

July 15, 2014

TO: Members of the MAG Transportation Safety Committee

FROM: Renate Ehm, City of Mesa, Chair

SUBJECT: MEETING NOTIFICATION AND TRANSMITTAL OF TENTATIVE AGENDA

Tuesday, July 22, 2014 9:30 a.m.
MAG Office Building, 2nd Floor, Ironwood Room
302 North First Avenue, Phoenix

A meeting of the MAG Transportation Safety Committee will be held at the time and place noted above. Committee members or their proxies may attend **in person, via videoconference or by telephone conference call**. Those attending video conference must notify the MAG site three business days prior to the meeting. Those attending by telephone conference call please contact MAG offices for conference call instructions.

Please park in the garage under the MAG building, bring your ticket, parking will be validated. For those using transit, Valley Metro/RPTA will provide transit tickets for your trip. For those using bicycles, please lock your bicycle in the bike rack in the garage.

In 1996, the Regional Council approved a simple majority quorum for all MAG advisory committees. If the Transportation Safety Committee does not meet the quorum requirement, members who have arrived at the meeting will be instructed a legal meeting cannot occur and subsequently be dismissed. Your attendance at the meeting is strongly encouraged.

Pursuant to Title II of the Americans with Disabilities Act (ADA), MAG does not discriminate on the basis of disability in admissions to or participation in its public meetings. Persons with a disability may request a reasonable accommodation, such as a sign language interpreter, by contacting Jason Stephens at the MAG office. Requests should be made as early as possible to allow time to arrange the accommodation.

If you have any questions regarding the meeting, please contact Sarath Joshua at (602) 254-6300.

TENTATIVE AGENDA

COMMITTEE ACTION REQUESTED

1. Call To Order

For the July 22, 2014 meeting, the quorum requirement is 10 committee members.

2. Approval of May 27, 2014 Meeting Minutes

2. Review and approve minutes of the Meeting held on May 27, 2014.

3. Call to Audience

An opportunity will be provided to members of the public to address the Transportation Safety Committee on items not scheduled on the agenda that fall under the jurisdiction of MAG, or on items on the agenda for discussion but not for action. Members of the public will be requested not to exceed a three minute time period for their comments. A total of 15 minutes will be provided for the Call to the Audience agenda item, unless members request an exception to this limit. Please note that those wishing to comment on action agenda items will be given an opportunity at the time the item is heard.

3. For information.

4. Program Managers Report

The following items will be addressed:

- Status of RSA and PA projects
- 2014 School Crossing Guard Workshops

4. For information and discussion.

5. MAG Transportation Alternatives Program: Non-Infrastructure - Second Call for Projects

The second call for MAG non-infrastructure Transportation Alternatives (TA) or Safe Routes to School projects, requested applications for programming qualifying project in FY2015. Projects from first call for projects, previously programmed in FY2016 and FY2017, were eligible to be advanced to

5. For information, discussion and possible action to 1) accept the advancement of the FY2016 and FY2017 funds to FY2015 for two Maricopa County projects as previously recommended by the committee and approved by Regional Council in May 2014, and 2) recommend a list of TA non-infrastructure projects for FY2015.

FY2015 as the funding levels for projects were increased from \$45,000 to \$135,000. A total of five project applications were received and are summarized in Attachment One. Two of the projects involve the advancement of previously programmed TA projects to FY2015 and would not require an evaluation. A committee evaluation of the three projects competing for funds was initiated and will be concluded at the meeting. The results of the evaluation will be discussed and a recommendation generated for programming available TA funds for qualifying projects.

6. Update on the Strategic Transportation Safety Plan (STSP) & Adoption of Network Screening Recommendation

The development of the STSP is at about 60 percent completion with work on four of the ten tasks completed. An brief update will be provided on recent project activities.

An STSP project task reviewed the MAG Intersection Network Screening Methodology, described in Attachment Two, developed by the committee to identify intersections with high crash risk. This review has resulted in a recommendation that crash rates should not be included in the methodology as it would create a bias in the final outcome. This will be discussed for possible adoption as a modification to the current methodology.

7. 2014 Corridor Safety Management Plan - Pilot Project - Selection of the Corridor

A new safety project included in the MAG FY2015 Unified Planning Work Program (UPWP) will conduct a pilot for developing a Corridor Safety Management Plan. This pilot will be similar to a Road Safety Assessment but would cover several miles of an urban arterial corridor with significant crash risk based on crash data for the most recent three years. This resulting Plan would address all

6. For information, discussion and possible action to remove the inclusion of crash rates from the Intersection Network Screening Methodology.

7. For information, discussion and possible action to recommend an arterial corridor for the MAG pilot project.

modes of transportation, including pedestrians (with and without disabilities), bicyclists, transit and vehicles. The pilot project would identify potential countermeasures and strategies, including public information campaigns and increased enforcement, that could be implemented to improve road safety. Attachment Three shows the map of Top 100 intersections for crash risk based on 2010-2012 crash data, and the conclusions and recommendations from a 2008 Synthesis of Corridor Safety Programs.

MAG staff recommends identifying a corridor located within a single local agency, to reduce the complexity of the pilot project and also increase its likelihood of success through implementation.

The committee will discuss the study scope and recommend an arterial corridor for the study and the corridor length, based on reported crash data.

8. Bicycle and Pedestrian Pathway/Railroad Crossing Recommendations

Throughout the MAG planning area there are several existing and planned pedestrian/bicycle shared-use paths that cross railroad tracks that are not located on public streets or at intersections. A recent MAG study developed regional guidelines that member agencies may utilize to work with railroads and utility companies to develop safe and appropriate crossing treatments. The recommendations in this document provides a framework for developing crossing treatments for these unique path crossings with railroads.

9. Reports by Committee Members on Transportation Safety Activities

Members will be requested to report agency activities or current issues that are related to transportation safety.

8. For information and discussion.

9. For information and discussion.

10. Request for Future Agenda Items

Members will be provided the opportunity to suggest future agenda topics.

