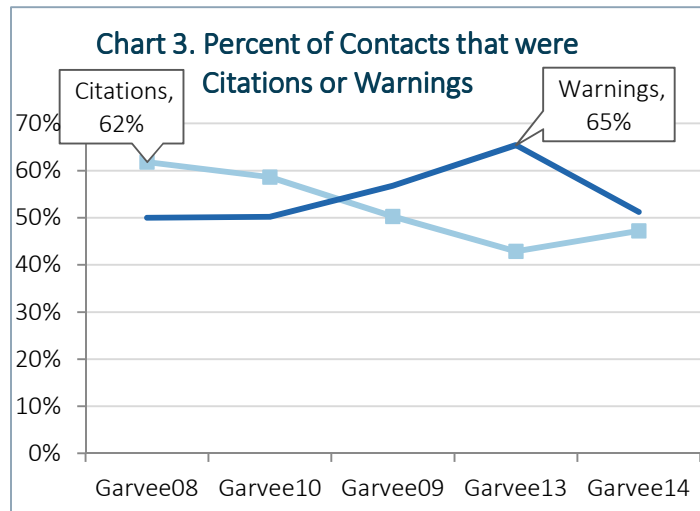
Chart 2. Total DUI and Crashes by Year



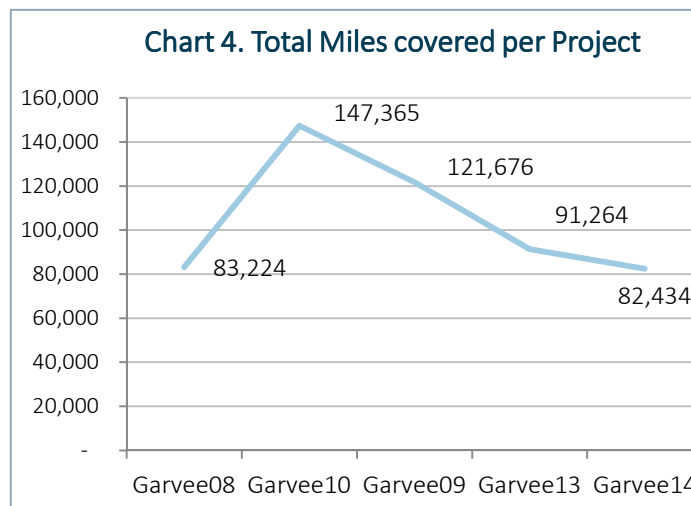
Garvee by Project

Chart 3 shows the percent of contacts that ended up as a warning or a citation. For Garvee08 there were more citations than warnings and as citations decreased over the years warnings have increased, especially in Garvee13 for unknown reasons which supports chart 3. One possible reason for the decline may be the burnout of troopers. Working overtime may cause them to be more lenient to avoid court appearances if someone disputes a ticket.

Garvee13 was primarily a state highway which may have influenced such an increase in warnings rather than citations for a number of reasons (i.e. reason for stop, trooper discretion). Now looking at the data we do have for Garvee14, citations and warnings are closer together. It will be interesting to see how it changes as the project finishes.



One item that troopers were asked to keep track of on the activity sheets was the miles they covered during their shift. Chart 4 shows the total number of miles covered per project. Garvee10 had the most miles covered by the troopers involved. Garvee10 went from the Franklin exit in Caldwell to the Garrity exit in Nampa, a distance of about 9 miles.



With the amount of miles covered in Garvee10 it makes sense that total hours worked was highest for Garvee10 with 9,782 hours logged as shown in Chart 5. Garvee10 was also active the longest giving troopers more time for emphasis patrol.

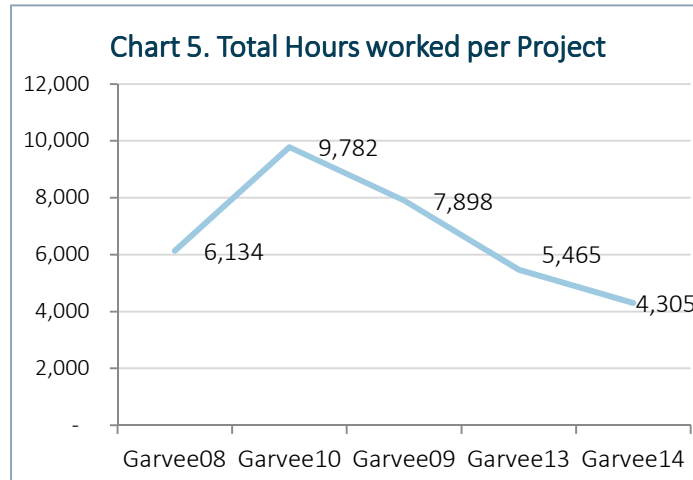


Table 2 shows the total citations for all five projects broken down into sub categories. Troopers were asked at the end to document the reason for the citation or warning. Overall speeding was the main cause for a citation for all the projects averaging 2,398 citations. Seatbelt violations were also high, especially in Garvee10. Other non-moving violations accounted for 3,420 citations between 10 and Garvee09. DUI citations were highest in Garvee09.

	Garvee08: 2008-2009	Garvee10: 2010-2012	Garvee09: 2009-2011	Garvee13: 2013-2014	Garvee14: 2014-2015
Following Too Close	111	183	68	25	47
Speeding	2,667	3,788	2,464	1,516	1,555
Failure to Yield	31	17	36	35	7
Inattentive	24	44	21	8	26
Child Restraint Violation	41	52	27	13	19
Seatbelt Violation	575	828	567	399	207
DUI Violation	172	170	205	55	34
Driving Without Privileges	231	336	237	128	112
Equipment Violation	250	236	216	107	71
Hazardous Moving Violation	275	486	305	154	164
Other Non-Moving Violations	941	2,236	1,184	840	633

Speeding was also more prevalent for warnings as well, as seen in Table 3, averaging 1,737 warnings for all projects. Equipment violations such as, a blown tail light, was also really high for warnings accounting for 11,492 warnings. Other non-moving violations was again high for 10 and Garvee09 for unknown reasons.

Table 3. Total Warnings by Category					
	Garvee08: 2009	Garvee10: 2010-2012	Garvee09: 2009-2011	Garvee13: 2013-2014	Garvee14: 2014-2015
Following Too Close	82	118	77	83	79
Speeding	1,492	2,031	1,972	1,878	1,316
Failure to Yield	25	50	39	26	10
Inattentive	20	17	22	16	10
Seatbelt Violation	28	59	25	28	14
Child Restraint Violation	8	15	11	49	1
Equipment Violation	821	1,699	1,212	1,287	473
Hazardous Moving Violations	696	1,073	1,156	700	641
Other Non-Moving Violations	1,134	2,100	1,505	931	574

Table 4 shows the additional categories that were listed on the activity sheets including total crashes, crashes investigated, personal injuries, property damage etc., was tracked. Motorist assists were high for Garvee10 and Garvee09 (1,835 and 1,033). There were 200 crashes in Garvee10 which the location may help explain that. Garvee10 took place from the Caldwell Franklin exit to the Nampa Garrity exit on I-84 which the majority of that area is two lanes and coming from Boise may have proved an issue with the construction.

