ELCSI-PFS 2005 TAC Meeting Notes

The following are the March 8th, 2005 meeting notes as distributed to the Low Cost Safety Improvements Pooled Fund Steering Committee:

Low Cost Safety Improvements Pooled Funds Study
Steering Committee Meeting Agenda
Tuesday, March 8th, 2005
Turner Fairbanks Highway Research Center

Agenda	
7:30– 8:00	Breakfast
8:00 – 8:30	Welcome, Introduction, and Overview of Steering Committee Activities, Kerry Perrillo and Michael Trentacoste
8:30 – 9:00	Overview of Preliminary Survey Findings, Kim Eccles
9:00 – 9:30	Presentation on Study Designs, Dr. Bhagwant Persaud

Meeting attendees will be divided into two groups to discuss each of the potential strategies, share their experiences, and assess the feasibility of evaluating each strategy. Each group will be asked to identify those strategies which should not be considered for the study.

9:30 – 10:30	Breakout Sessions Group A: Lane Departure (led by Dr. Hugh McGee) Group B: Unsignalized Intersections and Aggressive Driving (led by Kim Eccles)
10:30 – 10:45	Break
10:45 – 11:45	Breakout Sessions Group A: Unsignalized Intersections and Aggressive Driving (led by Kim Eccles) Group B: Lane Departure (led by Dr. Hugh McGee)
11:45– 12:00	Reconvene and Summary of Morning

12:00 –1:00	Lunch
1:00 – 1:15	Explanation of Balloting Procedures
1:15 – 2:30	Open Balloting
2:30 – 3:00	Summary of Ballots and Discussion of Results
3:00 – 3:15	Break
3:15 – 4:30	Discussion of Anticipated Implementation of Strategies
4:30 – 5:00	Next Steps
5:00	Meeting Adjournment

Introduction, and Overview of Steering Committee Activities

Mike Trentacoste (FHWA) welcomed the group and discussed housekeeping items

Kerry Perrillo (FHWA) gave an overview of AASHTO participation and an evolution of the study. She gave an explanation of the strategies eliminated and the high cost strategies included.

Overview of Preliminary Survey Findings

Kim Eccles (BMI–SG) welcomed the group, and gave an overview of the survey project and the survey findings. She explained that the strategies that were redundant or proven were removed.

Kim discussed the survey results of the Lane Departure and Unsignalized Intersection Strategies

Tom Welch (IA) asked for an explanation of U30: Enhanced signing and delineation

Loren Hill (MN) asked for an explanation of inclusion of strategies listed as additional

Patrick Brady (FL) asked for an explanation of "proven"

Kim Eccles answered that it must be in the guidebook or from another well designed study with a quantified crash factor

Patrick Brady asked if intersection lighting takes into account variations in lighting based on pedestrian vs. automobile use; lighting intensity quantifying?

Kim discussed the survey results of Aggressive Driver Strategies. Some strategies were removed because they were either proven, outside the scope, or too difficult to evaluate.

A discussion followed on strategies to add and remove for all three strategy categories

Tom Welch asked how to share information with states that are not present at this meeting. Kerry Perrillo answered that notes will be posted on Pooled Funds Study website.

It was noted that state by state research does not contribute well to the overall research pool. Effectiveness of strategies may vary by state and demographics.

Michael Trentacoste gave an invitation for suggestions of further research.

Overview of Study Design

Dr. Bhagwant Persaud (BMI–SG Consultant) discussed the basis of study design and evaluation. He explained experimental vs. observational studies.

The question was raised regarding the problem of regression to the mean. It was noted that regression to the mean can cause a significant overestimation of the results of a treatment. Examples of treatments that raise traffic volumes are addition of left turn lanes and adding roundabouts. Normalizing doesn't work because the relationship between crashes and traffic volumes is a non–linear relationship.

A handout was distributed– How Many Treatment Sites are required? –Attachment 2

Breakout Sessions

Meeting attendees were divided into two groups, lane departure and aggressive driving strategies, and unsignalized intersection strategies. A presentation of each strategy was given and participants were asked to share their experiences, assess the feasibility of evaluating each strategy, and identify which of any strategies should be removed. The following questions and comments were inspired by the presentations.

Breakout Session 1

Group A: Lane Departure and Aggressive Driving (led by Dr. Hugh McGee)

LD1: Profiled thermoplastic strips for centerlines

Brian Stanford (TX) – Inverted profiled thermoplastic strips for centerlines gives retroreflectivity, raised and inverted gives rumble effect. Treatment needs to take into consideration the amount of traffic. Application also influenced by snow plow usage.

Robert Hull (UT) – Should strategies that are not applicable across the board be removed? I.e. northern states cannot use certain rumble strips (because of snow plows).

Gary Modi (PA) – Consider what is best for your state.

Michael Trentacoste – Be objective as far as overall use of strategy, but most will lean toward what is applicable within their state.