11. Next Meeting

The next regular scheduled Transportation Safety Committee meeting is scheduled to be held on Tuesday September 23, 2014 at 9:30 a.m in the MAG Ironwood Room.

Adjournment

10. For information and discussion.

11. For information and discussion.

MINUTES OF
MARICOPA ASSOCIATION OF GOVERNMENTS
TRANSPORTATION SAFETY COMMITTEE MEETING

May 27, 2014
Maricopa Association of Governments
Ironwood Room, Suite 200
302 N. 1st Ave,
Phoenix, AZ 85003

MEMBERS ATTENDING

Michael Duhamel for Linda Gorman,
AAA Arizona
Tom Burch, AARP
Kohinoor Kar, ADOT
Heather Hodgeman for Shane Kiesow,
City of Apache Junction
*Dana Chamberlin, City of Avondale
#Chris Lemka for Thomas Chlebanowski,
City of Buckeye
Martin Johnson, City of Chandler
Bob Senita, City of El Mirage
*Kelly LaRosa, FHWA
Erik Guderian, Town of Gilbert
#Kiran Guntupalli, City of Glendale

*Alberto Gutier, GOHS
*Hugh Bigalk, City of Goodyear
Nicolaas Swart, Maricopa County
Renate Ehm (Chair), City of Mesa
*Jeremy Knapp, Town of Paradise Valley
#Mannar Tamirisa for Jamal Rahimi,
City of Peoria
*Kerry Wilcoxon, City of Phoenix
#George Williams, City of Scottsdale
Mike Mecham, City of Surprise
Julian Dresang, City of Tempe
*Sam Diggins, RPTA

OTHERS PRESENT

Sarath Joshua, MAG
Margaret Boone, MAG
Monique de los Rios-Urban, MAG
Eric Nava, MAG
Micah Henry, MAG
Kristin Myers, Town of Gilbert
Larry Talley, ADOT
Brian Fellow, ADOT
Mark Poppe, ADOT
Natalie Carrick, Baker

Dawn Coomer, Valley Metro
Anissa Janovich, Valley Metro
Tracey Fejt, Cardon Children
Jothan Samuelson, Wilson
Ellie Volosin, AECOM
Ashley Barinka, City of Mesa
Mike Blankenship, AMEC
Joe Spadafino, CivTech
Doug McCants, Atkins

- * Not present or represented by proxy
- # Participated by teleconference
- + Participated by videoconference

1. Call to Order
Chair Renate Ehm called the meeting to order at 9:31 a.m.
2. Approval of April 9, 2014 Meeting Minutes
Chair Renate Ehm called for a motion to approve the April 9, 2014 minutes. Eric Guderian noted the correct spelling of Kristin Myers' name for revision in the minutes and made a motion to approve, Bob Senita seconded and the motion passed unanimously.
3. Call to Audience
Chair Renate Ehm made a call to the audience providing an opportunity to members of the public to address the Transportation Safety Committee. None requested.
4. Program Manager's Report
 - Strategic Transportation Safety Plan: Sarath Joshua reported that a workshop was held on March 25th to refine the Action Areas, Strategies and that the MAG PM, Margaret Boone is working with MAG Performance Measurement staff to refine the performance measures associated with the strategies developed to complete Technical Memorandum #3. MAG Staff is compiling comments for finalization of Technical Memorandum #4 on the Network Screening Methodology. Task 5 and 6 are currently underway to incorporate safety in the Regional Transportation Plan and the TIP programming process. A Working Group has been formed between the Transportation Safety Committee, Transit Committee and Bike and Pedestrian Committee to come up with practices to include safety in the RTP specifically to address bicyclists and pedestrian safety access to transit. Ms. Boone reported that the working group meetings will be held in June and July.
 - Status of RSA and PA projects: Sarath Joshua reported that one RSA has been completed with the remaining 10 RSAs delayed until fall 2014 when school is back in session. The PA projects will be launched shortly. A workshop on RSAs will be conducted on May 28th to provide basic training on how to conduct an RSA. Local Agency staff is encouraged to participate for information on the RSA process from the agency standpoint and to generate a pool of volunteers that could participate in future RSAs. On-call consultants are required to attend the workshop. Eric Guderian asked if the fall RSAs have been scheduled. Ms. Boone stated that she would send the tentative schedule out to the local agencies who have requested the RSAs.
 - 2014 School Crossing Guard Workshops: Margaret Boone reported that this is the 10th year of providing this training. She noted that a revision of the "Guardians of the Future" video is in the process of filming, editing, and development of animations to be included in the video. Ms. Boone thanked Don Cross from Phoenix, Dale Brunk, Ray Parmigiani from Mesa and Brandon Forrey from Peoria for their help in this production process. Ms. Boone then reported the schedule for the upcoming workshops; July 29th in Phoenix at Washington High School, July 31st at the Mesa Convention Center and August 7th at the Rio Vista Community Center in Peoria.
 - Vice Chair nominations – The Vice Chair position has become vacant due to the current Vice Chair Chris Lemka leaving employment at the City of Glendale. It is likely that he will be nominated by the City of Buckeye. Any others interested should contact MAG.

