Phillip Bobitz:

Hello and welcome everybody to our webinar on the 2021 update of the Federal Highway Administration proven safety countermeasure initiative. I thank you for your time and attention today my name is Phil Bobitz. I am a safety engineer with the Federal Highway Administration Office of Safety and I'm happy you have taken time out of your day to join us. We are expecting a fantastic turnout with nearly 5,000 people registered for today's webinar, which is incredible. Very encouraging for us to see such tremendous interest and it's a great opportunity for all of us in the transportation industry given recent data and trends related to highway fatalities to share some tools and ideas on what you can potentially do with some proven effective countermeasures and how you can look at them and consider them in your work. In fact, we are going to present to you nine new proven safety countermeasures today but also remind you of others that have been part of the program for a number of years, all with the goal of improving safety for all users and on all roads.

A few housekeeping items with regards to the webinar platform this is a Microsoft Teams web event. This probably looks a little different for those of you that are used to the standard Teams meeting. As an attendee, functionality is limited so you will not be able to turn on your video or microphone or interact or participate, however and it might vary depending on the version of Teams you have installed. You will have access to the Q&A or questions and answer tab within the event interface. This should appear and is showing on my screen at the top toolbar and icon with two overlapping chat bubbles with a question mark. As we go through the webinar, we encourage you to post any questions you may have in the Q&A tab. Our team will do the best we can to address those as they come in, but we have also carved out time at the end of the session to go through a facilitated Q&A session.

Today's session is being recorded and will be posted along with the transcript to the webpage. And with that I would like to begin by quickly running through the agenda for today's webinar. We will start with remarks from leadership. We will provide background, go through the process we used that we went through to update and identify it with new proven safety countermeasures. We have a team of experts across the Office of Safety and the Resource Center that will walk us through the nine new countermeasures. A few next steps and resources and then we have again time at the end for facilitated Q&A. With that, it is my pleasure and I am pleased to introduce and give the virtual stage to our acting administrator Federal Highway administration for some opening remarks.

Stephanie Pollack:

Thank you so much and thank you to everyone joining today. An estimated 20,160 people died in motor vehicle crashes in the first six months of 2021, presenting an 18 percent increase over 2020. This is the largest six-month increase ever recorded in the history of the Fatality Analysis Reporting system. These often preventable deaths affected tens of thousands of others because those numbers represent not just statistics, but human beings. Yesterday was the world day of remembrance for road traffic victims. In a video posted by the Secretary, he rejected the often excuse that deaths from crashes are an inevitable cost of living in the 21st century, noting the fatality rate of Canada is half of ours and Europe is 1/4 of the United States.

It concluded with the Secretary reminding us a single preventable death is a tragedy. Tens of thousands per year is a national crisis, one that demands not just remembrance but urgent action. Clearly, the urgent action this crisis demands requires a multifaceted safe systems approach. Today's webinar focuses on one piece of that approach - building safer roads using the Federal Highway newest proven safety countermeasures.

You know as I do we can do better and make roads safer. We are delighted 5000 people registered for today's webinar to learn more about looking to be done to make streets safer. It is our hope that the community of engineers and professionals who design our streets—not just safety projects, but all streets—

are ready to do something different because we realize what we're doing is not working. That's where Federal Highway proven safety countermeasures come in.

Widespread use of safety countermeasures can offer significant measurable impact as part of any agency approach to improving safety and preventing crashes and deaths. These measures are designed for all road users and all roads from rural to urban, from high-volume freeways to less troubled State and County roads, from sentinel crossings, horizontal curves, and everything in between. This menu of treatments and strategies provides options for immediate action, options that should be considered and in many cases incorporated into many projects rebuilding streets that are underway and many more that will be launched with the new resources made available last week when President Biden signed the infrastructure law.

Federal Highway's goal is not just to educate you and others about the proven safety countermeasures but to accelerate their use throughout the City, State, and country because they can only save lives if they are actually used on the streets. Thank you for joining us and I hope you will join our efforts to build a transportation system that allows everyone to go where they need and safely get back home to their loved ones.

Phillip Bobitz:

Thank you very much for your leadership, your support, your being an ambassador for us in safety, and a champion for this effort and we appreciate your remarks and taking the time to join us today. So now I would like to introduce Mike Griffith, the director of the Office of Safety Technology within the Federal Highway Office of Safety, for some additional remarks and he will get us started with a history of the initiative.

Mike Griffith:

Okay thank you. Thank you very much Deputy Administrator, we really appreciate your outstanding leadership of our overall safety programs and your strong interest in advancing these proven safety countermeasures. I have been involved with each round of the proven safety countermeasures. We kicked off the initiative in 2008 and we have had two updates prior to the one we just hit, so we are on the fourth update and prior to this update, we had 20 countermeasures and now we are up to 28. It is really important I expect to you what the selection criteria is because I know we get a lot of questions about what ends up on the list of proven safety countermeasures. One, they have to be proven effective. We are very much a science-based organization and we look closely at the literature to look at what the safety research is showing in terms of how effective these countermeasures are. We are interested in what impact these countermeasures have on fatalities and serious injuries.

So, we have the Crash Modification Factor Clearinghouse as a major resource we use and we also look at other sources to look at what is the effectiveness of these various countermeasures. We also look at what countermeasures have not received wide-scale deployment.