Table 4. Total of Additional Categories					
	Garvee08: 2009	Garvee10: 2010-2012	Garvee09: 2009-2011	Garvee13: 2013-2014	Garvee14: 2014-2015
Total Crashes	68	200	72	31	130
Crashes Investigated	1	-	1	-	-
Personal Injury	14	55	18	7	31
Property Damage	53	145	53	24	99
Agency Assists	525	885	862	453	287
Abandoned Vehicles	210	520	287	108	169
Motorist Assists	693	1,835	1,033	447	681
Warrant Arrests	59	124	87	46	44
Drug Arrests	91	142	100	74	137
Cash Seizures	-	18	6	10	1
Property Seizures	1	2	-	-	5

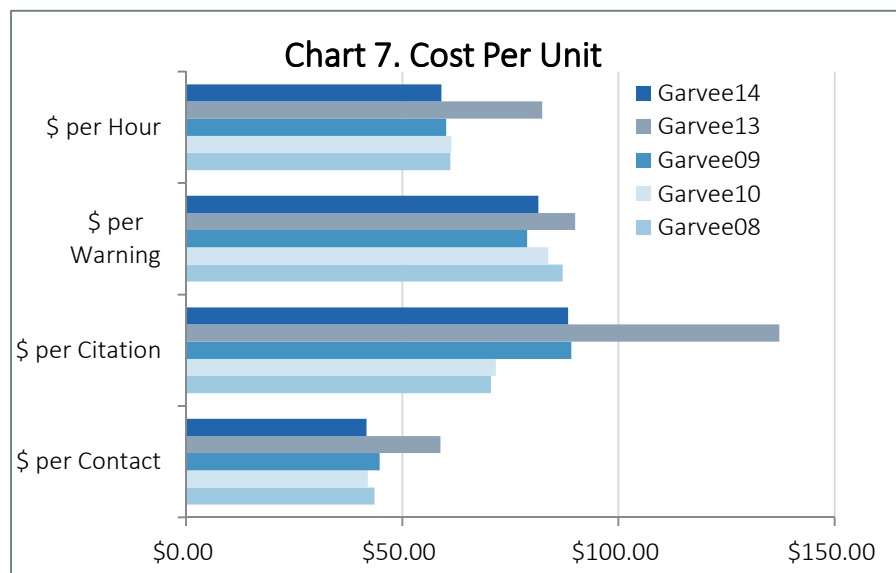
Table 5 shows the totals for citations and warnings per category. Speeding was the leading cause for citations followed by other non-moving violations. Both were also the main reason for warnings as well.

	Total Citations	Total Warnings
Following Too Close	434	439
Speeding	11,990	8,689
Failure to Yield	126	150
Inattentive	123	85
Child Restraint	152	84
Seatbelt Violation	2,576	154
DUI Violation	636	0
Driving Without	1,044	0
Equipment Violation	880	5,492
Hazardous Moving	1,384	4,266
Other Non-Moving	5,834	6,244

Garvee Cost per Unit

Taking the amount awarded to each project, cost per unit can be calculated. The projects were fairly consistent in the cost per contact, varying only by a few dollars; however increased greatly in the Garvee13 project (Table 6). The same can be said for cost per citation, warning, hour, and mile traveled. The increase is due to unknown factors but one possible explanation may be found in the location. Garvee13 took place on state highways 16, 44, and 26 where less traffic, when compared to I-84, occurs.

	\$ per Contact	\$ per Citation	\$ per Warning	\$ per Hour	\$ per Mile Traveled
Garvee08	\$43.60	\$70.51	\$87.08	\$61.13	\$4.50
Garvee09	\$44.81	\$89.12	\$78.92	\$60.14	\$3.90
Garvee10	\$42.03	\$71.63	\$83.80	\$61.33	\$4.07
Garvee13	\$58.85	\$137.19	\$90.03	\$82.34	\$4.93
Garvee14	\$41.71	\$88.40	\$81.51	\$59.04	\$3.08



Garvee Correlation and Regression

The data in Chart 3 and 4 indicate a relationship between contacts and citations/warnings. Therefore, we questioned whether the number of contacts influenced citations or warnings. A Bivariate Correlation test with a two tailed test of significance was performed with contacts, total citations, total warnings, and year (n=97). We found that there was a significant relationship between contacts and total citations ($p < .05$, $r = .833$), and contacts and total warnings ($p < .001$, $r = .821$). No significance was found in the correlation between contacts and year. However, there was significance between total citations and year ($p < .05$) with a moderate negative relationship ($r = -.314$) - as year increases, citations decrease. Surprisingly there was no significance between total warnings and year ($p > .05$).

Correlations					
	Total Contacts	Total Citations	Total Warnings	Year	
Total Contacts	1	.833 *	.821 *	-.032	
Total Citations	.833 *	1	.562	-.314	
Total Warnings	.821 *	.562 *	1	.186	
Year	-.032	-.314 *	.186	1	

The effect of year, warnings, and contacts on total citations				
	R	R Square	Adjusted R Square	Std. Error of the Estimate
Model 1	.889	.790	.783	41.29985
Predictors: (Constant), Total Warnings, year, contacts				

The effect of year, warnings, and contacts on total citations					
Model 1	Unstandardize d Coefficients	Std. Error	Standardized Coefficients	t	Sig.
	B		Beta		
(Constant)	22602.254	4783.569		4.725	.000
Year	-11.245	2.379	-.242	-4.726	.000
Contacts	.705	.062	1.002	11.390	.000
Total Warnings	-.274	.114	-.215	-2.403	.018
Dependent Variable: Total Citations					

Since the Bivariate Correlation test results showed a positive relationship between contacts and total citations and contacts and total warnings, we wanted to know if one could then predict the other. We performed two linear regression tests; one where total citations was the dependent variable and year, contacts, and total warnings were the independent variables and another where total warnings was the dependent variable and year, contacts, and total citations were the independent variables.

With total citations as the dependant variable, it was found that for every one contact, total citations will increase (.705) while keeping year and total warnings constant. Year, contacts, and total warnings account for 78% of the total variability in total citations. Also with every 1 unit increase in warnings, citations will decrease (.274).

The effect of year, citations, and contacts on total warnings				
Model 1	R	R Square	Adjusted R Square	Std. Error of the Estimate
Model 1	.857	.735	.726	36.46213
Predictors: (Constant), Total Citations, year, contacts				

With total warnings as the dependant variable, it was found that for every one contact, total warnings will increase (.581) if year and total citations remain constant.

Year, citations, and contacts explain 73% of the total variability. Also with every 1 increase in citations, total warnings will decrease (-.213). Looking at year, with total citations as the dependant variable, with each year, total citations will decrease (11.245). With total warnings as the dependant variable, with each year, total warnings will increase (4.897) supporting chart 3 and 4.

The effect of year, citations, and contacts on total warnings					
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model 1	B	Std. Error	Beta		
(Constant)	-9812.170	4591.524		-2.137	.035
year	4.897	2.283	.134	2.145	.035
contacts	.581	.059	1.051	9.786	.000
Total Citations	-.213	.089	-.272	-2.403	.018
Dependent Variable: Total Warnings					