5. MAG Transportation Alternatives Program: Non-Infrastructure - Second Call for Projects
Margaret Boone provided background information on the Transportation Alternatives program and the need to issue a second call for projects based on previous action of the committee on March 25th and invited Kristin Myers to inform the committee on the recommendation of the working group formed to discuss the guidelines for issuing the second call. Kristin Myers explained that the group first discussed the challenges in programming projects now that school is out and to reduce the stress on local agencies in this effort as well as reasonably meet obligation deadlines recommended issuing a second call to complete programming FY2015 projects only to include 1) existing projects such as the Maricopa County and City of Surprise projects to advance FY2016 and FY2017 funding to FY2015 or increase funding of FY2015 projects 2) other projects that could meet the obligation deadline. Kristin explained that a future call for projects to program FY2016 and FY2017 projects could be issued in early 2015. Ms. Myers provided the working group's recommendation to simplify the application to streamline and combine fields for more meaningful project evaluation and provide better guidance for establishing partnerships. This revision would be in effect for the call for projects to be issued in January of 2015. Ms. Myers then outlined the working groups recommendation to promote and emphasize Safe Routes to School Studies as a comprehensive tool that would include an engineering evaluation of school traffic safety to identify issues unique to each school site, recommend infrastructure and non-infrastructure projects and provide a framework to be used by schools and local agencies in partnership with the community. The studies main deliverable would be a final framework study and new or revised walking/biking route maps. Ms. Myers pointed out the success of a similar study done for the City of Maricopa and the coordination between MAG staff and ADOT to ensure that the scope of work, qualified consultants available on the ADOT on-call contract that would be utilized to administer this type of project would be consistent with the priorities and goals of the committee should they adopt this type of project as a priority. Margaret Boone added that in coordination with ADOT there was a suggestion that was met favorably by ADOT that MAG and the local agency would be included in the consultant selection process for projects using the ADOT on-call consultant list. Ms. Boone noted that the call for projects would be issued that week, applications would be due June 19th, evaluation by the committee members would be in early July and possible recommendation of the FY2015 projects would be on the July 22nd committee meeting agenda. Kiran Guntupalli asked when the applications would be due for FY2015. Sarath Joshua stated that they would be due on June 19th. Margaret Boone noted that the tight schedule is necessary in order to complete the MAG approval process and IGA process in order to meet the FY2015 obligation deadline. Kiran Guntupalli expressed that June 19th is too short a deadline to coordinate projects. Sarath Joshua reiterated that because of the short timeframe the types of projects that would be encouraged based on the working group recommendation are the SRTS studies and the advancement of funds or amended applications from the three existing projects due to be approved by Regional Council on May 28th and suggested that the application due date be pushed to the end of June. Julian Dresang stated that there has been a struggle to program these projects and asked what happens to the amount of the non-infrastructure SRTS funding allocated to the MAG region is left un-programmed and if the funding level of \$400,000 is too high. Sarath Joshua noted that this is the first time this programming has come through MAG and the \$400,000 was decided on with earlier discussions when formulating the TA process as a

whole and that the MAG TIP manager, Terri Kennedy, would have more insight into what happens to the un-programmed SRTS funds. Kristin Myers offered that the funding would go back MAG but that it would be up to Ms. Kennedy as TIP manager to find a funding opportunity. Sarath Joshua also mentioned that if the amount of funding is reduced it would be very difficult to come back in the future and ask for more funding and that the first task is to fully program FY2015 and that with the January call for projects would provide some time for the local agencies to coordinate with schools and school districts we could see more projects than we have funding for. Kristen Myers noted that the state of Ohio has a robust program that requires a study be done to identify safety issues at each school before they apply for funding so that the local agency and schools understand what the issues are going forward and sees this as the type of process that would benefit the MAG region. Sarath Joshua summarized the action to be taken includes 1) issuing a second call for projects with a project cap of \$135,000 and 2) recommendation encouraging SRTS studies, though not limited to the studies but this type of project would be promoted by the committee. **Kiran Guntupalli moved to adopt the guidelines for the second MAG call for TA projects. Kohinoor Kar seconded and the motion passed unanimously.**

6. HSIP Projects in FY2018 -2020

Sarath Joshua stated that this item is on the agenda for information and discussion. Mr. Joshua noted that the MAG region is allocated \$1.9M/year and that the projects for FY2014-2017 are fully programmed. Mr. Joshua noted that going forward we would be looking at projects consistent with those identified in the STSP for improving road safety would be addressed in the next call for HSIP projects, which would likely involve fiscal years 2018 through 2020. Sarath also noted that a list of strategies established through the development of the STSP is available for review in the attachment provided. Mr. Joshua stated that due to the uncertainty of transportation funds it is recommended that the committee discuss the output from the STSP and start identifying projects for the region keeping in mind that the allocation of \$1.9M could change with the reauthorization of the Federal Transportation Bill. Mr. Joshua described an example from the list of strategies that included non-infrastructure projects. Kohinoor Kar stated that the federal rule under the existing Notice of Proposed Rule Making (NPRM) is that all other sources of funding must be expended on non-infrastructure projects before HSIP can be used for non-infrastructure projects. ADOT is going to provide comments on the NPRM that there should be flexibility provided to the states for funding in this area as provided earlier on in MAP-21 legislation. Mr. Kar also stated that the final ruling is anticipated after the comment period which has recently been extended. Sarath Joshua added that with the information from ADOT that we could still look at engineering strategies included on the list to translate into projects with oversight by the committee. Margaret Boone noted that in reference to the engineering strategies developed in the STSP, a possible project could be providing bicycle detection at signalized intersections which addresses the STSP Action Area of Eliminating Death and Serious Injury to Pedestrians, Bicyclists and Persons with Disabilities. Ms. Boone also noted that this agenda item was requested by the committee and that Larry Tally was available at the meeting to address any questions by the committee. Sarath Joshua stated that the next step would be to determine which of these strategies would meet HSIP eligibility. Renate Ehm stated that one of the strategies on the attachment is to implement systemic improvements which in the past were easy to implement such as the pedestrian signals and that she will be interested to see what will

come out of the STSP and feels that providing bicycle detection could be a worthwhile systemic improvement. Sarath Joshua stated that it is important that the local agencies review the list of strategies to come up with a list of project and initiate a dialogue with FHWA and ADOT regarding which projects would be eligible and move forward with those project in the future HSIP programming cycle.