There are a lot of different countermeasures in the toolbox of practitioners. Certain countermeasures we noticed they really have not scaled up yet to national level. We see pockets of them being used across the country but we're trying to get national visibility and leadership to countermeasures that are proven effective but have not been used to the extent we would like to see. We also want to make sure it's clear we're not saying just use these countermeasures. There are other countermeasures that are out there that are just as effective but they're probably further along in terms of deployment in most cases. We also have crosscutting strategies. Not necessarily highway designed or traffic control elements such as local road safety plans and safety audits that were part of previous rounds of countermeasures. We thought it was important to not just look at the countermeasures you install out on the road but also look at strategies that can be helpful in making a difference when it comes to safety.

I know later in the presentation we're going to talk to you about what guidance and technical assistance we can provide. We have a lot of different resources you can take advantage of to make sure you are successful in implementing these countermeasures. In previous rounds we have tracked implementation progress and

that is something we will take a look at with the new ones we're talking about here today. With that I will turn it back to you. Thank you.

Phillip Bobitz:

Excellent, thank you Mike. Thank you for getting us started with a history of the initiative. Very beneficial to have you involved considering your involvement in each round and iteration since its initial release and appreciate your leadership and support along the way with this update. As you look at the existing set of countermeasures to include the new ones you can see many consistent themes that emphasize priorities starting with complete streets. The PSC can be used to form a foundation of creating an environment safe for all road users. Over half of them include strategies and tools to support agencies when designing, accommodating and operating streets that enable safe use and support mobility for all users.

We have a safe system approach and hopefully many of you are aware of the Safe System Approach. If not, I encourage you to visit our webpage, we have a number of resources, but at a high level it aims to eliminate fatal and serious injuries for all road users and does it through a holistic view of the system by first, anticipating human mistakes and second, trying to keep the impact energy on the human body at tolerable levels.

We are committed to this approach and the PSCs align with the safe system elements and principles of separating users in space and time, managing speed, managing impact force angles, increasing attentiveness of road users for the surrounding roadway environment, and then reducing complexity and design of the operation of the transportation system.

Speed management, we have a lot of troubling trends with speeding. Safer speeds is a key part of addressing those fatalities and serious injuries. Many of the PSCs can support agency efforts to effectively accomplish the goal of reducing speeding-related fatalities and serious injuries. You'll see with the new PSCs we have enough standalone speed management PSCs to warrant their own designated category or grouping of countermeasures but also have a number of other PSCs and other focus areas to support speed management.

We have equity. PSCs can be used to improve multimodal safety and accessibility to ensure equity. Many can be applied in a variety of contexts, including urban streets and rural roads. And then we have many encouraging consideration of infrastructure for vulnerable users, which can reduce our carbon footprint while ensuring Americans have clean access to transportation options and can connect to public transit.

Here on the screen with 20 existing proven safety countermeasures and the intent is not to go through each one of these. The focus of today's webinar is on the nine new PSCs, but we want to remind you, if you have not visited the webpage, take a look. We have a diverse set of existing countermeasures that align and address a lot of different focus areas - roadway departure, intersections, speed management, and then there's a number of crosscutting strategies that address multiple focus areas. I will get into this in more detail later but the project also included updates to these existing PSCs so one of them specifically USLIMITS2 went through much more substantial updates and has been renamed which will see shortly. Because of these updates we are labeling that one is a new PSC. In essence, we are replacing one of the existing 20 with a new PSC. They should make more sense later when we get to the slide with the new PSCs. You will see the total we have with the additions brings the total number to 28 PSCs.

So we kicked off a project last fall to update the initiative for the fourth time, the most comprehensive update to date and includes the identification and addition of new proven safety countermeasures, updates to the existing countermeasures, and then development of resources to assist with implementation. So, fact sheets, handouts, social media campaign, and then marketing the update through webinar and social media. First task was to have the contractor which we did have support for the project develop a literature review. So this was intended to be a comprehensive review of the universe of materials, research studies, and publications to identify potential proven safety countermeasures with justification and supporting information as to where they should be designated as a proven safety countermeasure.

After working with an internal workgroup and identifying the new PSCs, the contractors got into developing resources, so one-page handouts or fact sheets and updating the existing handouts. We have updated webpages and then we are getting into the marketing for the rollout of the update through these rollout webinars and social media campaign but also. The contract included development of two short videos, one of them is an overview video and the other will be on one of the new PSCs.

Just wanted to share a 30,000-foot view of the process we went through to update the initiatives and to identify and select the new PSCs. We recognized early on we could not do this in a vacuum, so we established a workgroup of representatives across the Office of Safety, the Resource Center, Turner Fairbanks, part of the agency which represents the research focus. We had representation from other program offices, division offices, really to make sure we had a diverse set and a team to review, identify the new PSCs, and review the material we developed as part of this effort. The team has definitely increased in size over time to make sure we pulled in the expertise necessary to make sure our materials were reflective of the latest and greatest research and considerations.

Before the project started, we had a brainstorming session with the workgroup to generate ideas that were shared with the contractor and to generate ideas about the countermeasures that could perhaps be included in the literature review. So the contractor took the input, conducted additional review and identified 30 potential countermeasures with justification and supporting information as to why they should be designated as a proven safety countermeasure. The workgroup took the information, considered the potential countermeasure crash reduction value, the quality rating if the crash reduction was pulled from the clearinghouse.

We focused on the highly reliable or highly competent crash reduction factors to validate the safety effectiveness. We considered how well the countermeasures aligned with priorities and trends, with several meetings over a few weeks. A lot of good healthy debate over the countermeasures. We went through several iterations of the review to address for comments and feedback on different areas and supporting information for the potential countermeasures and a few more exercises to narrow down and focus the discussion and, ultimately, we were able to reach consensus on the new PSCs.