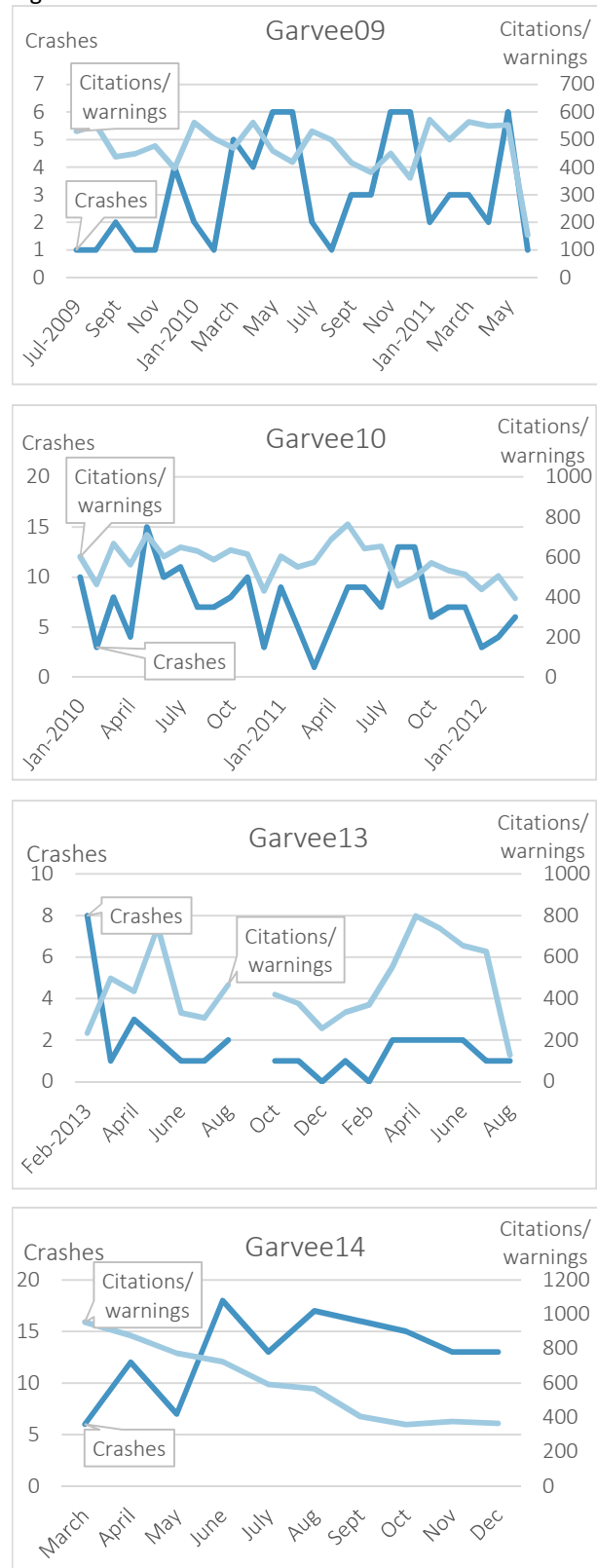
Garvee Total Warnings/Citations and Crashes

Did productivity decrease as the project went on? Surprisingly there was an up/down effect from one month to the other. For Garvee10 warnings/citations the fluctuation was closer together but more spaced out in the total crashes, June especially where crashes peaked in 2010

Looking at Garvee09, warnings/citations fluctuated closer together with a major dip in June 2011 for unknown reasons. When compared to Garvee10, Garvee09 did not have that many crashes, peaking at six crashes five times throughout its duration where Garvee10 peaked at 15 crashes in May.

For Garvee13 the up/down effect seen in the past two projects continues for both warnings/citations and total crashes. Garvee14 shows a constant decline in warnings/citations from March to December. Total crashes peaked in June with 18 for that project but have remained fairly high when compared to crashes in Garvee13 where it peaked in February with 8 crashes. Garvee13 shows a huge dip from July to August in warnings/citations for unknown reasons but went from above 600 to below 200.

Figure 2



Police Administrative Data

Citation data was extracted from the Idaho State Police E-ticket database. Since the e-ticket database was established at the beginning of 2010 the citation data was limited to July 2010 to December 2014. The data was further limited to citations occurring in Ada and Canyon Counties. The month and year of the project and the location of the citation (street and milepost) were used



to designate whether the citation occurred in a garvee project area. A pseudo project, Garvee 09/10 had to be created for locations that were covered by both projects during a certain time period. Citations occurring in garvee project areas were identified as occurring before, during or after the garvee project. In addition to identifying violations occurring in garvee project areas, timesheet information was used to identify citations issued by officers paid with garvee funds.

All commissioned officer timesheet data containing the day, hours worked, and the grant or general fund paying for the officers time was obtained to identify citations written by officers being paid with garvee funds. One limitation of this data is that the records in 2010 were only available by pay date. Thus, violations occurring in garvee areas during the month that an officer was paid by garvee funds was designated as a garvee funded citation. Although this allows for errors and does not provide the hours worked, it was the only way to include 2010 data.

Analysis of Individual Deterrence

Law enforcement officers enforce the law primarily to deter the criminal behavior of citizens. If the certainty of punishment is evident, those who might consider breaking the law may forgo the act because of the risk of apprehension. For example, if drivers were aware more troopers patrolling highways over a holiday weekend they may slow down to avoid receiving a ticket. Drivers may also weigh the consequences of receiving a more costly ticket and conclude that committing a traffic

violation is not worth the risk. The theory of deterrence assumes severity of punishment will influence the decision making of future criminals. However, crime deterrence rests upon a few critical ideas: 1) criminals are aware of every law and aware of penalties for breaking the law; and 2) humans rationally choose whether or not to commit a crime.

If punishment were swift and certain, few would make the choice to disobey the law (Wright, 2010). However, most crimes do not result in an arrest and conviction and involve low risk to the offender. Therefore, if an individual does not believe they will be apprehended, the severity of the punishment would not impact their actions. Wright (2010) discussed research from 2001 among a group of college students wherein the certainty of punishment more often predicted a reduction in the likelihood to drive drunk than the severity of punishment. The Sentencing Project (2010) described why the deterrence of law enforcement is somewhat limited:

Based upon the existing evidence, both crime and imprisonment can be simultaneously reduced if policy-makers reconsider their overreliance on severity based policies such as long prison sentences. Instead, an evidence-based approach would entail increasing the certainty of punishment by improving the likelihood that criminal behavior would be detected. Such an approach would also free up resources devoted to incarceration and allow for increased initiatives of prevention and treatmentⁱⁱⁱ.

The following analysis was conducted to determine how individual drivers are affected by the deterrence affect of law enforcement. By linking the e-tickets database and data on misdemeanors and felonies from the Idaho State Court Repository, the number of offenses before and after the citation was calculated. A main limitation of this study is that it is known law enforcement officers have some flexibility in writing citations. Therefore, it is not known how many drivers were given a warning instead of a ticket. However, it is assumed that if a driver is a frequent violator, a law enforcement officer will be more likely to cite an offender.

Table 7 lists citations or arrests of individuals stoped in garvee project areas. There was a total of 2,949 citations/arrests for driving without priveleges in garvee project areas (before, during, and after project completion). Of those receiving driving without priveleges violations in garvee project areas, 1,767 had

been previously cited/arrested for the same violations. After receiving a driving without privileges citation/arrest in garvee project areas, there were 1,608 driving without priveleges violations for these individuals.

Analyzing violations in all garvee project areas, paired t-tests revealed that after a traffic stop people had an average of 1.987 tickets/arrests beforehand and 1.5 offenses after the traffic stop ($p < .05$). If a driver was cited for driving without privileges, they were less likely to have a violation for driving without privileges afterwards (.6 before, .5 after). Drivers cited for driving offenses (not speeding or following too close), they were less likely to have a driving violation afterwards (.03 before, .02 after). However, this could be due to the differences in time since survival analysis was not performed and given the limited information available. Therefore, analysis will now focus on performance measures before, during, and after garvee projectes in project areas.

Table 7. Total number of citations by offense and the number of priors or subsequent offenses per individual

Offense	Sum	Prior	Subsequent
Speeding	11,265	0	0
Insurance	8,191	0	0
Safety Restraint	4,316	0	0
Driving	3,575	114	64
Work Zone	3,168	0	0
Vehicle Reg/Title	3,079	0	0
Driving Without Privileges	2,949	1,767	1,608
Excessive Speeding	2,190	5	5
Following Too Close	1,382	0	0
Other Violations	1,116	0	0
Drug	795	167	142
DUI	642	64	46
Vehicle Equipment	633	0	
Drivers License	625	0	0
License Plate	328	0	0

Garvee Project Performance Analysis

The month and year of the project and the location of the citation (street and milepost) were used to designate whether the citation occurred in a garvee project area. Table 8 shows the location of each garvee project, the dates of garvee emphasis, the road construction sites and the dates of construction.