7. Corridor Safety Management Plan – Pilot Project

Chair Renate Ehm stated that the Corridor Safety Management Plan is programmed in the 2015 MAG work program. Sarath Joshua stated that this was a recommendation from the committee as a new project that would be like an RSA conducted for a longer segment including several intersections and look at all facets of transportation including transit, bicyclist and pedestrian safety. The budget for this is \$200,000 as an on-call consultant project to develop a Corridor Safety Management Plan for a high risk corridor in the region that would identify countermeasures to address safety issues. The project would be kicked-off some time in August and the recommendations would be able to compete for a PA or HSIP funding in the future. A corridor has not been identified yet and MAG is seeking input from the committee on selecting a corridor for the pilot project and refine a scope. Mr. Joshua further stated that the extent of the scope will be dependent on the length of corridor and suggested that a working group be formed to identify a corridor and develop a scope of work within the available budget for the project and that the recommendations from the working group would be brought back for possible committee approval at the July 22nd meeting. Mr. Joshua stated that Kerry Wilcoxon had recommended either 35th Avenue or Indian School Road in Phoenix based on the Top 100 high crash risk intersections as a possible corridor. Kohinoor Kar wanted clarification on if the pilot project would develop a regional plan noting that every corridor may differ in traffic and operations and that more data analysis would need to be done for a regional plan than what is normally done for an RSA. Sarath Joshua noted in agreement that there would be more data analysis done with the pilot project which would be to develop a plan for the chosen corridor and not a regional plan. Renate Ehm stated that she feels a Phoenix corridor would be appropriate based on the data that has been available to the committee and endorses their suggestion for moving forward. Eric Guderian stated that the Denver region does a lot of corridor studies that look at access management and turning conflicts that don't typically occur at the intersection and that in looking at a corridor would require looking at data for non-intersection crashes. Sarath noted that if the data indicates issues along a specific corridor show high risk this could be a starting point for a more in depth look at what is going on in the corridor and that there will be several factors that need to be looked at. Julian Dresang stated that it would be interesting to look at a corridor that is multi-jurisdictional so that each agency could benefit from what the other agency are doing. Mannar Tamirisa mentioned the Bell Road corridor.

8. Reports by Committee Members on Transportation Safety Activities

Chair Renate Ehm asked for reports on safety activities from committee members. Kohinoor Kar updated the committee on the status of the State SHSP; the executive committee is in the middle of a three month review of the draft SHSP, comments are being compiled for the final plan to be released in July with implementation anticipated to begin in the summer with the help of a management consultant. Kiran Guntupalli noted the activation of a flashing yellow arrow at 59th Avenue and Olive Avenue which currently ranks #2 on the Top 100 listing which has over 200 pedestrian crossings and to

accommodate that aspect, the flashing yellow arrow is on a time of day plan.

9. Request for Future Agenda Items

Chair Renate Ehm asked for requests for future agenda items. None requested.

10. Next Meeting

Chair Renate Ehm stated that the next meeting is scheduled for Tuesday, July 22nd, 2014 at 9:30 a.m. in the Ironwood Room.

11. Adjournment

Chair Renate Ehm adjourned the meeting at 10:51 a.m.

MAG TA Non-infrastructure SRTS List of Projects

Project No.	Project Name	Lead Agency	Funding Request FY2015	Funding Request FY2016	Funding Request FY2017
First Call for Projects - As Approved by Regional Council on May 28, 2014					
1	DPH - Walk N Rollers	Maricopa County DPH	\$ 45,000.00	\$ 45,000.00	\$ 45,000.00
2	SKMC - Safe Routes for Safe Kids	Maricopa County DPH	\$ 45,000.00	\$ 45,000.00	\$ 45,000.00
3	SRTS Study for City of Surprise Schools	City of Surprise	\$ 24,500.00	\$ -	\$ -
Total Requested 1st Call			\$ 114,500.00	\$ 90,000.00	\$ 90,000.00
Funding Available per FY			\$ 400,000.00	\$ 400,000.00	\$ 400,000.00
Remaining Funds Available After 1st Call			\$ 285,500.00	\$ 310,000.00	\$ 310,000.00

Second Call for Projects - Requests to Advance Previously Approved Projects to FY2015					
1	DPH - Walk N Rollers - Advance FY2016 & FY2017 project to FY2015	Maricopa County DPH	\$ 90,000.00	\$ -	\$ -
2	SKMC - Safe Routes for Safe Kids - Advance FY2016 & FY2017 project to FY2015	Maricopa County DPH	\$ 90,000.00	\$ -	\$ -
Additional FY2015 Funds requested			\$ 180,000.00		
FY2015 Funds Available after 1st Call			\$ 285,500.00		
Remaining Funds After Advancement of DPH & SKMC projects to FY2015			\$ 105,500.00	\$ 400,000.00	\$ 400,000.00

Second Call for Projects - Requests for New Projects					
3	SRTS Study for City of Surprise Schools - Amend project scope to add SRTS Studies for additional schools and increase amount already approved	City of Surprise	\$ 48,000.00	\$ -	\$ -
4	Cityscape - Mapping, Signing & Striping	City of Glendale	\$ 128,000.00	\$ -	\$ -
5	Valley Metro Be Bright "Be Safe, Be Seen, Be Bright"	Valley Metro	\$ 124,315.18	\$ -	\$ -
Total for New Projects			\$ 300,315.18		

Remaining Funds Available	\$ 105,500.00	\$ 400,000.00	\$ 400,000.00
Remaining Funds Available	\$ (194,815.18)	\$ 400,000.00	\$ 400,000.00

**FY2016 & FY2017
To be programmed in Jan 2015**

Network Screening Methodology for Intersections

Introduction

Improving intersection safety is identified in the MAG Strategic Transportation Safety Plan as a regional priority. Recent crash statistics for the region show that 60 percent of traffic related injuries and 40 percent of fatalities are caused by crashes at intersections. In order to target specific locations for road safety improvements it is necessary to screen the region's road network and identify and rank high risk locations. A methodology that helps perform a network screening based on crash risk has been adopted by MAG for this purpose. A network screening approach that is based purely on crash frequency tends to be biased in favor of intersections with high volumes as they will have higher numbers of crashes. Similarly, a network screening that applies weights for different crash severities tend to bias the outcome in favor of location with a high crash high severity. At the 2009 TRB¹ annual meeting a paper on a network screening methodology, based on research work done by the Wisconsin DOT, was presented. This method, with a slight modification, has been adopted for use in the MAG region, and is referred to as the Network Screening Methodology (NSM-I) for Intersections. As recommended in the TRB paper the analysis period was kept to the three most recent years for which crash data are available.