Without further ado, based on work group efforts, these are the new proven safety countermeasures. So, we have rectangular rapid flashing beacons; lighting; crosswalk visibility enhancements; pavement friction management, which includes continuous pavement friction measurement and high friction surface treatment; wider edge lines; bicycle lanes; variable speed limits; speed safety cameras; and appropriate speed limits for all road users. You can see the diversity, whether it is rural or urban application, State, local or tribal agency.

There is something here for everyone to add to their toolbox but also, they align well with the trends we are seeing specific to pedestrian and bicyclist fatalities, speeding, it can support a safe system approach, the Complete Street vision. There are opportunities to consider implementation of these countermeasures and all of that was important as we went through the process of vetting and considering the new proven safety countermeasures to make sure we had to maintain the diversity with the countermeasure initiative really and making sure they were relevant to the many priorities.

As I noted a few slides ago—and we will get into detail once we get to the overview of the speed management PSCs—The appropriate speed limits for all road users will replace USLIMITS2. So we broadened the countermeasure to look at all the different approaches, applications, considerations that are going into setting and considering speed limits. So again, we will go into more detail, but that replacing USLIMITS2 and the other additions bring us to a total of 28 proven safety countermeasures.

As we go to the site that references the handout or fact sheet, the safety effectiveness for the crash reductions noted are tailored to the PSC. There was specific focus on fatality and serious injuries when supported by the data. What I mean is we focused on utilizing and referencing high quality, highly reliable crash modification factors for fatality and serious injury reductions when the data was available in the Crash Modification Factor Clearinghouse or the research supporting that crash reduction. We provided additional context with types of crashes or other factors such as functional classification, area type, time of day, to highlight the most

beneficial applications of the PSCs. Again, where supported by the data. We definitely don't want to come across that we are promoting these in every situation or these will address or answer every safety problem or issue that you may encounter, but we try to focus on the most beneficial applications of the countermeasures and the proven effective criteria.

So we are going to have several technical leads and subject matter experts walk through each of these proven safety countermeasures, starting with safety engineer with the Resource Center safety and design team who will walk us through rectangular rapid flashing beacons and crosswalk visibility enhancements.

Peter Eun:

Thank you. The RRFB, many of you have probably seen these because they have been very popular because they are proven. Just like my background, I am blending and sometimes we need more than just marked crosswalks. You need visibility to increase so the RRFB does that with existing signs. You know you can actually supplement those, the pedestrian, the school crossing post mounted warning signs with an RRFB. It makes you a lot more visible because sometimes you do need more than just a marked crosswalk and we will get to that.

They have been very effective, but these really help and one of the benefits, the beauty of the RRFB is you can introduce solar power or hardwired. With the solar power, it reduces the cost and can put them in more locations, especially in rural applications we don't have the hardwiring put in. These can be put at uncontrolled marked crosswalks, whether at intersections or at mid-block crossings. Here we have Table 1 of the Guide for Improving Pedestrian Safety at Crossing Locations. These are very effective as far as crash reduction factor, 47 percent, but as far as yielding rates, up to 98 percent but we recommend you go to this Table 1 to look at the appropriate location. We have the speed and the number of lanes as far as where the appropriate application, the best spots are. We do recommend typically these are in the 35 under 40 mile-per-hour sweet spot.

One of the beauties of these is they do get your attention and you need to have two at the crosswalk location. At every crosswalk you have one on the right and one on the left and these are great on the multilane roads but, once again, watching where the speed, but if you're using them on a divided highway you need to have them on both sides and if you have a median you can put them in the median as well. What I really love about these is the beacon is initiated each and every time the pedestrian is detected. So when the button is activated these things go on, the drivers draw the attention and the driver slows down. Speed is a huge issue for pedestrians when crossing the road. The majority of pedestrians get killed or seriously injured when crossing the road so great advice you will see more of these and hopefully get more in the next, as we move on.

It all starts with crosswalks and instead of the minimal transfer slides or parallel lines, you can improve crosswalks with higher visibility marked crosswalks but also lighting and others. This is sort of the basis for the pedestrian crossings and these are low cost. You are looking at $12,000 to $16,000, which the enhancement. You can look at the $100 to $200 with certain signs, so they are lower cost. You can use these at midblock and uncontrolled crossing locations at intersections. These have a crash reduction factor between 23 percent and 48 percent in that we do have multiple crosswalk treatments, high visibility marked crosswalks, curb extensions, and lighting switch all fall under the enhancements. Once again, going back to Table 1 with regards to what is the appropriate context where it is best utilized.

And then the higher visibility marked crosswalks. Just like you mentioned you want to draw the attention to drivers, but crosswalks are for pedestrians to know where there's a cross and also for drivers, so consider these midblock crossings. A lot of people crossing the midblocks where they are getting hit, so installing new crossings with higher visibility crosswalks is a good start. There are different materials you can use. Plastic, paint, and brick a lot of things that go with higher visibility, sometimes where they are offset a little bit. These also have a crash reduction factor of injuries going down by 40 percent. And then we have improved intersection lighting with regards to crosswalks, 42 percent a win-win between pedestrians and

vehicles, but you're really lighting the majority. A good percentage over 50 percent of crashes happen during nighttime or in dark conditions.