Loren Hill – Minnesota interested in study of this strategy and the possibility of its modification to suit the needs of each state. Would like wet reflectivity without snow plow prohibition.

Harry Taylor (FHWA) – Vote on those that you would like to implement within your state.

LD2: Wider cross sections on 2–lane roads

Cass Napier (KY) – Wider cross–sections have decreased crashes, but increased severity of crashes in KY.

Gary Modi – Study influence of different variations of cross–section widening (with or without shoulder widening for example).

John Carey (CT) – Is the experimental design going to account for crash reduction outside of the normal scope (non–fatal accidents, a–type, k–type, fatalities, driveway crash reduction).

Cass Napier – Agree that type of crash is important in evaluation.

Faria Emanain (OK) – Concern about cost and maintenance as a part of the evaluation, creates resistance to implementation.

Mike Griffith (FHWA)– Use of cable guardrails in European countries to aid with alternating passing lanes.

Mike Trentacoste – Germany uses pavement markings for alternate passing lanes. Also, signage which gives detail of passing lane availability.

LD6: Median Barriers

Cass Napier – Concerns about redundancy of rumble strip studies.

Gary Modi – Center–line rumble strips may cause motorcycle issues.

How did center–lane rumble strips get a fair rating for suitability for crash based evaluation? Answer: Possibility of evaluation, pending volunteering states for trials.

Gary Modi – Looking into safety of raised, snow plowable pavement markings due to the markers being thrown from the roadway and at vehicles.

Gary Modi – Tracking of skid resistant pavement. State trying to implement a policy. No reliable data on skid numbers; variability based on different ways to measure this data. Tires and other variables make research difficult.

LD11: Enhanced Shoulder or in–lane delineation and marking for sharp curves

Gary Modi – High speed reductions. Would like to see more data.

LD12: Delineate poles or trees with reflective tape

Gary Modi – Notes that this treatment only works when you have control of the vehicle. The ultimate treatment would be to remove the item.

Mike Griffith – Does marking of trees and other objects pull people further off the roadway in low–light areas? Do individuals track on these markings?

Roundtable discussion, Gary Modi, Harry Taylor, Loren Hill, etc – consensus, this is a situational strategy that may not be effective when objects are located too far off the roadway.

LD13: Enhanced Guardrail Delineation

Brian Stanford – Standard treatment in TX to help.

Gari Modi – PA uses this in some situations.

Faria Emamian – Suggests that this reflectivity reduces wear and denting on guardrails. This reduces maintenance costs.

Gary Modi – This increased delineation can increase traffic speeds because of increased driver comfort.

Harry Taylor – Post delineation may help. Reduce redundancy of post delineation and guardrail reflectivity.

LD14: Truck Pullovers

Gary Modi – Provision of pull–offs vs. traditional stops such as hotels. Variations in opinion by drivers and industry.

LD15: Automated Warning Signs for Curves

Cass Napier – Cost effectiveness of keep up.

John Carey – Issues with teens using this to see how fast they can make it thru a curve and then bragging about speeds on internet.

Gary Modi – Implementation resulted in high cost and lots of maintenance issues.

A1/A2: Target enforcement for aggressive driving

Mike Trentacoste – How to quantify?

Linda Cosgrove (NHTSA) – Tie paid media into the levels of education about enforcement.

A5: Reduce nonrecurring delays and provide better information about these delays

Robert Hull – Salt Lake is broadcasting travel times to certain points via changeable message signs.

David Piper (IL) – His state is using limitations on time spent in freeway left lanes (3/4 mile).

Brian Stanford – Texas no longer allowed to post "slower vehicles keep right sign," must post "left lane for passing only."

Loren Hill – Use of aerial video to profile aggressive drivers and aid in their apprehension/conviction.

Concern about variability in specificity of discussed strategies.

Group B: Unsignalized Intersections (led by Kim Eccles)

Note taker did not note who made the comments

U1: Driveway closures/relocations

35% crash data

Larger study– is it enough data to use

Allowing left turn to just have right–in, right–out; not enough data for analyzing driveway crashes

Case by case basis to analyze driveway closures

U2: Driveway turn restrictions

Includes physical factors (signs)

U3: Longer left turn lanes at intersections

Why is it poor? Part of our implementation, have huge safety projects

In VA, moderate costs is underestimating it because of road realignment

U4: Offset left–turn at intersections

Comment – problem with pedestrian walks

City of Minneapolis has this, but has limited left turn on but not left turn offset

U5: Bypass lanes on shoulders at T–intersections

Tested in Minnesota

Found effective in low volume, rural in S. Dakota

Use shoulder, reinforcing shoulders

Kansas

U6: Left turn acceleration lanes at divided hwy intersections

Missouri and Minnesota – has a lot of potential

Worry about testing

U7: Longer right–turn lanes at intersections

See crashes – see severe crashes

In Arizona, Minnesota, Wisconsin,

U8: Offset right turn lanes at intersections

If its on hwy. put cyclists at risks

U11: Restrict or eliminate turning maneuvers by signing

Shifting problem

Signs are not tracks (problem when they were put in)

U12: Restrict or eliminate turning maneuvers by providing channelization or closing median openings

NY – did major studies on closing

U13: Convert four legged intersections to two T–intersections

Offset should be left to right

The picture in the presentation shows left to right, but it should be right to left because it is safer than left to right

NY – how many states are now converting to roundabouts?