Intersection Safety Network Screening Methodology

The first step in the application of NSM-I is the identification of the complete list of intersections, number of crashes by crash severity (KABCO scale), number of vehicles involved in each crash, collision manner, number of pedestrian involved and the number of bicyclists involved. Only the crashes that are identified in ALISS as "intersection related" will be analyzed in the NSM-I. Since ALISS data cannot be edited by any entity other than Arizona DOT, none of ALISS data will be corrected for errors prior to analysis. In other words, all crash data are assumed to be 100 percent accurate.

The NSM-I generates a composite intersection ranking based on four crash attributes: (a) Crash Frequency (CF), (b) Crash Severity (CS), (c) Crash Type (CT) and (d) Crash Rate (CR). The fourth factor CR was not included in the Wisconsin DOT methodology. The MAG Transportation Safety Committee determined it was necessary to include crash rates in the network screening analysis.

¹Qin X., Laracuante L., Noyce D.A., Chitturi M. *Systemwide Intersection Safety Prioritization Development and Assessment*. In TRB 2009 Annual Meeting, Washington, D.C.

Crash Frequency (CF)

The total number of crashes that occurred during the period of analysis, or crash frequency, at each intersection is first summarized. The Crash Frequency Score or **CF Score** for any intersection is the ratio of, the crash frequency at the intersection to the highest intersection crash frequency for the region, for the same period of analysis.

CF Score for Intersection i

= (Total number of crashes at Intersection i/ Highest number of crashes recorded for any intersection in the analysis area)

Crash Severity (CS)

Every crash is assigned a crash severity (KABCO scale) based on the highest resulting injury from the crash. The equivalent sum of all crash severities, or CS value, for an intersection can be generated by the application of the KABCO weight scale shown in Table 1. An intersection's CS value is calculated as the sum of the products of the total number of crashes of a particular severity multiplied by the weight associated with that crash severity. The **Crash Severity Score** for an intersection is the ratio between CS value for the intersection to the maximum CS value for the network being analyzed.

CRASH SEVERITY	WEIGHT
Fatal Crash(K)	1,450
Incapacitating (A)	100
Non-Incapacitating (B)	20
Possible Injury (C)	11
PDO (O)	1
Unknown	1

Table 1. Crash Severity Weights

Crash Type (CT)

The ALISS database provides information on the Crash Type or Collision Manner for each recorded crash – such as rear-end, right angle, head-on etc. Campbell and Knapp² have described a procedure for calculating the average crash cost per vehicle/pedestrian/bicyclist for different types of collision manner. This method is utilized in the Wisconsin DOT methodology. Table 2 lists the estimated crash cost by crash severity provided by FHWA, same as that used by ADOT.

Table 2: Crash Cost by Injury Severity

Crash Severity	\$ Value
Fatal Crash(K)	\$5,800,000
Incapacitating (A)	\$400,000
Non-Incapacitating (B)	\$80,000
Possible Injury (C)	\$42,000
PDO (O)	\$4,000
Unknown	\$4,000

These crash costs were used to calculate the average cost per vehicle, pedestrian or bicyclist that is involved in any crash of any particular Crash Type or Collision Manner. This calculation requires a detailed examination of crashes, with the number of vehicles, pedestrians and bicyclists involved in each. All intersection related crashes in the database were queried for the number of crashes by injury severity, number of units involved in the crashes and by collision manner. Table 3 shows the results, as the cost per each vehicle/pedestrian/bicyclist involved in any crash of a particular collision manner.

²Campbell J.R., Knapp K., *Alternative Crash Severity Ranking Measures and the Implication on Crash Severity Ranking Procedures*. Proceedings of the Mid-Continent Transportation Research Symposium, Ames, Iowa, 2005

Table 3. Crash Costs by Crash Type per Vehicle / Pedestrian /Bicyclist.

Injury Severity	REAR END		ANGLE RIGHT ANGLE		SINGLE		SIDE SWIPE SAME DIRECTION		ANGLE OPPOSITE DIRECTION	
	Crashes	Units	Crashes	Units	Crashes	Units	Crashes	Units	Crashes	Units
O	23,133	48,912	17809	36534	4289	4289	7635	15535	12064	24845
C	6,488	14,405	5941	12632	532	532	702	1465	5035	10708
B	2,088	4,839	4249	9210	750	750	284	640	3971	8557
A	350	854	1183	2684	208	208	70	164	1189	2597
K	29	73	165	381	28	28	8	19	101	219
Unknown	0	0	0	0	0	0	0	0	0	0
	\$840,268,000	69,083	\$2,090,878,000	61,441	\$345,100,000	5,807	\$157,144,000	17,823	\$1,638,806,000	46,926
Cost Per Vehicle	\$12,163		\$34,031		\$59,428		\$8,817		\$34,923	

Injury Severity	REAR TO SIDE		SIDE SWIPE OPPOSITE DIRECTION		HEAD ON		OTHER & UNKNOWN		# of Pedestrians	# of Bicyclists
	Crashes	Units	Crashes	Units	Crashes	Units	Crashes	Units		
O	1731	3466	403	836	195	410	558	1206	108	312
C	75	152	50	108	79	180	100	222	411	700
B	18	36	44	106	90	200	116	271	660	1010
A			14	34	36	80	35	89	318	223
K			1	3	8	19	7	21	62	12
Unknown	0	0	0	0	0	0	0	0	24	63
	\$11,514,000	3,654	\$18,632,000	1,087	\$72,098,000	889	\$70,312,000	1,809	\$557,390,000	270,500,000
Cost Per Vehicle	\$3,151		\$17,141		\$81,100		\$38,868		\$352,110	\$116,595

Table 3: Crash Cost per Vehicle / Pedestrian /Bicyclist.