And then as far as signing, in addition you can have the advanced yield or stop signage markings where stopping vehicles are 20 to 50 feet in the sweet spot is 30 feet in advance of the crosswalk. It really helps with regards to the multi-threat situation to open up site triangles where in the lower speed locations it reminds drivers it is the law and depending on the State to yield or to stop to pedestrians. Works great with education campaigns but having the reminder the law is you're supposed to yield or stop for pedestrians at the crosswalk. Marked or unmarked. So, there is a range to improve pedestrian crossings. Next I'm going to turn it over to my colleague in the Resource Center to talk about bicycle lanes.

Brooke Struve:

Thank you. Most fatal and serious injury bicycle crashes occur at non-intersection locations, including nearly 1/3 of those who die from crashes involving an overtaking motorist. To improve safety, agencies can consider including bicycle lanes, which are a dedicated facility for the use of bicyclists along the roadway adjacent to motorized vehicles.

Bicycle lanes can be included on new roadways or created on existing roadways by reallocating traveling and shoulder width. In addition to the paint stripe used for a typical bicycle lane, a lateral offset with a painted buffer can help to further separate bicyclists from vehicle traffic and improve comfort for the bicyclist. State and local agencies may consider physical separation of the bicycle lane from motorized traffic lanes for the use of vertical elements like posts, curbs, or vegetation. Based on international experience and implementation in the United States so far, there is potential for further safety benefit associated with separate bicycle lanes, referred to cycle tracks.

Separated bicycle lanes align with the Safe System Approach principle of anticipating human mistakes where separating users in space can enhance safety for all. FHWA is conducting research on separating bicycle lanes, which includes the development of crash modification factors expected to be completed in 2022 to address the significant interest we have seen in this topic. Agencies can use various strategies, practices, and processes to enhance their ability to address equity in bicycle planning and design. For example, one agency in Louisiana is using the percentage of students anticipated in the free or reduced school lunch program as a factor in prioritizing the project to build facilities for pedestrians and bicyclists. Agencies should reference the FHWA selection guide for more information on choosing a bike design that will best serve all abilities in a given context.

Research indicates roadways with the traveling width decreased to add a bicycle lane did not experience an increase in injury or congestion. This applies to all crashes on roadways classified as principal arterials with no control of access in urban areas. Some crash reduction factors were developed through the FHWA evaluation of low-cost safety improvement fund study. This evaluation found adding a bicycle lane by reducing lane and shoulder width resulted in a 57 percent reduction of total crashes, not just bicycle crashes. On a four-lane undivided collector or local road, resulting in a 30 percent reduction in total crashes onto lanes undivided collector or local road. With that, I would like to introduce our next speaker, an engineer with the Office of Safety who will tell us about wider edge lines.

Cate Satterfield:

Thank you. Along roadways with edge lines mostly using four-inch pavement markings, but here we are referring to six-inch lines used to heighten the visibility of the pavement marking and the edge of the roadway. The wider edge line increases driver perception of the edge of the travel lane and can provide safety benefit to all facility types - freeways, multilane, or two-lane highways. Wider edge lines are most effective in reducing crashes on two-lane highways, especially for single vehicle crashes. Wider edge lines are considered low-cost because the additional cost is only in the materials, so a lot of the cost going into the installation is actually the labor of getting out the material itself is the only thing that's extra when you switch from 4 to 6 inches. It is likely agencies will try and find a lower cost when using durable marking material

such as thermoplastic, so it's good to think of the in terms of not just your initial outlay but the lifecycle cost over the life of the pavement marking.

For automated vehicles, six-inch edge lines may be determined easier. There is proposed language in the notice of proposed amendments that was put out and I'm not going to go into detail about what that says but it is much broader than this proven safety initiative. So we are going to stay focused on this when there were comments to the rulemaking that are being reviewed and when a decision is made about what's going into the next it will be announced to the Federal Register as a final rule. Back to this.

As agencies consider implementing these wider edge lines, we recommend a systemic approach. So that means you would want to base your installation not necessarily on a specific system of where you would want to place them but look at one of the crash risk factors and specifically roadway departure risk factors. Some might include things like narrow pavement or narrow shoulders. The presence of curbs, history of crashes, et cetera.

The wider edge lines can reduce crashes up to 37 percent, fatal injury crashes on rural two lane roads, and up to 22 percent for fatal and serious injury crashes on rural freeways. Very effective for a small cost. The wider edge lines can have a benefit cost ratio of 25:1 for fatal and serious injury crashes on two-lane roads. Now let's go through lighting and friction management.

Joe Cheung:

Thank you. We know that lighting enhances our ability to see what's ahead whether when driving, walking on the sidewalk, or crossing the streets. Nighttime fatality rates are three times the daytime rate even though only 25 percent of vehicle miles traveled occur at night. At nighttime, vehicles travelling at high speeds may not have the ability to stop once a hazard or change in the road alignment becomes visible by the headlights. Similarly, pedestrians cannot detect along the walking path at night or be seen by motorists when trying to cross the street. When considering locations such as intersections and pedestrian crossings, lighting significantly improved the overall visibility, increases site distance, and makes roadside obstacles more noticeable to the driver.

And now, we all use different forms of LED lighting fixtures in our homes because it is more energy efficient and appears to be brighter. The LED lighting technology also affects the roadway lighting as well. LED lighting provides far superior precise control in reducing excessive light affecting the nighttime sky glow and minimizes spillage over to the adjacent cars. It allows for effective lighting control to customize the light level according to the needs and specific time period at night. In addition to traffic safety, adequate lighting often serves the purpose of safeguarding personal safety for pedestrians, wheelchairs, and other mobility devices, bicyclists, and transit users as they travel along and cross the roadways.