Change in volume

U15: Indirect left turn treatments to minimize conflicts at divided hwy. intersections

Example – Michigan/Louisiana/Maryland (just put in unsignalized rural hwy)

U23: Flashing beacons at stop controlled intersections

MN stop using this because of confusing for a four way stop

Red/yellow – red (stop) / yellow (through)

U25: Lane assignment signing or marking

Anthony Giancola (NACE) – is it considered low cost? —picture showed a very urban example, which did not appear low cost, but in the guidebook it is listed

U31: Splitter islands

Those found are quantitative

Cost is high

Questions/comments from participants:

Look at the severity of right turn lane and unsignalized intersection

Hope we are look at severity/reduce the overall severity of crash

Currently analyzing 4 to 3 lanes conversion, just striping a 4 lane to 3 lane

Intersection Lighting was added to the ballot

Possible maintenance problems

Breakout Session 2

Group A: Lane Departure and Aggressive Driving (led by Dr. Hugh McGee)

LD3: 2–way center left turn lane

Sweden – Increase in head on crashes.

Patrick Brady – 2–way center left turn lane increases crashes as traffic volumes increase and approach certain levels (exact volumes to be determined).

Found to be effective to certain volumes.

LD5: Alternating passing lanes or four–lane sections at key locations to prevent head–on crashes

Pierre Jomini (MT) – creating passing sections on 2–lane roads. Separate, just for the purpose of passing.

LD6: Median Barriers for Narrow–Width Medians on Multilane Roads

Patrick Brady – clarification of multilane roads meaning 4–lane.

Patrick Brady – Uses of Quick Curb.

LD7: Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders

Bhagwant Persaud – Believes this strategy to be evaluated by NCHRP 17–25.

Thomas Welch – mention of variations on this strategy.

Patrick Brady – Further thoughts on more aggressive rumble strips.

Harry Taylor – Some may be snow plowable.

LD8: Midlane Rumble Strips

Patrick Brady – Never heard of this.

Shawn Troy (NC) – NC did a quick comparison. Showed no change in crashes. Many variations in offset distances of shoulder rumble strips. NC has discussed midlane rumble strips, but never tested it.

Patrick Brady – It would be nice to see someone experiment with this, but it would likely make motorcyclists cringe.

LD9: Provide Enhanced Pavement Markings

Thomas Welch – Missouri, problem with these markers being thrown by snowplows into drivers' windshields.

Patrick Brady – We need to know if it is going to make things worse. Concern about increased speeds and crashes.

Bhagwant Persaud – Was a part of NCHRP study on a similar concept. Hugh questions if this study includes enough crash data to reach a conclusion. At this time we can not draw a conclusion from the study as to whether crashes increase because of increased speed

Patrick Brady – Increased speed versus increased visibility; usefulness of markings in gauging speed and recognition of curves.

Shawn Troy – Concern about the study of crash numbers, severity, and speed as factors in determining the situational use of this strategy.

LD10: Skid Resistant Pavement Surfaces

Barbara O'Rourke (NY) – NY has a lot of data on this.

Bhagwant Persaud – NY has had successful applications of this in intersections.

Patrick Brady – FL has skid data as well.

Maryland also has some data. Look at Colesville Rd. in Silver Spring.

LD11: Enhanced shoulder or in–lane delineation and marking for sharp curves

Clifford Reuer (SD) – Would this be used in addition to other, roadside delineation?

Patrick Brady – Would this be in addition to advance warning signs, chevrons, etc.

Pierre Jomini – Would an advised speed be better than slow? Slow for one person may be different for another.

A good contact for this strategy in Florida, Mendocino County, Gibb Peasley, University of Florida.

LD12: Delineate utility poles or trees with reflective tape

Patrick Brady – Targeting instead of delineation. Is this going to be positive or negative delineation?

Clifford Reuer – Concern about uniformity.

Group – Utility companies may limit nailing / bolting into utility poles.

LD13: Enhanced guardrail reflectors

Patrick Brady – most reported accidents in FL are no–injury crashes.

LD14: Pavement Pull–offs for drowsy truck drivers on isolated segments

Shawn Troy – NC implementing this for safe pull–offs for truck drivers, emergency etc. NC putting this in Gorge sections.