Table 8. Garvee Projects, Locations, Dates							
Garvee Project	Garvee Emphasis			Construction Location	Construction		Substantial Complete
	Mile Points	Start Date	End Date		Mile Points	Start date	
Garvee 09 - Garvee East							
Interstate 84 Cole to Broadway	46-59	7/1/2009	6/1/2011	Cole to Broadway	51.3 - 54.5	9/1/2009	7/1/2011
				Vista Avenue Interchange	52.6 - 54.2	7/1/2009	9/1/2010
				Orchard Interchange	49.1 - 52.4	4/1/2009	4/1/2010
Garvee 10 - Garvee West II							
Interstate 84 Franklin to Ten Mile	29-46	1/1/2010	3/24/2012	Ten Mile Road Interchange	41.5 - 42.5	5/1/2009	7/1/2011
				Franklin Boulevard to 11th Avenue	36.0 - 37.8	6/1/2010	1/1/2012
				11th Ave Bridge	36.7	3/1/2010	10/1/2010
				Garrity Interchange Bridge, 11th Ave to Garrity	37.8 - 38.8	11/1/2009	6/1/2011
Garvee 13 - State Highway 16							
S.H. 16	0-6	2/17/2013	8/31/2014	Boise River Bridge and North Stage		5/1/2012	9/14/2014
S.H. 20/26	30-37			Phyllis Canal Bridge and South Stage		8/1/2012	9/14/2014
S.H. 44/20	10-18			Intersection of SH 44/US 20		5/1/2012	9/14/2014
Garvee 14 - Interstate 84							
Interstate 84	44-57	3/1/2014		Broadway to Gowen Mainlaine	55.12	3/1/2014	
				Meridian Road Interchange	43.58	4/1/2014	

Did Garvee funding increase the number of citations?

Garvee funding did increase the amount of citations written for violations occurring in garvee project areas. The number of citations written during garvee project periods was significantly larger than the amount written before or after project periods in the project areas. The total hours worked by officers writing citations in garvee project locations also increased during garvee project periods with the exception of Garvee 14. However, due to the differences in length of time these indicators were measured, the daily average was measured (see table below).

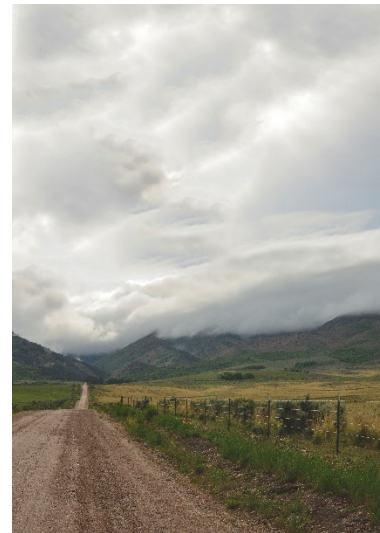


Table 9. Total citations by project area and project period					
Garvee Project	N days	N Stops w/ Citation	N Garvee Citations	Total hours	Garvee Hours
Garvee 09 - Garvee East					
During	340	3,430	1,658	8,676	2,126
After	335	1,849		10,784	
Garvee 09/10					
During	334	354	156	1,712	483
Garvee 10 - Garvee West II					
During	604	9,912	4,649	26,202	5,611
After	274	3,511		15,682	
Garvee 13 - State Highway 16					
Before	381	211		1,264	
During	569	2,071	1,575	6,170	3,794
Garvee 14 - Interstate 84					
Before	423	2,932		16,846	
During	305	4,201	1,626	16,410	3,473
Garvee 09 and 10 are incomplete - citation data goes back to July 2010. Garvee 09/10 is a pseudo project to account for overlap in the two projects.					

Table 10 indicates that officers writing tickets in garvee areas were highly productive during the time of each emphasis. A total of 16,839 citations were written for violations occurring in garvee areas during emphasis patrols, an average of 8.09 citations per day. Approximately 57% of these violations were written by officers on garvee emphasis patrols (paid with Garvee funds). When garvee projects were not in operation, a total of 8,503 citations were written in the same garvee areas, or an average of 6.02

a day. However, by hour, garvee emphasis operations times were not as productive as times when garvee projects were not in operations. Only 3.51 citations were written an hour during garvee project periods and 5.24 citations per hour when garvee projects were not in operations in garvee specific areas. This may be explained by the increased crashes occurring during garvee project operations which take a considerable amount of time for officers to handle.

Garvee14 was the only project having a lower average daily crash rate during patrol emphasis periods compared to other garvee projects. Crashes occurred at a higher rate during Garveee09 with a rate of .43 crashes a day compared to Garvee 13’s daily crashes of .16. On the other hand, Garvee13 was the least productive project with 3.64 citations a day compared to the Garvee14 which had 13.77 citations a day during the project period. An important consideration is that troopers rarely conduct regular patrols in the Garvee13 area (State Highway 16) but primarily focus on Interstate-84, the focus of the other garvee project areas.

Table 10. Daily average citations and crashes by project area and project period

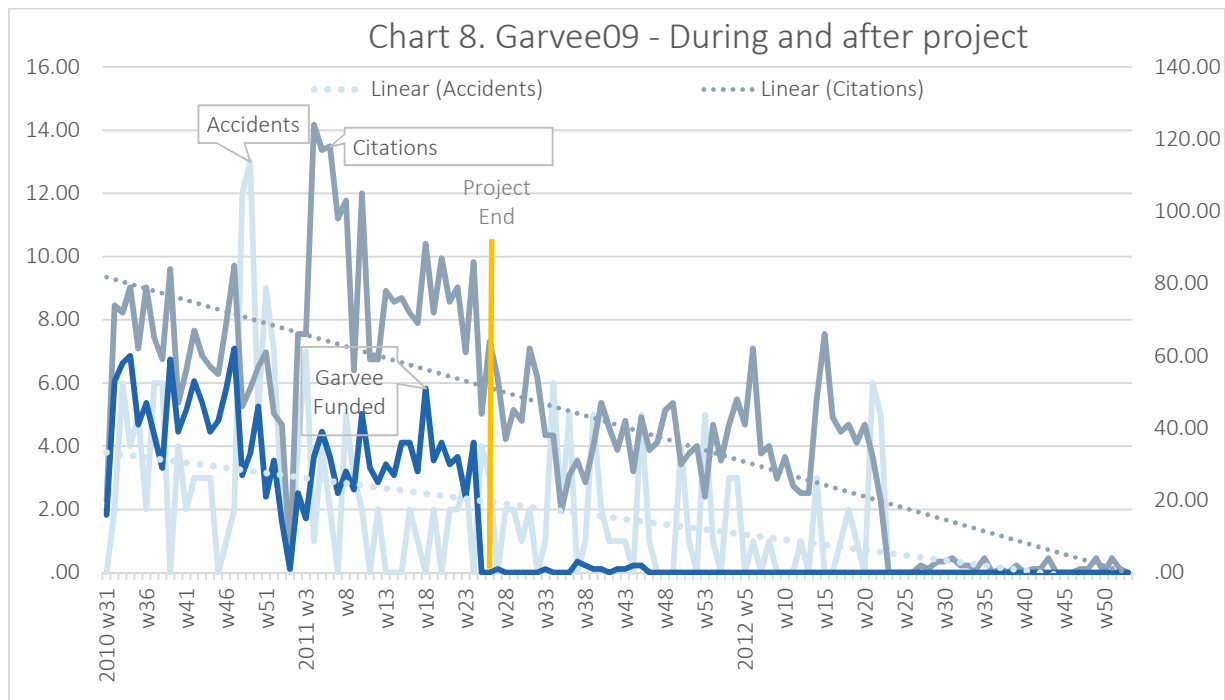
Garvee Project	All Citations				Crashes	
	Citation per day	Garvee per day	Citations per hour	Garvee Citations per hour	Total Crashes	Daily ave. crashes
Garvee 09 - Garvee East						
During	10.09	4.88	2.53	0.78	146	0.43
After	5.52		5.83		77	0.23
Garvee 09/10						
During	1.06	0.47	4.84	0.32	12	0.04
Garvee 10 - Garvee West II						
During	16.41	7.70	2.64	0.83	237	0.39
After	12.81		4.47		105	0.38
Garvee 13 - State Highway 16						
Before	0.55		5.99		11	0.03
During	3.64	2.77	2.98	0.42	91	0.16
Garvee 14 - Interstate 84						
Before	6.93		5.75		145	0.34
During	13.77	5.33	3.91	0.47	70	0.23

Did Garvee Decrease Crashes?