Agencies can equitably engage with underserved communities to determine where and how new and improved lighting can most fit the community by considering the priorities, including eliminating crash disparities, connecting two essential neighborhood services, and improving active transportation routes that promote personal safety.

Research shows lighting intersections can reduce crashes up to 42 percent for nighttime injury pedestrian crashes at intersections and 38 percent for nighttime crashes at rural and urban intersections. Agencies can consider continuous lighting on both rural and urban highways, including freeways. Research shows lighting can reduce crashes up to 20 percent for nighttime injury crashes on rural and urban highways. As part of this effort, we are developing 3- to 5- minute video on lighting that will feature a case study and additionally anticipate a pedestrian lighting user guide later this year or early next year.

So, pavement friction. Friction provided by roadway surfaces affects how vehicles interact with the roadway, including the frequency of crashes and measuring, monitoring, and maintaining pavement friction, especially at horizontal curves with low radius, lack of elevation, and the location where vehicles are frequently turning slowly and stopping, which is fairly typical at intersections. This can prevent many roadway departure intersections and pedestrian-related crashes. This proven safety countermeasure includes Continuous

Pavement Friction Measurement. Continuous friction measurement improves the agency's ability to measure friction through intersections and around curves and provides more clear a picture of how friction varies for different parts of the road segment. Traditional friction management devices cannot safely and accurately collect such data, especially in curves or intersections where the pavement polishes more quickly and having adequate friction at these locations are so much more critical, yet because it can only spot measurements at increments around 60 feet. And because it cannot be performed in smaller increments, agencies will assume the same friction over a mile or more and cannot assess friction in between measurements. And sometimes we refer to sampling.

Additionally, using lock rear trailers requires traffic control and can cause a disruption to traffic operations and secondary crashes. To get more accurate data, the agency uses technology which can operate at highway speed and provide both network- and segment- level data. It is established and a proven approach that has been used for several decades in other countries and that revolutionizes the role of pavement friction in framing our understanding and management of the safety performance of our nation's roadways.

Equipment is able to measure pavement friction continuously without stopping with curves and intersections and at speeds as high as 50 miles per hour. This data can then be processed in the office and can be get down to a small increment as small as one foot. Practitioners can analyze the friction, the crash and roadway data to better understand and predict where friction-related crashes will occur to better target locations and more effectively put in safety countermeasures such as High Friction Surface Treatment.

High Friction Surface Treatment was one of the Every Day Counts safety initiatives. It is an application of very high quality aggregate, typically that are polish and abrasion resistant and applied to the pavement using polymer binding to restore and enhance pavement friction at existing or potentially high crash areas associated with friction. This is highly effective in reducing hydroplaning on wet surfaces. As most of you are familiar, it was part of an existing proven safety countermeasure under the pavement friction for horizontal curves. However, when added to the list of proven safety countermeasures a few years back, it was limited to horizontal curve application only. Since then we have a lot more experience with it in other applications, so creating a standalone proven safety countermeasure makes sense that allows us to be more inclusive of the other non-curve locations were friction demands driven by the ability to perform short-term maneuvering such as sudden braking, lane changes, and minor changes in direction within lanes. It is evident that in our everyday driving on the highway system we encounter the intersection approach is an approach crosswalk as well. So, CPFM and HFST can certainly enhance the safety aspect of those locations.

As far as effectiveness, HFST can reduce crashes up to 63 percent for injury crashes and 40 percent for injury crashes at horizontal curves, wet crashes 83 percent and 20 percent total crash reduction at intersections. That completes my presentation. Now I want to turn over the time to my colleague; she is the safety specialist with the safety operations team at headquarters. She will be presenting variable speed limits. Thank you.

Anyesha Mookherjee:

Thank you. I will be leading you to the next set starting with variable speed limits. Variable speed limits are speed limits that change based on different conditions. Improving traffic safety by reducing speed variants, users can also improve driver expectation in advance of slowing and lane changes. Results may be limited to alleviate congestion, manage speed during traffic events such as incident or work zone, and reduce speeds during inclement weather. Based on available research, it is most effective when implemented on urban and rural and arterials with speed limits greater than 40 miles per hour.

Reducing speed so human injury tolerances are accommodated by improving visibility provides additional time for drivers to stop in reducing impact. In this way, we are integral to the safe speed element of the Safe System Approach. As far as effectiveness, we reduce crashes on freeways by up to 34 percent for total crashes, 65 percent for crashes, and 51 percent of fatal and injury crashes.

So the next new PSC, speed safety cameras, quite a number of abbreviations there. Using speed measurement devices to detect speeding and capture photographic or video evidence of vehicles violating a set speed threshold. Agencies can use speed safety cameras as an effective and reliable technology to supplement more traditional methods of enforcement, along with engineering and education, to alter the social norms of speeding and affect much-needed progress in reducing speeds.

Agencies should definitely conduct a network analysis of speeding-related crashes to identify locations to implement. These can be deployed as a fixed unit—a single stationary camera targeting one location—or a point-to-point unit which has multiple cameras to capture average speed over a certain distance, or a mobile unit, which is a portable camera, generally in a trailer.