Table 4 Summary of Per Unit Crash Costs

Crash Type/Collision Manner	Cost per Vehicle / Pedestrian / Bicyclist
Rear End	\$ 12,163
Angle Right Angle	\$ 34,031
Single	\$ 59,428
Side Swipe Same Direction	\$ 8,817
Angle Opposite Direction	\$ 34,923
Rear To Side	\$ 3,151
Side Swipe Opposite Direction	\$ 17,141
Head On	\$ 81,100
Other & Unknown	\$ 38,868
Pedestrian Crashes	\$352,110
Bicyclist Crashes	\$116,595

The Crash Type (CT) Cost for an intersection is calculated by multiplying the number of units involved in a crash by the cost per vehicle/pedestrian/bicyclist for each type of collision manner, and summing the results.

$$CT \text{ Cost} = \sum_{i=1}^n (N_i * CM_i)$$

N_i - Number of units (vehicles, pedestrians or bicyclists) involved in a crash of a specific Collision Manner

CM_i - Cost per Vehicle/Pedestrian/Bicyclist by Collision Manner (see Table 4)

n - Number of crashes at the intersection

The Crash Type Cost for an intersection is ratio between Crash Type Cost at a particular intersection to maximum of Crash Type Cost at all intersections in the region.

Crash Rate (CR)

The Wisconsin DOT methodology was modified by MAG by the addition of the Crash Rate, the fourth factor, as suggested by the MAG Transportation Safety Committee in October 2009. This factor is defined as follows:

CR value for intersection i
 = Average annual crash rate at intersection i for the analysis period / Maximum value of all average intersection crash rates for the region
 = CR / Max (CR)

The first application of this methodology was for identifying the 100 high crash risk intersections in the MAG region, using crash data for 2006, 2007 and 2008. There were over 17,000 specific intersection crash locations during this analysis period. The computation of CR values for this many intersections was deemed infeasible at this time due to lack of traffic volume data at these locations for each of the 3 analysis years. Therefore, the highest ranked 100 intersections were determined first based on interim intersection safety scores that were based ONLY on CF, CS and CT, with the weights 1/5, 3/5 and 1/5 respectively.

$$ISS = \left(\frac{1}{5} * \frac{CF}{\text{Max}(CF)}\right) + \left(\frac{3}{5} * \frac{CS}{\text{Max}(CS)}\right) + \left(\frac{1}{5} * \frac{CT}{\text{Max}(CT)}\right)$$

Next, the CR values were determined for these 100 intersections and applied in the final step to determine the Intersection Safety Score as described next.

Intersection Safety Score (ISS)

The final Intersection Safety Score (ISS) for an intersection is determined by combining all four scores, as shown in the formula below. Severity Index score CS is weighted higher in the final scoring process as the motive of the Network Screening process is to eliminate crashes with higher severity at intersections.

$$ISS = \left(\frac{1}{5} * \frac{CF}{\text{Max}(CF)}\right) + \left(\frac{2}{5} * \frac{CS}{\text{Max}(CS)}\right) + \left(\frac{1}{5} * \frac{CT}{\text{Max}(CT)}\right) + \left(\frac{1}{5} * \frac{CR}{\text{Max}(CR)}\right)$$

Synthesis Study: Effectiveness of Safety Corridor Programs, Report on Tasks 1–3



Final Report July 2008

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SYNTHESIS STUDY: EFFECTIVENESS OF SAFETY CORRIDOR PROGRAMS, REPORT ON TASKS 1–3

**Final Report
July 2008**

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4. CONCLUSIONS AND RECOMMENDATIONS

Most safety corridor programs across the United States are similar, but no single program will fit every state’s needs. Roadway and crash characteristics, as well as the availability of safety funds, differ from state to state. Each state DOT must decide which aspects of the safety corridor process will effectively and efficiently accommodate its organization’s needs. A multidisciplinary 4E effort has proven to be an effective solution to improving a roadway’s safety. Sharing and dissemination of information between states is an integral part of the U.S. goal of reducing traffic fatalities. This synthesis encompasses the current state of the practice in safety corridor programs across the U.S. and provides characteristics of these successful safety corridors that states can use when addressing sections of a highway system with higher crash histories. Table 1 lists the characteristics of successful programs by state. Each characteristic of the safety corridor programs is discussed in more detail below.

Table 1. Characteristics of successful safety corridors, by state

State	Characteristic Observed												
	1. Multidisciplinary	2. Limited Number	3. Crash Data	4. Champion	5. Safety Action Plan	6. Legislation	7. Special Signage	8. Road Safety Audits	9. Minimal Engineering	10. Length	11. Decommissioning	12. Selection Criteria/MOEs	13. “After” Data
Alaska	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓
California	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Florida	✓		✓	✓					✓	✓		✓	✓
Kentucky	✓	✓	✓				✓	✓	✓			✓	✓
Minnesota	✓						✓	✓	✓	✓			
New Jersey	✓	✓	✓	✓		✓	✓	✓			✓	✓	✓
New Mexico	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓
New York	✓	✓	✓	✓	✓					✓		✓	
Ohio	✓	✓	✓				✓		✓	✓	✓	✓	✓
Oregon	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pennsylvania	✓		✓			✓	✓		✓	✓		✓	✓
Virginia	✓	✓	✓			✓	✓		✓	✓		✓	✓
Washington	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓

4.1. Safety Corridor Program Characteristics and Recommendations

Based on the results of the synthesis, the following list summarizes the characteristics, good practices, and other items found in safety corridor programs across the U.S.:

4.1.1. Multidisciplinary

Most states agreed that there was not a single cause for the higher crash frequencies along particular stretches of highway and consequently believed that a group of solutions needed to be considered. This called for a broad-based approach to both problem identification and countermeasure selection. The task force teams were most often led by the state DOTs. California's efforts were led by the Highway Patrol, and Washington's efforts were many times headed by the local jurisdiction. **Regional planning organizations were shown to be important members with special skills in bringing together disparate groups.** In addition to representatives from education, enforcement, engineering, and emergency responders, consideration should be given to inviting traffic court prosecutors and judges to serve on the safety corridor team.

Consensus and Recommendations: A multidisciplinary approach should be used; most states also included emergency medical providers, which represent the fourth "E" in the 4E approach.