Patrick Brady – FL implementing this with emergency pull–offs in work zones. Also, putting in truck rest areas with showers that allow drivers to sleep in cabs.

Neil Boudreau (Ma) – Check with Utah. They have a plan to deal with drowsy drivers.

LD15: Automated warning signs when driving too fast for curve

Patrick Brady – Use of a similar system with accelerating in–pavement lights.

Tennessee, using this for trucks.

Group – This system used primarily for truckers, some includes weigh on the go technology GA, TN, VA. Concern about rollover data.

Patrick Brady – once off roadway, rollover is a result of slope.

Harry Taylor – Causation studies are very difficult because of the methodology of police reporting.

Group – Causes for leaving the roadway drowsy, drunk, speeding, distraction, deer, offensive drivers.

A1/A2: Target Enforcement for Aggressive Driving

Clifford Reuer – Has seen significant reduction during enforcement, reverses when enforcement stops. This tends to be a temporary fix.

Barbara O'Rourke – Enforcement data is generally from the enforcement period only. Seems inaccurate.

Use of video imaging helps to establish effect and improve enforcement.

Patrick Brady – Random enforcement during enforcement campaign can affect driver behavior patterns by getting they used to police present.

Bhagwant Persaud – Crash data may go up because more crashes will be reported.

Tom Welch – Effectiveness is limited by volume and police availability.

Patrick Brady – Saturation of law enforcement happens in this type of enforcement.

Shawn Troy – May reduce percentage of speeders as opposed to significant reduction in average speeds.

Barbara O'Rourke – Evaluation of these strategies, data available.

A3: Educate and impose sanctions against repeat offenders

Patrick Brady – How are you going to evaluate that?

Zero tolerance for speeding is the best way to enforce. Success with this in other countries.

A4: Change or mitigate the effects of identified elements in the environment

Gary Ogletree (TN) – Would that include realistic speed limits? A. Yes.

Group B: Unsignalized Intersections (led by Kim Eccles)

Note taker did not note who made the comments

U2: Driveway/turn restriction

No quantitative data

U3: Longer left turn lanes at intersections

VA – high cost

U4: Offset left turn lanes at intersections

MN – 4–lane freeway

U5: Bypass lanes on shoulders at T–intersections

Decrease in safety

FL – doing 4 legged intersections

Hundreds of installations

20 t intersection

Didn't do a before and after study, did a compare this intersection with this intersection

U6: Left turn acceleration lanes at divided hwy intersection

Jan Hanson – contact to gather more data – information came from Loren Hill

U7: Longer right–turn lanes at intersections

If you use shoulder (existing) as a right turn lane

Make a distinction in right turn lane

FHWA – study evaluation

Mike Griffith – asked how we are defining the term longer

U8: Offset right turn lanes at intersections

Montana – had problem with because of crashes occurring with right turn and incoming traffic

U11: Restrict or eliminate turning maneuvers by signing

At the intersection

Effective with physical barriers

U13: Convert four legged intersections to two T–intersections

Picture is transposed

Safer – right turn left turn

NCHRP 17–25

Look at FHWA – comparison/accident studies on four–legged and T–intersection

U18: Roadside markers or pavement markings for gap assistance

Roadside markers or pavement markings for gap assistance

Gary Ogletree tried. Does the person at the stop sign read the signs?

Few numbers/little impact of roadside marker or pavement marking because people do not read the sign

Can examine through human factors

More of a daytime hours strategy

U20: Rumble strips on intersection approaches

Removed because Janet is studying this topic

U22: Pavement markings with supplementary messages, such as "stop ahead"

Targeted treatment

U23: Flashing beacons at stop controlled intersections

For 2/4 way stop

Loren Hill said did not use 2 way stop

No study on 2 way stop

U29: Targeted public information and education on safety problems at specific intersections

Area wide campaign

Hard asset safety on area wide campaign

U30: Enhanced signing and delineation

Can be multiple studies

U31: Splitter islands on the minor–road approach to an intersection

Loren Hill mentioned the video, Joe Bared's work on speeds and unsignalized intersections. Developed a video and distributed to some states—new strategies to use novel techniques to reduce speeds—none of the strategies are on the ballot today except U31, splitter island, is on the videotape, and there are rumble strips on the main line

U34: Improved maintenance of stop signs

Peter Kissinger (AAA) –Looking at higher grade reflective material on strategy 34

Tim gates (TTI) – looked at stop signs with increased retro and couldn't find a crash effect. He also looked at retro strips too. Kim Eccles did study of fluorescent yellow –not crashed based, but saw small increases in some with increased retro

John Carey used throughout the state so has a large sample size. Group would like to see retro added to the ballot

Balloting and Afternoon Session

A revised ballot was distributed based on changes made in the morning session

Some strategies revised, some strategies were deleted because they were already under study, also based on breakout sessions, some strategies were added, and some were combined