When implementing, agencies should consider the following. This should always be planned with community input with impact in mind with proper controls in place. There can also be fair and equitable enforcement of speeding regardless of driver age, race, gender, or socioeconomic status. Public trust is very important to the success of any program. If possible, use a mix of highly visible and hidden enforcement to encourage drivers to comply with speed limits everywhere. Conduct a legal and policy review to check if within your jurisdiction and, finally, conduct and consult DOT and guidelines. This was positioned in 2008 and is currently undergoing an update.

How effective are speed safety cameras? Six units can reduce crashes on urban principal arterials by up to 54 percent for all crashes and 47 percent for injury crashes. In New York City, they were found to reduce speeding way up to 63 percent. Point-to-point units can reduce crashes on urban street ways, expressways, and principal arterials up to 37 percent for fatal and injury crashes. Mobile units can reduce crashes on urban principal arterials by up to 20 percent for fatal and injury crashes.

This brings us to the last - Appropriate speed limits for all rural users, which mentioned before will replace USLIMITS2. In previous initiatives we promoted the use of these tools. Since then, the state of knowledge in the practice of speed limit and for us here at Federal Highway, the Safe System Approach has been part of this revolution. The Safe System Approach places special emphasis on safe speeds, which is one of the core elements, so even though this is not a brand-new PSC but somewhat of a revision of an existing, we believe the reasons are significant enough to have a special mention here today.

In 2019, speeding killed 9,478 people, representing 26 percent of U.S. highway fatalities. As we all know, we humans are unlikely to survive high-speed crashes. Nine out of 10 pedestrians, if hit by a vehicle traveling around 20 miles per hour are likely to survive, while only one out of 10 pedestrians will likely survive impact at 60 miles per hour. Higher vehicle speeds increase not only the severity of the crash but its likelihood because higher speed diminishes the driver ability to recognize and avoid potential conflict.

State and local transportation agencies are generally responsible for setting and enforcing speed limits under their jurisdictions. They may do so statutorily or non-statutorily. Statutory are established by statutory action would design, function, and jurisdictional and/or location characteristics. Non-statutory speed limits must be based on engineering studies. They should be conducted in accordance with and involve multiple factors and take into account judgment, Federal Highway Administration practices for speed limits, and an informational report published in 2012. But with this new PSC, agencies are being encouraged to use the expert system approach. The expert system approach relies on a knowledge-based decision-support process developed by subject matter experts to provide consistent results. Practitioners interested in this approach may use USLIMITS2 or the posted speed limit setting procedure developed as part of report 966.

Another approach to consider is the Safe System Approach to setting speed limits and thereby reduce the risk of death or serious injury for all road users. Based on international experience and implementation in the United States, use of 20 mile-per-hour speed zones or speed limits in urban areas where one or more users share the roadway may receive safety benefits. When setting a speed limit, agencies should consider a range of factors such as pedestrian and bicycle activity, context, crash history, intersection spacing, roadway functional classification, traffic volume, and observed speeds. Implement self-imposing roadways, traffic, and speed safety cameras in concurrence with speed limit settings. As far as effectiveness is concerned,

traffic fatalities in the City of Seattle decreased 26 percent after the City implemented into citywide speed management strategies and countermeasures. This included setting speed limits on all non-arterial streets at 20 miles per hour and 25 miles per hour for 200 miles of arterial streets. With that I will hand it back.

Phillip Bobitz:

Okay thank you to all of our SMEs for their brief overview on each of the nine new PSCs. I would like to transition to review some of the materials both new and updated that we have developed as part of the update starting with the webpages. Please note some of the functionality I am going to show as part of the presentation, some of the screenshots, the functionality is not quite been enabled on the webpage yet. We continue to work with IT to enable that and we're hopeful that it should be added soon.

So, the webpages received an updated look and branding but retained the icons and the one-page handout where content for each of the PSCs with the initiative containing 28 countermeasures. The website received new features to better organize the PSCs and help users find the resolution to their issues. First, the homepage was organized in five areas, so we have speed management, roadway departure, intersection, pedestrian and bicyclist, and cross cutting with each of the countermeasures listed under those headings. The website will also feature enhanced functionality, including a text search capability and a new filter tool. This is the functionality, you can see the toolbox to the top of the page on that screenshot that is not currently shown on the public facing webpages. So that will be hopefully added soon.

The search tool will allow users to enter or type in keywords into the search box and then the website would return the PSC that contains the keyword. We also have a filter tool which will allow users to obtain a tailored listing of potential Proven Safety Countermeasures for their location of interest. Based off of answers or questions or criteria that a user selects that user would receive a tailored list of PSCs meeting the same criteria.

Let's take a little bit deeper dive into what the filter tool kind of looks like. This is a screenshot of the new filter tool and the questions are parameters that can be selected to filter the full list. We thought this was a very important addition to the webpage now containing 28 countermeasures. The first glance can be overwhelming navigating the pages, even grouping them by focus area. It is a lot to sort through. The intention with the tool is to assist practitioners including those with limited safety backgrounds to more easily identify solutions that meet their needs. Some of the questions you can see. The area type, the focus area you're trying to address, traffic volume ranges, targeted crash types, or a problem you're trying to address such as excessive speed or driver intention.

After a user selects the options that they are looking for, you can select as many or as little of these options or answer what questions you need to based off your project or situation. You hit apply filters at the bottom of the page and a list of PSCs will update at the bottom of the page based off the query and the answers are selections you have made. This is an example using these selections provided from the previous screenshot. You have now gone from 28 countermeasures down to four, which is a much more manageable list to sort through. Something, a more tailored list you can dig into and find out what might be the best fit for your situation. From this list each of those is a clickable link so you would click on these and to take it to the countermeasure's specific page or you get more information or if there are links included for additional resources or a page to go on the webpage to get more additional information but, again, a more manageable list to sort through as you try to look and find out what might be the best fit for your project.