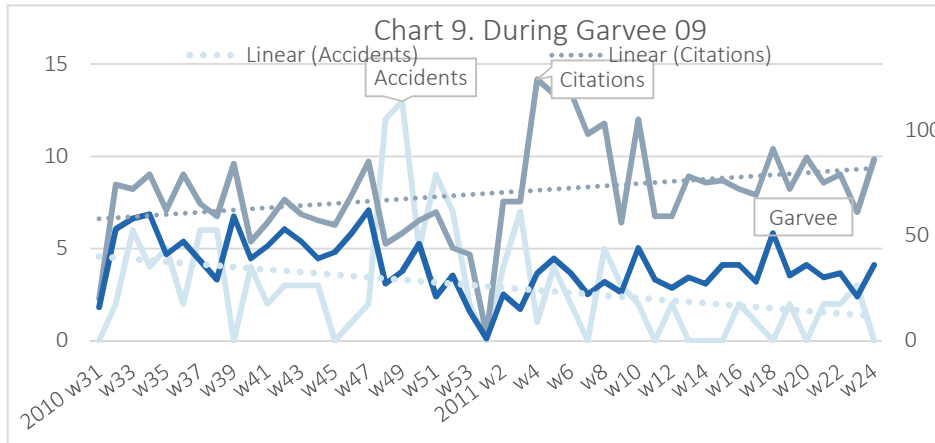
As discussed in the previous section, the daily crash rate tended to be higher during project period, possibly due to road construction. It's possible that the crash rate would be higher without increased enforcement. The charts below plot each garvee project area over time to illustrate the interactions between citations, the garvee project, and crashes.



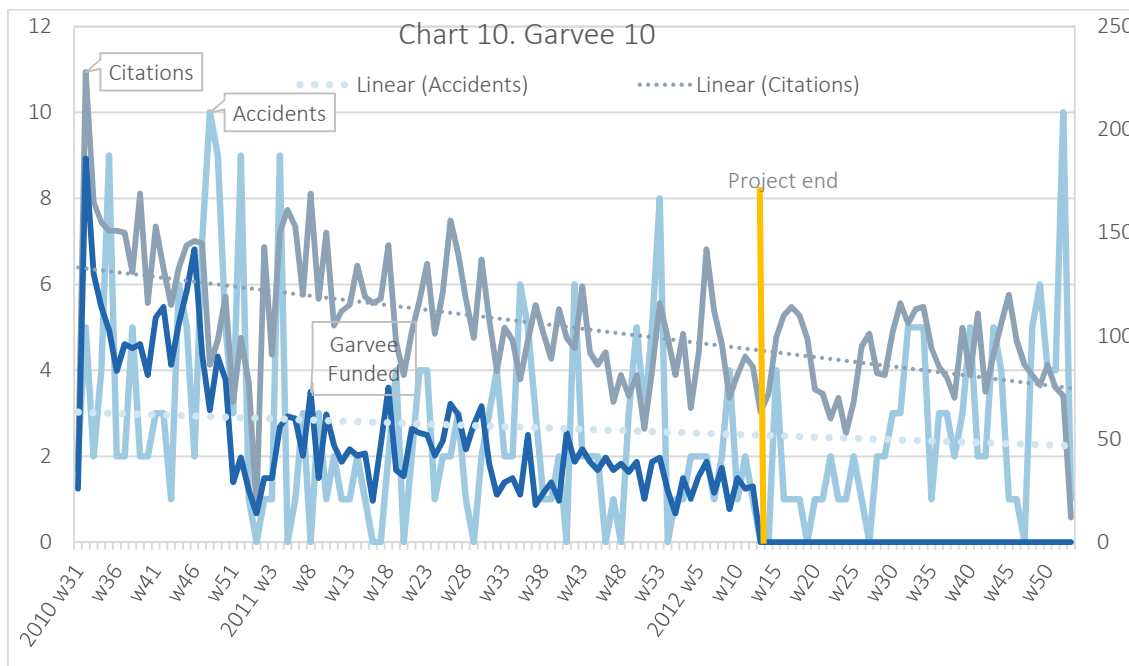
The Chart 8 below shows the dramatic decline of citations in the Garvee09 area after the project ended. In fact, tickets written by officers funded with garvee appeared to be the same as all citations written after the project. Accidents also decreased once construction ended so it is hard to see any affect citations had on accidents. Since Garvee09 started in July of 2009, before citation data was available in the e-tickets database, it is unknown what affect garvee citations had on accidents before July of 2010.



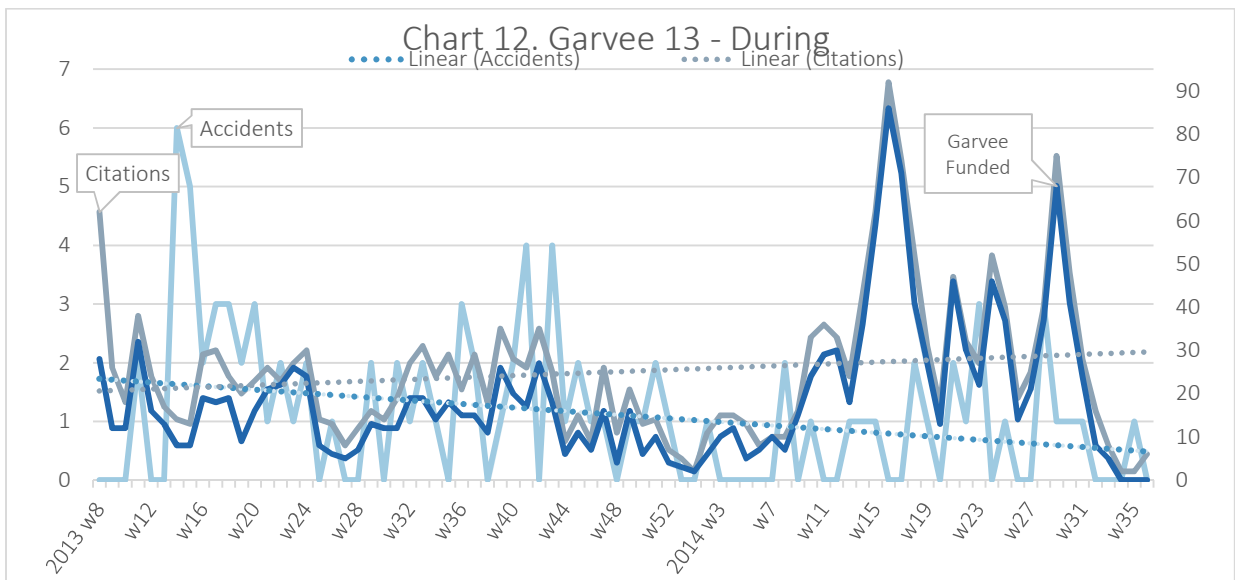
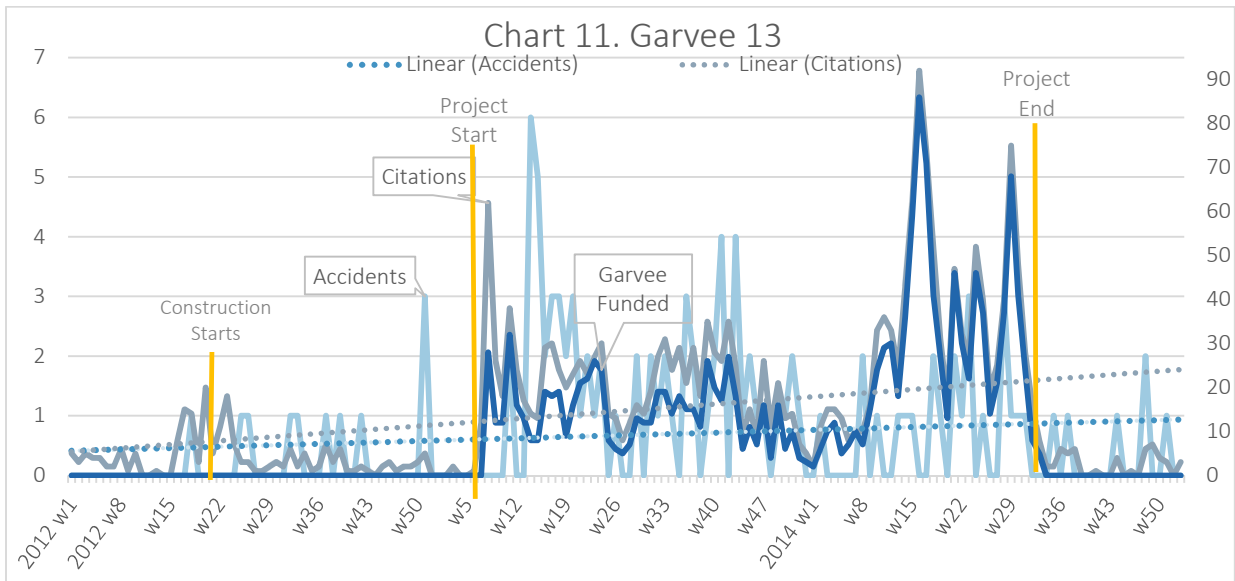
Focusing only on the time period when construction was active, you see that as citations increase, accidents decrease. Chart 9 plots the number of accidents, citations, and garvee funded citations during and after the Garvee09 project period. Further, when citations go up in select weeks, there appears to be a corresponding decrease in accidents (as in week 39 2010).