Discussion of strategies involving left and right turn lane

Mike Griffith gave a brief overview of a cost evaluation study for safety effectiveness of intersection left and right turn lanes

Tom Welch noted he had an interest in severity for this study instead of a simple quantitative analysis

Bhagwant Persaud promised to always include severity in analysis of this strategy

Mike Griffith noted the decision to keep this strategy in the ballot is based on limitations of original study

Kim Eccles noted that (U7– Longer right–turn lanes at intersections) will be modified to include severity as a condition of evaluation of existing lanes

Discussion of partial lighting of unsignalized rural intersections

Cass Napier has in interest in the provision of partial lighting of unsignalized rural intersections

Patrick Brady feels that this is really the issue of the effects of different light intensities on various intersection usages and types

Discussion of addition of cable barriers to LD5

Patrick Brady was concerned about the addition of a cable barrier (LD16) for alternating passing lanes or four–lane sections at key locations to prevent HO crashes (LD5)

Hugh McGee stated it would be used as an alternative passing lane strategy

Mike Trentacoste clarified that the cable is in place on a very small median

Harry Taylor explained the reality vs. the perception of deflection of cable medians in a crash situation. They do not present as much as a problem as some would believe.

John Nagle (IN) requested review of the midlane rumble strip strategy.

Kerry Perrillo stated that she will continue to track studies to eliminate those that are already being studies and which are in the top 20 balloting

Kim Eccles explained the balloting procedure, the open balloting process took place, and the results were reported (see Attachment 2)

Implementation Discussion

Kim Eccles gave a brief discussion of implementation and installation of strategies

Tom Welch asked why would installation benefit this study

Kim Eccles replied that it gives the opportunity for prospective vs. retrospective studies This may allow for random selection of sites. Also allow for the choice between Empirical Bayesian evaluation or non–Empirical Bayesian evaluation.

Kim also pointed out that agencies should consider saving data that may normally be purged in order to use comparison for treatment sites vs. untreated. This needs 3–5 years.

Kim Eccles asked several question for discussion

Has anyone implemented any of these treatments?

Does anyone plan on implementing any of these treatments?

Is anyone aware of any other states, not represented here today, that are planning to implement any of these treatments?

Arizona

LD1: Install profiled thermoplastic strips for centerlines

LD2 : Wider cross sections on two–lane roads

LD3 : Center two–way left–turn lanes for four– and two–lane roads

LD5: Alternating passing lanes or four–lane sections at key locations to prevent HO crashes

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

LD17: New: Combination of lane width versus shoulders

U5 : Bypass lanes on shoulders at T–intersections

U8: Offset right turn lanes at intersections

Connecticut

Lane Departure Strategies

U35: New: Stops signs with increased retroreflectivity

Florida

LD3: Center two–way left–turn lanes for four– and two–lane roads

Removing

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

Recent and near future installation

LD10: Provide skid–resistant pavement surfaces

LD15: Automated warning signs when driver too fast for curve (particularly for trucks)

LD17 : New: Combination of lane width versus shoulders

U1: Driveway closures/relocations

U2 : Driveway turn restrictions

U5 : Bypass lanes on shoulders at T–intersections

U12: Channelize or close median openings

U35 : New: Stops signs with increased retroreflectivity

A1 : Revised: Target (manual) enforcement for aggressive driving combined with educational and public information

Illinois

LD3: Center two–way left–turn lanes for four– and two–lane roads

LD5 : Alternating passing lanes or four–lane sections at key locations to prevent HO crashes

LD6 : Median barriers for narrow–width medians on multilane roads to prevent HO crashes

LD10: Provide skid–resistant pavement surfaces

LD13 : Enhanced guardrail reflectors

U4: Offset left–turn lanes at intersections

Indiana

LD3: Center two–way left–turn lanes for four– and two–lane roads

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders

U5 : Bypass lanes on shoulders at T–intersections

Iowa

LD3: Center two–way left–turn lanes for four– and two–lane roads

LD6 : Median barriers for narrow–width medians on multilane roads to prevent HO crashes

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

LD9 : Provide enhanced pavement markings

LD11: Enhanced shoulder or in–lane delineation and marking for sharp curves

LD12 : Delineate utility poles or trees with retroreflective tape

LD17 : New: Combination of lane width versus shoulders

U3 : Longer left turn lanes at intersections

U6 : Left turn acceleration lanes at divided highway intersections

U7 : Longer right–turn lanes at intersections

U8 : Offset right turn lanes at intersections

U13: Convert four legged intersections to two T–intersections

U23 : Flashing beacons at stop controlled intersections

U27 : Double yellow centerline on the median opening of a divided highway at intersections

U35: New: Stops signs with increased retroreflectivity

Kansas

Lane Departure Strategies

Implementing some strategies, specifics unknown

Kentucky

Lane Departure Strategies

NCHRP 500 Study: Will be implementing some of these strategies, still refining strategies, locations, and criteria