We also developed, which were popular with previous iterations of materials from the initiative one page fact sheets or handouts for each of the nine new PSCs. Most of the content from the slide deck today was pulled from the one page or handouts. The one pagers are great for briefing leadership and they're beneficial and a handy resource for practitioners looking to implement a PSC. Although we cannot cover every detail in a one pager, we cover the key nuggets of information. So a very brief overview of what the countermeasure is, the safety effectiveness or crash reduction associated with the most beneficial applications where supported by data and research. I saw a couple questions related to this. Each crash reduction noted includes a footnote or reference to the research, in most cases a crash modification factor, so that study has a footnote

at the bottom so you can dig into that if you're looking to get more information, but we have tried to provide a summary on the left side for the sidebar of each handout. So we can focus on the most beneficial applications of the countermeasures and then we also include information on applications and considerations for implementation.

Some of the PSCs went through much more substantial updates since it has been years since many of the fact sheets or handouts have been updated. One example is dedicated left and right turn lanes at intersections. The new fact sheet includes information on the research and application considerations and crash reduction associated with offset turn lanes. We now have enough research and information that demonstrates and supports that use from a safety perspective. Going forward it is our intention to keep the countermeasure-specific pages, the handouts with the data, possibly as new research and information becomes available. Instead of waiting three, four, five years between each major iteration, you can visit webpages to get the latest and greatest fact sheets and we will do our best to keep those up-to-date as the new applications become evident.

We have also developed a number of other resources. The overview flyer is shown on the top left. It is a one pager front and back. The front includes an overview of the initiative and the backside contains the full list of 28 proven safety countermeasures. The screenshot of the cover of the booklet is a compilation of all 28 PSC handouts and fact sheets. Really nice, handy desktop reference. Pre-pandemic these were very popular in our in-person events but both of these are available for download on our webpages. At the bottom you will see the PSC rollout box. That is currently included on our webpage. However, it currently shows the flyer, the booklet, and the guidance memos. Within the next few weeks, we will host and post the webinar recording and the transcript on that page. Also, in development are two videos. One is a PSC overview video which we hope to have finalized and posted by the end of the calendar year. The second is on lighting and Joe touched briefly on this, featuring Florida DOT, is a case study. They have a progressive lighting program as far as new locations for lighting. Also, they are retrofit, so upgrading high-pressure sodium lighting to LED lighting, so really appreciate their willingness to contribute to that video and we hope within the next few weeks to have them posted on our webpages for viewing.

So, in conclusion, find the PSCs that fit your situation. We encourage you to consider the Proven Safety Countermeasures as viable options for improving safety on all roads and for all users. The information here and in other materials, we don't want to suggest or imply that the Proven Safety Countermeasures are the answer to all your problems. There are many other countermeasures available and they may be a better fit, so I think we have noted that a few times but just want to reiterate, we urge you to consider these for implementation but recognize there may be other countermeasures available.

Use the resources and save lives. Updates are intended to provide the most up-to-date research and considerations and provide tools for practitioners, all with the goal of reducing fatalities and serious injuries on roadways. We encourage you to visit the webpages, download resources developed, and also keep an eye out on the webpages for the enhanced functionality. If there is anything we can do to help, please let us know. All in all, Federal Highway is committed to providing any assistance related to the DOT and related safety programs. Reaching the goal of zero deaths and serious injuries requires all of us to take ownership and safety. Widespread implementation of these PSCs can help accelerate achievement of those safety goals and enhance safety for all road users.

That wraps up our presentation. We will transition now into a Q&A session. I'm going to ask Kevin Elliott from the contractor team to come on and help moderate or facilitate the session. Again, our platform doesn't permit the ability to ask questions through audio so we encourage you to ask your question in the Q&A tab of the event interface. A lot of questions are coming. Subject matter experts have been working to answer a lot of those questions but now I'm going to hand it over to Kevin.

Kevin Elliott:

Thank you. Yes, there have been some really good questions, very active in the Q&A. Just so everyone knows, if we are not able to answer your question audibly in the section it does not mean you won't get an

answer. We are keeping track of every question that has been asked and as quickly as possible our subject matter experts are typing in their answers live. We will section these out and then do our best to get answers to everyone. So, what I would like to do is I will start with an overall question that came in and then we will go through section by section and I will ask the question and let the particular SME answer those questions. The first one. It's kind of a general question about the literature review. A comprehensive review was mentioned and one of the tasks under this project the wider edge line countermeasure mentions a few of these, these are studies and sources and you mention this, but I want to make sure everybody knows. Talk about the lit review a little bit and some of the footnotes in those fact sheets to make sure everybody knows where to find that information and that background.

Phillip Bobitz:

The literature review was a full, very comprehensive review of all the different research in both the Crash Modification Factor Clearinghouse, publications through TRB. You name it, it was all considered in the literature review. So, the contractor scoured and conducted that. After identifying the countermeasures, that support information or the crash reductions were included. And again, I think Mike touched on briefly with the criteria we looked at for determining which countermeasures to designate as proven safety countermeasures. We focused on the highly confident and reliable crash notification factors and we do that by looking at the star quality rating assigned to each crash modification factor.