Garvee10 also started before data was available in the e-tickets database, therefore it is unknown what affect garvee citations had on accidents before July of 2010. The linear relationship between accidents and citations indicates that both decreased with time. Looking at citations and accidents, it appears that accidents and citations have an inverse relationship in most weeks. When citations decreased in a week, accidents increased and when citations increased, accidents decreased.

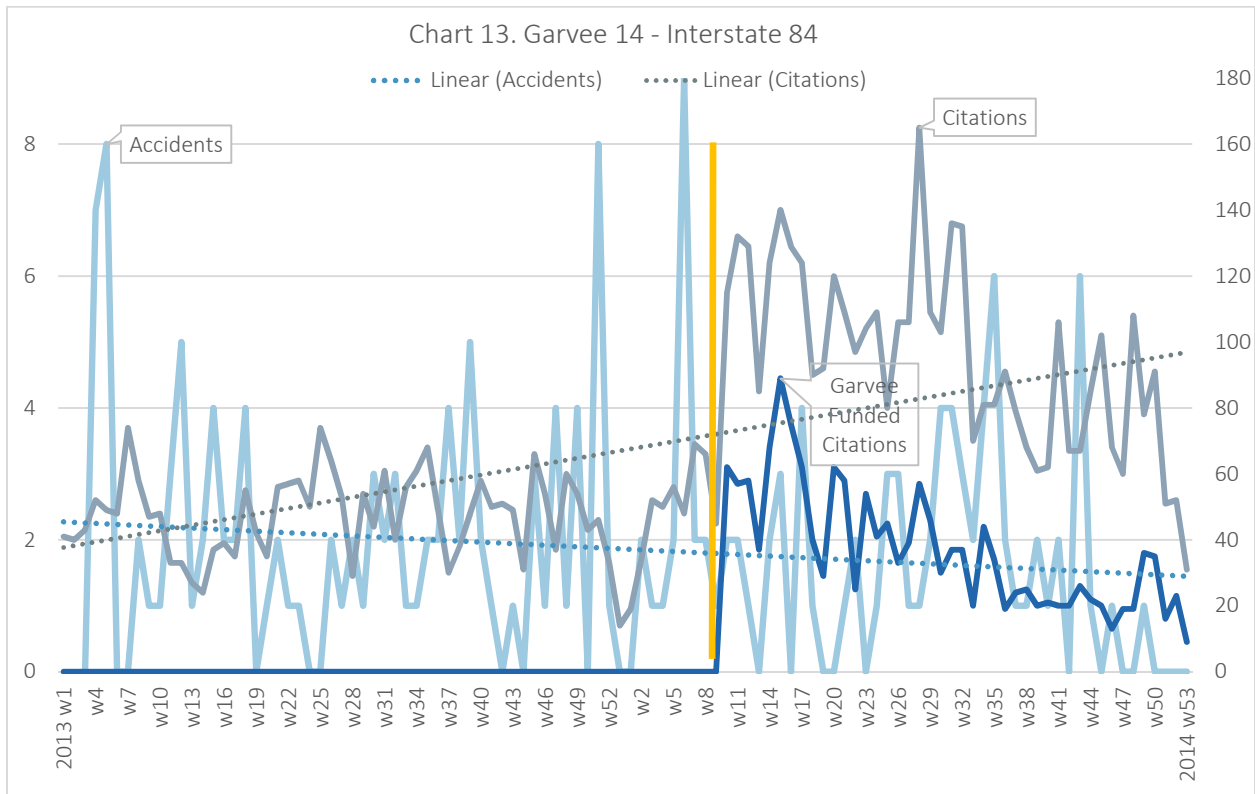


Garvee13 was operational on highway 16, highway 44, and highway 20/26 where a new corridor was being built from highway 15, over highway 44, to highway 20/26. Since the Idaho state police rarely patrols this area on a regular basis, there was very little information on citations before the project. During the project, it was noted by command staff that there was also occasional patrol work being accomplished in and around the construction areas, but not classified as Garvee Overtime Patrols.



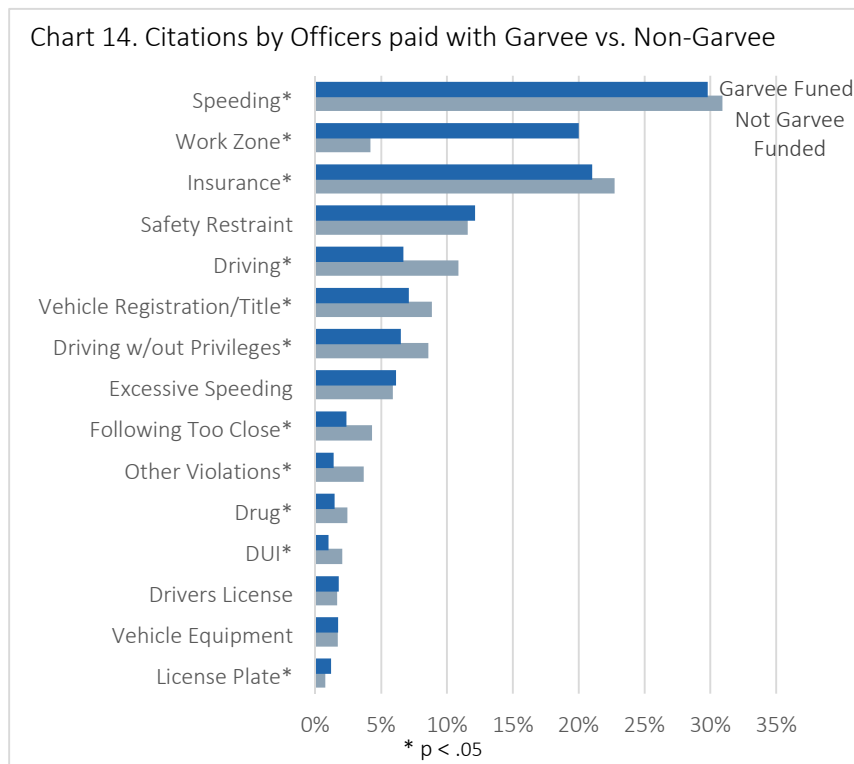
The two charts (Charts 11 and 12) appear to show two different trends. The linear trend for accidents and citations in Garvee13 indicates that both citations and crashes increase. During the project period on the other hand, accidents actually decreased while citations increased. In addition, the majority of citations written during the garvee project period were funded by garvee overtime.