LD7: "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

Will be installing

LD11: Enhanced shoulder or in–lane delineation and marking for sharp curves

Will be installing

LD17 : New: Combination of lane width versus shoulders

Will be installing

U5: Bypass lanes on shoulders at T–intersections

U6 : Left turn acceleration lanes at divided highway intersections

U14 : Convert offset T–intersections to four legged intersections

U17 : Change horizontal and/or vertical alignment of approaches

U19 : Large regulatory and warning signs at intersections

U22 : "Pavement markings with supplementary messages, such as "stop ahead"

U23 : Flashing beacons at stop controlled intersections

U35 : New: Stops signs with increased retroreflectivity

U36 : New: Intersection lighting intensity

U37 : New: Use shoulder for right turn lane (variation of U7)

Maryland

Aggressive Driver Strategies

Smooth operator program

Massachusetts

Lane Departure Strategies

Drowsy driver lane departure strategies

Aggressive Driver Strategies

Aggressive Driver program starting this summer

LD3 : Center two–way left–turn lanes for four– and two–lane roads

LD9 : Provide enhanced pavement markings

U36 : New: Intersection lighting intensity

Minnesota

LD2: Wider cross sections on two–lane roads

LD3 : Center two–way left–turn lanes for four– and two–lane roads

LD5 : Alternating passing lanes or four–lane sections at key locations to prevent HO crashes

LD6 : Median barriers for narrow–width medians on multilane roads to prevent HO crashes

LD7: "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

U5 : Bypass lanes on shoulders at T–intersections

Did a study

U6 : Left turn acceleration lanes at divided highway intersections

Did a study

U23 : Flashing beacons at stop controlled intersections

Removed

Montana

LD3: Center two–way left–turn lanes for four– and two–lane roads

LD5 : Alternating passing lanes or four–lane sections at key locations to prevent HO crashes

New York

LD6 : Median barriers for narrow–width medians on multilane roads to prevent HO crashes

Frequent installation

A1 : Revised: Target (manual) enforcement for aggressive driving combined with educational and public information

Lots of data, very active

North Carolina
– Evaluating a lot of work will give Kim info later

Lane Departure Strategies

Engineers placing rumble strips without analyzing crash history

Sample size too small, people want answers, often political decision and engineers looks at measures incorrectly

Unsignalized Intersection Strategies

Aggressive Driver Strategies

North Dakota

U23: Flashing beacons at stop controlled intersections

Oklahoma

Will e–mail information, not sure of items

Pennsylvania

LD2 : Wider cross sections on two–lane roads

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

LD9 : Provide enhanced pavement markings

LD11: Enhanced shoulder or in–lane delineation and marking for sharp curves

LD12 : Delineate utility poles or trees with retroreflective tape

LD13 : Enhanced guardrail reflectors

LD15 : Automated warning signs when driver too fast for curve (particularly for trucks)

LD17 : New: Combination of lane width versus shoulders

U5 : Bypass lanes on shoulders at T–intersections

U10 : Full width paved shoulders in intersection areas

U11 : Restrict or eliminate turning maneuvers by signing

U17 : Change horizontal and/or vertical alignment of approaches

U18 : Roadside markers or pavement markings for gap assistance

U19 : Large regulatory and warning signs at intersections

U22 : "Pavement markings with supplementary messages, such as "stop ahead""

U23 : Flashing beacons at stop controlled intersections

U25 : Lane assignment signing or marking at complex intersections

U26 : Turn path markings

U28 : Targeted enforcement to reduce stop sign violations

U29 : Targeted public information and education on safety problems at specific intersections

A1 : Revised: Target (manual) enforcement for aggressive driving combined with educational and public information

Doing study right now

South Carolina

LD2: Wider cross sections on two–lane roads

Hired Consultants

LD3 : Center two–way left–turn lanes for four– and two–lane roads

LD9 : Provide enhanced pavement markings

Hired Consultants

LD12: Delineate utility poles or trees with retroreflective tape

Hired Consultants

U30 : Enhanced signing and delineation

U35 : New: Stops signs with increased retroreflectivity

Short–term, changing signing with high intensity sheeting

A1 : Revised: Target (manual) enforcement foraggressive driving combined with educational and public information

Thru public safety department– awarded by NHTSA

South Dakota

LD3: Center two–way left–turn lanes for four– and two–lane roads

LD7: "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

LD15: Automated warning signs when driver too fast for curve (particularly for trucks)

Tennessee

Lane Departure Strategies

Aggressive Driver Strategies

A5 : Reduce nonrecurring delays and provide better information about these delays

Texas

LD1: Install profiled thermoplastic strips for centerlines

LD6 : Median barriers for narrow–width medians on multilane roads to prevent HO crashes

LD7 : "Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders"

LD11: Enhanced shoulder or in–lane delineation and marking for sharp curves

LD17 : New: Combination of lane width versus shoulders

Utah

Lane Departure Strategies

U36 : New: Intersection lighting intensity

Virginia

LD6: Median barriers for narrow–width medians on multilane roads to prevent HO crashes

LD10: Provide skid–resistant pavement surfaces

LD15 : Automated warning signs when driver too fast for curve (particularly for trucks)

Online

Wrap–Up

Kerry Perrillo led a wrap–up discussion

A1 was ranked highly; Kerry said she will mention it to NCHRP when they meet on behavioral study. A1 was modified top include educating judges and litigators.