4.1.2. Limited Number

In general, successful states limited the number of active corridors at one time because they believed that too many would result in a lack of focus and effectiveness. Drivers may become desensitized to the effect of safety corridors if too many are implemented. The range of active safety corridors per state was from 3 to 12 at one time. Several states started with one or two pilot corridors, while some states selected one per DOT district.

Consensus and Recommendations: Limit the number of active corridors at one time; too many become ineffective. Pilot corridors should be developed first.

4.1.3. Crash Data

The use of crash and fatal/injury data was common among all states in the safety corridor selection process. Some states simply used a crash frequency number or a crash rate, while others used a combination of frequency and rate for preliminary selection of corridors. A crash rate that was 10% greater than the statewide average for similar roadways was found to be a common statistic. Once the preliminary group of corridor candidates was determined, the states typically used some type of ranking process dependent upon location, volume, severity of crashes, etc. The top three to five corridors were then selected for a safety corridor program, **usually starting with one or two pilot corridors.** The same data used for selection of a corridor should also be used after implementation of safety measures in performance analysis to ensure consistency.

Consensus and Recommendations: Crash and death/injury data, including rates, should be consistently used for selection, evaluation, and decommissioning.

4.1.4. Champion

Many successful programs were supported by one “figurehead” or spokesperson. This person, usually working in the state DOT headquarters, was a constant champion for the safety corridor program. The champion acted on behalf of the local safety corridor task forces to provide lines of communication between the state DOT and all of the stakeholders involved. This person was often an informational source about the corridor process as well as someone to provide suggestions to the task force for sources of possible funding.

Consensus and Recommendations: A statewide champion encourages the success of a program by guiding the selection of corridor, maintaining uniformity in the program, and identifying and distributing available funding.

4.1.5. Safety Action Plan

A comprehensive plan developed by the multidisciplinary task force was important in the safety corridor process. The task force should begin drafting a Safety Action Plan (SAP) at the first meeting, outlining the ideas and steps needed to successfully implement and manage the safety corridor. In this plan, the corridor’s safety problems, crash history, and 4E mitigation strategies for the duration of the project should be documented. The engineering, education, enforcement, and EMS activities should all be outlined step by step in the SAP before the safety corridor is initiated. Throughout the process, the task force should meet regularly (quarterly) to update the SAP, discuss the results achieved, and develop any new strategies needed.

Consensus and Recommendations: A multidisciplinary corridor SAP should be developed by a task force that meets regularly for continual review and monitoring of the plan and strategies.

4.1.6. Legislation

Safety corridor legislation was enacted in about half of the surveyed states to establish the corridor program and impose enhanced fines for traffic-related offenses. Some states found it difficult to pass such legislation, while others had positive political support. One state innovatively attached the safety corridor legislation to legislation for double fines in work zones. Legislation gives tremendous support for overtime and targeted enforcement efforts.

Consensus and Recommendations: Legislation can be valuable to establish corridor criteria and permit increased fines. This can be important in the success of the enforcement effort and driver performance.

4.1.7. Special Signing

Signs designed specifically for safety corridors were often used among the states. Depending on the sign purpose, some states used black on white regulatory signs to designate the beginning of a safety corridor, some used black on yellow warning signs, while others used white on green informational signs. Supplemental safety corridor placards were sometimes added to speed limit signs throughout the corridor as well. The signs need to be easily identifiable and serve a purpose within the safety corridor by both advising and warning drivers of the extra emphasis on safety in that roadway section..

Consensus and Recommendations: Special signing in safety corridors should be used. “Safety Corridor – Fines Doubled,” “Enhanced Speed Limits,” and “Lights on for Safety” are typical messages.

4.1.8. Road Safety Audits

For the last several years, the FHWA and many state DOTs have adopted and promoted a multidisciplinary, team-based safety assessment process, RSAs, as a means of improving the practices/procedures/standards relative to the safety of newly constructed highways and existing facilities. Detailed guidelines for conducting these audits have been developed (FHWA 2006). States with successful safety corridor programs believe some type of safety review should be conducted initially on the selected corridors. Many suggested the RSA approach as one that is well established and appropriate for safety corridors. A typical RSA process can be found in Appendix E.

Consensus and Recommendations: An RSA or another type of detailed, multidisciplinary safety review should be conducted initially on the selected corridors to ensure a comprehensive and potentially successful effort.

4.1.9. Low-cost Engineering

Most states typically focused primarily on education and enforcement efforts, with minimal actual engineering improvements. Safety corridors were sometimes used as temporary measures for improving safety when a larger engineering improvement was planned in the future (generally 3–10 years). Any engineering improvements were based on specific crash types and trends observed in the corridor. A focus on driver behavior through educational information and enforcement presence was most important for the safety corridors identified in this synthesis.

Consensus and Recommendations: In general, safety corridor strategies include only low-cost engineering improvements, such as signing upgrades, center line and edge line rumble stripes/strips, and similar measures. However, these improvements can be valuable in reducing common crash causes such as run-off-road crashes.

4.1.10. Length

The length of a safety corridor varied widely from state to state. Some states preferred a length of 3–20 miles, while Kentucky extended its corridors across multiple counties and had corridors that exceeded 50 miles. The constant in successful programs was that the corridor had similar roadway and driver characteristics throughout. Corridor length can have positive and negative aspects: shorter corridors are easier to enforce, while longer corridors attract a wider distribution of road users' awareness.

Consensus and Recommendations: No subjectively determined safety corridor lengths should be specifically set, but selected sections should have homogenous characteristics throughout.

4.1.11. Decommissioning

Most states had some type of decommissioning process incorporated into the safety corridor program. Decommissioning is used to avoid desensitizing road users to the safety practices employed. Decommissioning should take place after safety measures have been shown to improve and should use the same criteria that were employed in the selection and evaluation process. A good goal might be an improvement in safety over two to three consecutive years following implementation.

Consensus and Recommendations: Decommissioning is important after an improved safety measure is achieved, as applied funds can then be applied to other corridors where the need is greater.