Garvee 14 is perhaps the best illustration of the effect of garvee emphasis patrols on crashes. One can see that before the garvee project, 40 to 80 citations were written a week and there were about 2 accidents a week. Looking at the trend line of accidents and citations, one sees that as citations increased, accidents decreased.



Are garvee emphasis patrol citations different than citations funded by other sources?

Citations written by officers on garvee overtime patrol are more likely to be for work zone violations (20% versus 4%), and license plate violations (20% versus 4%), and license plate violations (no front license plate). Officers not working garvee overtime have more arrests/citations for driving violations (improper lane change, incorrect passing), speeding, failure to have insurance, driving without privileges, driving while under the influence, drug violations, following too close, and vehicle registration or title violations. However, this analysis doesn't consider the project time frame and relies more heavily on timesheet data which was limited in 2010.



Are there significant differences in the types of citations written before or after a project period?

All garvee projects had significantly more male drivers cited during garvee emphasis patrols than the comparison period. Further, more citations were written during the day shift during garvee emphasis patrols. Also during all garvee emphasis patrols, more citations were written, more citations were for work zone violations, vehicle registration/title violations, seat belt violations, lack of insurance, excessive speeding, and driver’s license violations. Citations for speeding, driving without privileges, and driving were more likely to be issued during garvee emphasis timeframes except in the Garvee10 project period where the difference was statistically significant. Since there are some difference between citations written during emphasis patrols and those outside of those timeframes (but in the same location), the next analysis looks at whether there is an effect on crashes.

Table 11. Averages by Garvee Project Areas and Time												
	Garvee09		Garvee10		Garvee13		Garvee14					
	During	Before	During	Before	During	Before	During	After				
Male	7.53	*	3.82	11.10	*	8.86	3.09	*	1.24	9.74	*	4.87
Day Shift Citations	5.93	*	3.71	10.43	*	9.36	1.90		1.63	9.81	*	5.09
Total Citations	10.18	*	5.11	16.17	*	12.81	4.76	*	1.95	13.82	*	7.03
Total Hours	25.74	*	29.79	42.74	*	57.23	14.18	*	12.03	53.98	*	40.40
Work Zone Citation	1.72	*	0.15	2.11	*	0.01	0.72	*	0.00	2.85	*	0.00
Vehicle Registration/Title	0.85	*	0.38	1.46	*	0.83	0.24	*	0.10	1.04	*	0.74
Safety Restraint	1.13	*	0.59	2.27	*	1.45	0.64	*	0.18	1.14	*	0.79
Insurance	2.12	*	1.22	3.68	*	2.91	1.10	*	0.34	2.57	*	1.76
Excessive Speeding	0.94	*	0.44	0.97	*	0.59	0.18	*	0.08	0.68	*	0.42
Driver's License	0.21	*	0.06	0.30	*	0.21	0.08	*	0.01	0.19	*	0.10
Vehicle Equipment	0.18	*	0.07	0.34	*	0.26	0.08		0.07	0.14		0.11
Speeding	2.86	*	1.67	4.44		4.81	1.83	*	1.15	3.57	*	2.11
Driving w/o Privileges	0.61	*	0.35	1.31		1.31	0.20	*	0.07	0.84	*	0.63
Driving	0.81	*	0.49	1.36		1.32	0.28	*	0.17	1.46	*	0.90
Violations after	2.49	*	2.51	3.06		3.03	0.24	*	0.10	0.00		1.20
Violations before	0.37	*	0.37	1.61		1.59	0.18	*	0.05	0.96		0.29
Following Too Close	0.26	*	0.17	0.53		0.59	0.03		0.03	0.78	*	0.33
At construction point	5.03	*	0.00	5.30	*	0.00	0.00		0.00	4.86	*	0.00
Total misdemeanors (history)	6.79	*	6.93	7.75		7.94	0.96		0.53	2.99		3.29
Total felonies (history)	0.04		0.12	1.32	*	2.00	0.00		0.01	0.01	*	0.02
Total Infraction (history)	0.04		0.12	1.32	*	2.00	0.00		0.01	0.01	*	0.02
License Plate violation	0.09		0.06	0.21	*	0.11	0.04		0.03	0.07	*	0.03
Drug	0.11		0.10	0.29		0.38	0.05	*	0.01	0.22		0.16
DUI	0.13		0.09	0.19		0.21	0.06		0.03	0.15		0.15
Other Violations	0.24		0.19	0.38		0.45	0.06		0.04	0.38		0.29

*p<.05

Are there significant differences in the crashes occurring before or after a project period?

There were more accidents occurring during garvee projects except for Garvee 10 (not significant) and Garvee14 which had more crashes before construction. Crashes in the Garvee09 were more likely to be weather related or occur at night than after before construction began. Crashes in Garvee14 locations were just the opposite in having more weather related accidents, night shift accidents and property damage accidents before the project.

Table 12. Accident information by rate per day											
Accidents	Garvee09		Garvee10		Garvee13		Garvee14				
	<u>During</u>	<u>After</u>	<u>During</u>	<u>After</u>	<u>During</u>	<u>Before</u>	<u>During</u>	<u>Before</u>			
Total Accident	0.43	*	0.21	0.39	0.38	0.21	*	0.12	0.23	*	0.35
Weather Related	0.13	*	0.02	0.06	0.05	0.00		0.02	0.00	*	0.12
Night shift crash	0.15	*	0.05	0.09	0.08	0.04		0.02	0.04	*	0.09
Property Damage	0.33	*	0.16	0.26	0.27	0.12	*	0.05	0.04	*	0.20
Total Vehicles	0.75	*	0.38	0.71	0.70	0.42		0.25	0.53		0.61
InjuryC	0.04	*	0.01	0.06	0.04	0.05		0.05	0.11		0.09
Injury Crash	0.10	*	0.05	0.13	0.11	0.09		0.07	0.19		0.15
InjuryA	0.01		0.01	0.02	*	0.00	0.01	0.01	0.02		0.01
InjuryB	0.04		0.03	0.05	0.06	0.03	*	0.01	0.06		0.05
Injuries	0.16		0.09	0.18	0.13	0.12		0.13	0.26		0.21
Speed Related	0.00		0.00	0.00	0.00	0.00		0.00	0.00		0.00
Alcohol Related	0.01		0.00	0.00	0.00	0.00		0.00	0.00		0.00
Fatalities	0.00		0.00	0.00	0.00	0.00		0.00	0.00		0.00
*p<.05											