Kerry thanked meeting attendees for their eager participation

Kerry noted that there will be a technical advisory committee (TAC) meeting about once a year. The money taken from the Pooled Fund Study was discussed. 23 States joined, 2.43 million from states, money from FHWA, 3.93 million total. Possibility of additional NCHRP funding equating to a total of 4.6 million. Hoped that 20 strategies can be studied with funds. BMI–SG will follow up and begin evaluations and experimental design. Project will be contracted out at some point this summer.

Tom Welch asked if it will be contracted out to one or multiple contractors

Kerry answered preferably one contractor with (possibility of) subcontractors

Tom Welch noted there may be benefits to using several firms to evaluate data from various states

Patrick Brady voiced concerns over how to collect the data. States don't have the man power. One contractor would be preferable for this purpose because it is easier to deal with fewer individuals.

Mike Trentacoste insured that regardless of one or more contractors, assembling a team to perform tasks.

The group offered options on how to go about selecting a contractor/ assembling a team to perform these tasks.

It was mentioned that there is a website www.pooledfund.org. Click under proposed studies TPF–5(099). Will update information and will include meeting notes. Eventually there will be an exclusive website for this project.

http://www.pooledfund.org/projectdetails.asp?id=332&status=4

Patrick Brady suggested that the contractor may be best to setup and maintain website for project.

Kim Eccles stated she will follow up on implementation. She invited states to e–mail her regarding any new developments with states represented or not represented here.

Meeting adjourned

Attachment 1: Balloting Results			
Strategy ID	Strategy	Score	Ballots
LD7	Install edgeline "profile marking," edgeline rumble strips or modified shoulder rumble strips on section with narrow or no paved shoulders	138	18
LD11	Enhanced shoulder or in–lane delineation and marking for sharp curves	119	16
LD9	Provide enhanced pavement markings	67	12
LD5	Alternating passing lanes or four–lane sections at key locations to prevent HO crashes	61	10
U23	Flashing beacons at stop controlled intersections	60	9
LD3	Center two–way left–turn lanes for four– and two–lane roads	54	9
LD6	Median barriers for narrow–width medians on multilane roads to prevent HO crashes	54	9
U5	Bypass lanes on shoulders at T–intersections	51	10

Attachment 1: Balloting Results			
Strategy ID	Strategy	Score	Ballots
LD17	New: Combination of lane width versus shoulders	48	7
U22	Pavement markings with supplementary messages, such as "stop ahead"	47	8
LD1	Install profiled thermoplastic strips for centerlines	44	7
LD4	Narrow "buffer median" on two–lane roadways	39	6
U18	Roadside markers or pavement markings for gap assistance	34	8
A1	Revised: Target (manual) enforcement for aggressive driving combined with educational and public information	34	8
U4	Offset left–turn lanes at intersections	33	8
U35	New: Stops signs with increased retroreflectivity	32	6
LD15	Automated warning signs when driver too fast for curve (particularly for trucks)	31	6
U6	Left turn acceleration lanes at divided highway intersections	28	5
U36	New: Intersection lighting intensity	28	7
U7	Longer right–turn lanes at intersections	24	3
LD2	Wider cross sections on two–lane roads	24	5

Attachment 1: Balloting Results			
Strategy ID	Strategy	Score	Ballots
U15	Indirect left–turn treatments to minimize conflicts at divided highway intersections	23	3
U37	New: Use shoulder for right turn lane (variation of U7)	21	3
U25	Lane assignment signing or marking at complex intersections	21	5
LD13	Enhanced guardrail reflectors	18	3
A2	Revised: Target (automated) enforcement for aggressive driving combined with educational and public information	18	4
LD8	Midlane rumble strips	17	3
U8	Offset right turn lanes at intersections	17	3
U17	Change horizontal and/or vertical alignment of approaches	17	3
U12	Channelize or close median openings	14	2
U19	Large regulatory and warning signs at intersections	13	4
U30	Enhanced signing and delineation	12	4
A7	Widen painted edgelines to slow and calm aggressive drivers	8	2
U31	Splitter islands on the minor–road approach to an intersection	7	1