4.1.12. Selection Criteria and Measures of Effectiveness

Most states' selection criteria and MOEs were typically not very statistically rigorous. As mentioned above, simple crash rates or frequencies were generally calculated and ranked fairly simply. A few states used a more detailed method that included many factors for ranking high-crash corridors. Whatever method chosen, the criteria should be able to meet statistical tests.

Consensus and Recommendations: Selection criteria and analysis of MOEs should be statistically rigorous to assure effective and data-supported results.

4.1.13. "Before" and "After" Data

Due to the newness of some states' safety corridor programs, detailed analyses were difficult to identify. "Before" and "after" data are important for determining the success of a safety corridor so the program can constantly improve safety. Statistical analysis of data after implementation was limited in many states, and simple crash frequencies and rates and speed distributions were examined. However, for statistically valid data at least three to five years of "after" data is needed in most instances. The drivers' response to the safety corridor activities is also important to achieve the desired results of improved performance and reduced crash rates.

Consensus and Recommendations: Most states have limited “after” data and considered such factors as number of crashes, injuries, speeds, and similar measures. Comprehensive “before” and “after” data, as well as driver reaction, are all important in the success of a safety corridor.

4.2. Other Issues

4.2.1. Pedestrians

Pedestrian issues are very important in the more urban safety corridors, and in two of the corridors the researchers observed this was a primary issue/problem.

4.2.2. Miscellaneous

Several items pertaining to safety corridors that may be of interest include the following:

- The Vancouver, Washington, police officers place a red “Safety Corridor” stamp on their tickets so that prosecutors and judges recognize that the violation occurred in an area where there is a safety problem/focus.
- Kentucky initiated a special program for high schools along the safety corridor.
- Motorcycle police enforcement is prevalent in some urban safety corridors.
- Washington used safety corridor placards or bumper stickers on the back of large trucks traveling through the corridor to further enhance the designation awareness.

4.3. Supplemental Information

In June 2008, the states with known safety corridor programs were contacted again to gather additional data, either through a survey form or through personal contact.

The states’ responses to this survey are summarized under the survey questions below. The complete responses are on file in the CTRE office.

4.3.1. Which agency has the major responsibility for and manages the safety corridor program?

In most states, the DOT has assumed major responsibility for the establishment of safety corridors and related activities. However, in many states the Governor’s Traffic Safety Office and law enforcement are also involved. In California, the CHP is the responsible agency.

4.3.2. What are the major funding sources for operation of the safety corridor?

Funding sources vary among the states. Roadway improvements are generally funded through federal programs, such as the HSIP, or state funds. For enforcement and education efforts, NHTSA funding, either Section 402 or 406, is common. Even relatively small levels of funding

can be valuable as “seed” funds or ways to leverage other funding opportunities. A reliable source of funding is very important for the administration of a successful safety corridor program.

4.3.3. Are citation revenues used for a specific purpose related to safety corridors?

Almost all states responded negatively to this question, but Alaska legislation allows these revenues to be used to continue policing programs. New Jersey also uses citation revenue for low-cost engineering improvements and enforcement efforts.

4.3.4. Has public reaction to safety corridors been positive, negative, or ambivalent and, if negative, how was that addressed?

Most states have experienced no negative public reaction to safety corridors, but no significant positive reaction either. In California, when some concern was raised by certain advocacy groups, special efforts to include these groups in the planning process were undertaken and extra communication was used to build consensus. Kentucky and Washington indicated a positive public reaction to safety corridors.

4.3.5. Were or are emergency responders included in the planning or managing of the safety corridors or were any special accommodations included for EMS in the program?

Involvement of emergency responders in safety corridor programs varies widely among the states. Some states do not include EMS at all, while EMS representatives are active members of safety corridor teams in Alaska, California, Kentucky, and Washington.

4.3.6. Has reaction to safety corridor citations by judges, magistrates, and prosecutors been supportive, negative, or ambivalent?

Most states have not experienced much specific reaction from these groups, but not much support either. California has invited representatives from prosecutorial groups and judges to serve as safety corridor task force members. Virginia reported a good overall reaction, and Pennsylvania has undertaken an outreach program to district judges that has yielded positive results. The use of an advisory stamp on safety corridor citations in Washington has seemingly resulted in a positive response from judges.

4.3.7. Has there been any involvement by schools and/or news media in the safety corridor program? If yes, please explain.

The news media has proven a valuable asset in many safety corridor programs, sometimes by creating awareness of the need for attention to safety concerns. No state reported negative media coverage. Kentucky and Virginia advised outreach programs for schools. Washington has experienced considerable involvement by schools in the safety corridor efforts. News media coverage has also been good in Washington.

4.3.8. Were any specific Federal DOT resources applied to the safety corridor program?

The states generally reported the use of funding from federal programs such as HSIP for engineering improvements and used NHTSA funding for enforcement and educational efforts. No other federal programs were mentioned.

4.3.9. Law Enforcement Information

1. Are both state and local law enforcement agencies involved?

Most states reported that both state and local enforcement agencies are involved in safety corridor activities. In California, apparently the State Patrol contributes all uniformed officers for enforcement and outreach efforts.

2. Were more citations issued following designation of safety corridors?

Responses were mixed for this question. Some states experienced an increase, others did not, and some did not specifically track the data.

3. Are citation revenues used to offset additional enforcement costs?

All responding states replied negatively to this question except Alaska and New Jersey, where these revenues can be used for enforcement and low-cost engineering, respectively.

4. If special enforcement efforts were applied, such as overtime or increased surveillance, how are the additional costs handled?

No special funding sources were reported. Section 402 funding and agency budgets were applied as needed.

5. Was improved driver performance and/or reduced crashes observed following designation of safety corridors?

All states reported improvement in driver performance, as evidenced by decreased crash levels. However, performance could sometimes be observed returning to pre-safety corridor levels later and during periods of more normal enforcement efforts.

4.3.10. Was enabling legislation enacted for the establishment of safety corridors?

States were split on this issue, most did have some form of enabling legislation in place, but many did not. Copies and descriptions of some legislation are included in Appendix B of this report.