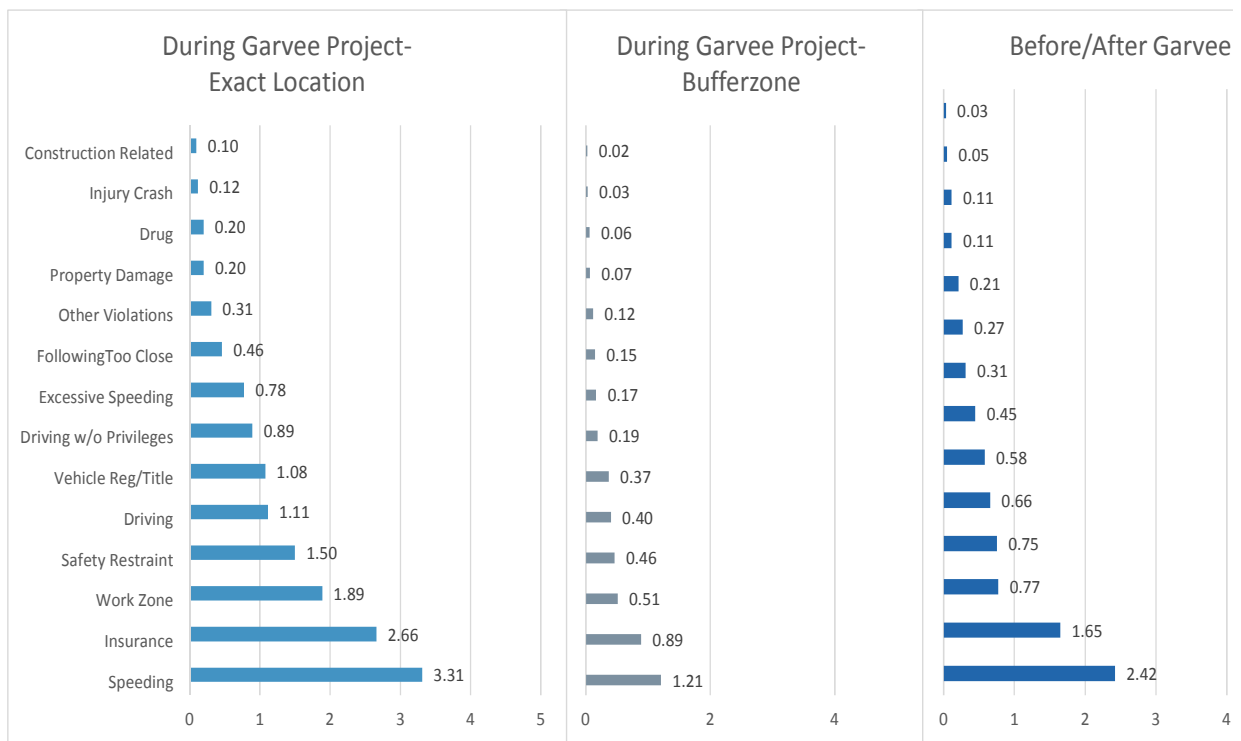
The analysis so far uncovers issues in identifying specific citations related to specific projects due to overlap in time and space as well as limited timesheet information. Therefore, the final analysis separates all crash and citation data into three groups, a treatment group consisting of all citations and crashes occurring during the project timeframe in the exact project locations, all citations and crashes occurring within a buffer zone around the garvee area, and all crashes and citations occurring outside of the project times.

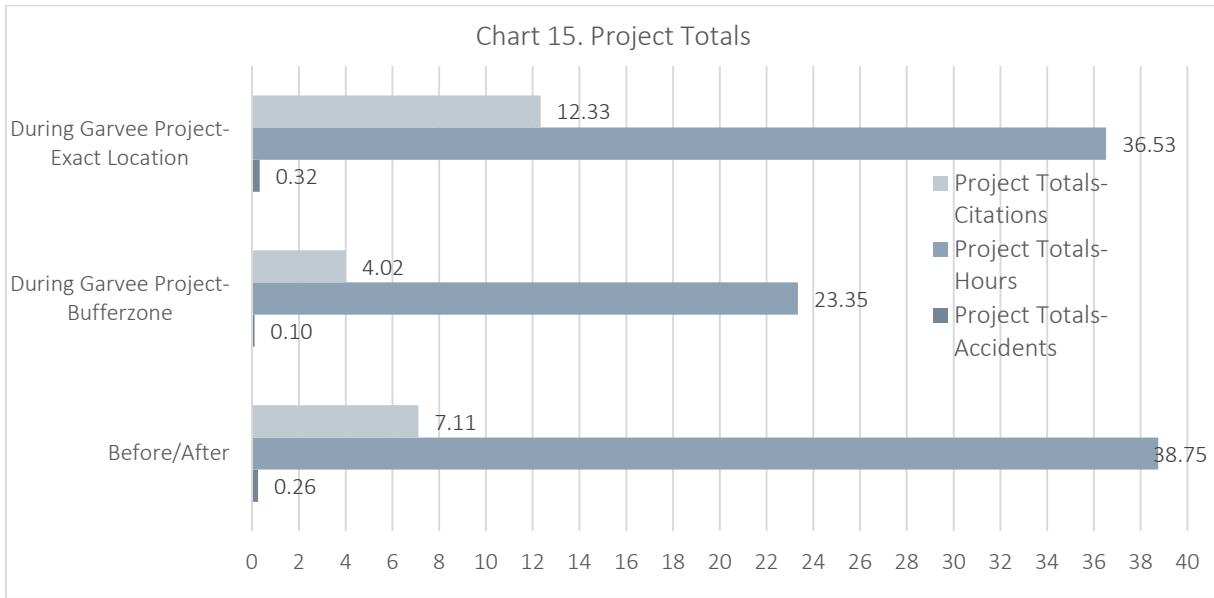
Comparison Groups

Recognizing that Garvee09 and Garvee10 covered some of the same miles and were in operation at the same time for parts of the projects, the data set was divided into three comparison groups. The first are citations/crashes in garvee project areas during the time of emphasis. The second group that contains all citations/crashes during the same time as the garvee project but occur within a five miles radius of the garvee project. The third group contains all citations/crashes in exact garvee project locations but outside of the garvee emphasis timeframes (before/after).

Table 13. Comparison Groups				
Garvee Project	Start Date	End Date	Exact Mile Points	Buffer Mile Points
Garvee 09 - Garvee East				
During	7/25/2010	6/1/2011	I84 47-59	I84 60-62; I-184 0-4
After	7/01/2011	5/31/2012		
Garvee 09/10				
During	7/31/2010	6/30/2011	I84 46	I84 46; I-184 0-4
Garvee 10 - Garvee West II				
During	7/29/2010	3/24/2012	0	
After	4/01/2012	12/31/2012	I84 29-46	I84 24-28; I84 47-51; I-184 0-2
Garvee 13 - State Highway 16				
Before	1/01/2012	1/16/2013	SH16 0-15	SH16 0-6
During	2/08/2013	8/31/2014	20/26 29-44	SH 20/26 29-44
After			SH44 8-22	SH44 8-22
Garvee 14 - Interstate 84				
Before	1/01/2013	2/28/2014		
During	3/01/2014	12/31/2014	I84 44-57	I84 38-43; I84 58-62; I-184 0-4

One-Way Anova comparisons revealed significant differences between the three comparison groups (see figure 2). During garvee project emphasis (exact time and location) there were more citations per day for excessive speeding, speeding, insurance, work zone, safety restraint, driving violations, driving without privileges, following too close, vehicle equipment and driver’s license violations, drug violations, and day shift citations. On the other hand, night time crashes and crashes resulting in injuries were more likely to occur during the project compared to the other two comparison groups. Therefore, although the number of citations per day are higher during the project period, traffic accidents are higher in garvee areas during the project but least highest in the buffer zones.





Conclusion and Implications

The results of this study indicate that although garvee overtime does increase citations and visibility of troopers on the freeway, crashes were still at a higher rate. However, garvee projects did show an inverse relationship between citations and crashes during project emphasis. The most promising project was Garvee14. If the factors that made Garvee14 more successful could be identified, then those best practices could be in place to enhance the safety of Idaho's roads.

ⁱ Idaho Transportation Department, Idaho Office of Highway Safety. Idaho Traffic Crashes 2013.

ⁱⁱ Idaho Transportation Department Work Zone Safety and Mobility program. January 2012.

ⁱⁱⁱ Wright, V. (2010). Deterrence in Criminal Justice: Evaluating Certainty vs. Severity of Punishment. The Sentencing Project. Washington DC. Retrieved at: www.sentencingproject.org.