Attachment 1: Balloting Results			
Strategy ID	Strategy	Score	Ballots
LD10	Provide skid–resistant pavement surfaces	7	2
LD14	Widened pavement/pull–offs on isolated segments for emergency situations	6	1
U33	Dashed markings (extended left edgelines) for major–road continuity across the median opening at divided highway intersections	6	1
U1	Driveway closures/relocations	6	2
A5	Reduce nonrecurring delays and provide better information about these delays	6	2
U9	Right turn acceleration lanes at intersections	6	3
LD16	New: Adding cable barrier for LD5	5	2
U14	Convert offset T–intersections to four legged intersections	5	2
A4	Change or mitigate the effects of identified elements in the environment	5	2
A3	Education and sanctions against repeat offenders	4	1
U24	Retime adjacent signals to create gaps at stop–controlled intersections	3	1
U3	Longer left turn lanes at intersections	2	1
U2	Driveway turn restrictions	1	1

Attachment 1: Balloting Results			
Strategy ID	Strategy	Score	Ballots
U10	Full width paved shoulders in intersection areas	1	1
A6	"Slower Vehicles Keep Right" signs	1	1
LD12	Delineate utility poles or trees with retroreflective tape	0	0
U11	Restrict or eliminate turning maneuvers by signing	0	0
U13	Convert four legged intersections to two T–intersections	0	0
U16	Close or relocate "high–risk" intersections	0	0
U20	REMOVED	0	0
U21	Supplementary stop signs mounted over the roadway	0	0
U26	Turn path markings	0	0
U27	Double yellow centerline on the median opening of a divided highway at intersections	0	0
U28	Targeted enforcement to reduce stop sign violations	0	0
U29	Targeted public information and education on safety problems at specific intersections	0	0
U32	Stop bar (or provide a wider stop bar) on minor road approaches	0	0
U34	Improved maintenance of stop signs	0	0

Attachment 2: Bhagwant Persaud's handout

How many treatment sites are required?

Basics

When planning a before–after safety evaluation study it is vital to ensure that enough data are included such that the expected change in safety can be statistically detected.

In the planning stage the expected change in safety is not known, but it is still possible to make a rough determination of how many treatment sites are required based on the best available information about

the expected change in safety

the average number of crashes per site

From this, one could estimate, for the number of available sites, the change in safety that can be statistically detected.

Available sample size estimation methods are (conservatively) based a conventional before–after study with comparison group design

Statistical accuracy attainable for a given sample size is described by the standard deviations of the estimated percent change in safety.

One can estimate P–values for various sample sizes and expected change in safety for a given crash history.

A P–value of 0.10 roughly translates into 90% confidence and is generally regarded as a limiting value.

Case study 1: Red Light Camera Evaluation

Assume that the number of comparison sites is equal to the number of treatment sites.

Assume (from published data)

20 crashes/site–year of which

3.5 are right angle crashes and

12.0 are rear–end crashes

Assume three years of 'before' crash counts, one and a half years of 'after' period crash counts.

P–values for various sample sizes and expected changes in safety (based on equal number of comparison sites)			
Number of treated sites	20	60	??

% change in crashes	10%	20%	30%	10%	20%	30%	10%	20%	30%
Right angle crashes	0.58	0.23	0.05	0.42	0.08	<0.01	0.33	0.05	<0.01
Rear–end crashes	0.51	0.23	0.10	0.42	0.14	0.04	0.40	0.12	0.03

(Shaded cells indicate where P–values of 0.10 are attainable)

Example 1: If the sample contains 20 treated sites, and a 30% reduction in the number of right angle crashes is expected due to RLC installation, we may expect to obtain a statistically significant result at the 10% level (since P actually equals 0.05).

Example 2: With 60 treated sites, if there is a 20% increase in the number of rear–end crashes, we do not expect a statistically significant result at the 10% level (since P > 0.10). However, that result would be significant at the 15% level.

Assessment of available treatment site samples:

Best judgment on possibility of detecting safety effects at the P = 10% level (Assuming a 25% decrease in right angle crashes and a 30% increase in rear end crashes)					
Crash Type	City 1	City 2	City 3	City 4	All
Right angle	Y	Y	Y		Y
Injury right angle	Y		Y		Y
Rear end	Y	Y	Y		Y

Injury rear end	Y		Y		Y

(Y significant results may be obtained, significant results may not be obtained)

Case study 2: Centre line rumble strips

Minimum required 'before' period mile–years for treated sites for detecting an expected change in safety (P 0.10) (assumes equal length of before and after periods)				
Expected Percent Reduction in Crashes	Equal number of mile–years for treatment and comparison sites		Half as many mile–years for comparison as for treatment sites (Pop Quiz!)	
	2.10 crashes /mile/year	0.54 crashes /mile/year	2.10 crashes /mile/year	0.54 crashes /mile/year
40	13	52		
20	87	339		
10	426	1659		