All of the crash modification factors were included in that literature review as part of the supporting information, but when we really started getting into the discussion of trying to identify and select with the new countermeasures, we had to raise the bar a little bit and focus in on the higher-rated star quality rated CMFs for consideration. A lot were pulled from the Crash Modification Factor Clearinghouse as we selected them, some additional research was consulted to make sure we looked at and provided those most beneficial applications of the PSCs. Ultimately, the ones were included on the fact sheets, handouts, and the slide deck today. Every crash includes a reference to study or research whether from the CMF Clearinghouse, that is a footnote on each of the fact sheets or handouts. So, if you're a data nerd and want to dig into the study a little bit further, that study or research is included as a reference to each of the crash reductions. Hopefully that addresses the question. I know it's a lot stepping through the literature review and only including a few crash reductions we had to focus and raise the bar a little bit to make sure we are highly confident in the research supporting that crash reduction.

Kevin Elliott:

Thank you, the next question is for Peter. A lot of questions about the RRFB. As you saw, Peter entered most of them but one that came in - Have there been any consideration of using RRFBs at yield or stop controlled intersections?

Peter Eun:

So at the yield and stop, and I think the question is trying to draw attention to maybe people not necessarily yielding, so we would not put the RRFB in those situations. The RRFB is for uncontrolled so you have a stop condition. You could use LED around the border. That is a possibility to draw attention to the stop sign. The other thing is if the stop sign is on a minor street and you don't have a stop condition of the major street, an RRFB can be installed. But do not put an RRFB with a stop sign on the same road the stop sign is on.

Kevin Elliott:

Thank you. Peter one more question for you. Can you repeat the different options for cost for the RRFBs?

Peter Eun:

Yeah, so a couple people mentioned with PHBs as well, The RRFBs being in the $10,000-$15,000 range. Is the pedestrian hybrid beacon is much higher, $80,000 to $100,000. There are some solar options as well, coming down to $26,000 range, but the cost of something else, that's just for the equipment. Please note if

you are putting in a brand-new midblock crosswalk, we have to add curb ramps or get right-of-way, there will be additional cost, so that number is really just for the equipment itself. May I recommend also PedSafe, if you Google PedSafe it has a lot of countermeasures and it does have some national estimates with regards to the cost for the different countermeasures that we talked about.

Kevin Elliott:

Thank you, Peter. There was a question about lighting at intersections. Let me get to this one real quick. A question for maybe Joe or Peter. I have lost the question. I will tell you what, what about, this would be a question for Joe I think. Joe, what about in pavement crosswalk lighting, LEDs installed in the pavement that light up the crosswalk from below?

Joe Cheung:

Yeah, there were a couple questions on that. One of the answers is maintenance of these devices. A lot of jurisdictions have tried to use it. Whenever a couple of seasons, especially after the winter freeze and thaw months, it actually stops working. Near where I live, I saw several of them that had them before and then they ended up not using them anymore. That's the general experience. It's not something they can rely on all the time, so instead they use other traffic control devices to help.

Kevin Elliott:

Thank you, Joe. I think this one is for Peter but Peter answered in the Q&A. Are there any guidelines for when to light midblock marked crossings?

Peter Eun:

We would recommend if you can at all put in lighting, it is not required—that we understand obviously—there is cost involved, but we recommend you would always light. There is an informational report called the Informational Report on Lighting Design for Midblock Crosswalks. Something I did not mention during the presentation is we do recommend you put it in front of the crosswalk, the lighting in front of the crosswalk rather than directly over or behind because that creates more of a silhouette effect. So the recommendation is to put the lighting in front of the crosswalk. I will put a link to that report in that response.

Joe Cheung:

Yes. If I can add to that, this is a report that I think was published in 2008. Probably needs an update however the information is still fairly accurate. So for now that's probably the best reference that we can refer to, in terms of for midblock crossing. However, there is kind of like Peter said, there's no requirement developed with that just yet however I think there was a study that had just been concluded by Virginia Tech that looked at the effectiveness of midblock crossing. I think it's either in conjunction with Illinois DOT, so maybe that particular finding will shed a little more light on that.

Kevin Elliott:

Great, thank you. The next question is on bicycle lanes. What was the reduction in severe and fatal injury crashes when adding bicycle lanes?

Brooke Struve:

Thank you. It’s going to depend on your context. For four lanes, undivided urban collector or local road, we see a 57-percent reduction for all road users. And then on a two-lane road in that same context, it is a 30-percent reduction and those are the two that we are highlighting because they are very reliable. There is a great number of others you may find in the Crash Modification Factor Clearinghouse. I would advise if you're looking at those, look at the underlying research and the star rating to see the context in which the research is applied and you know what nuance there may be. Because one thing that I will caution you when

you look at crash modification factors for bicycle travel is that you know we're talking about a total number of crashes, but if you build the facility and it is increasing the ridership you might see an increase in crashes, but you also have had a much greater increase in potential exposure because more people are using the facility. While we don't want to see any increase in crashes, make sure you know what the data and the numbers are telling you.

Kevin Elliott:

Very good, thank you. This next question is for Cate on wider edge lines. In the study, was the use of recessed pavement markings included in the study?

Cate Satterfield:

We did not do a specific study to determine which would be Proven Safety Countermeasures. We reviewed the existing literature. So recessing pavement markings, that is an excellent way to increase durability of your markings. The cost effectiveness of that is going to depend on a lot of conditions. The volume on your roadway, the amount of snow plowing you do, et cetera, so that's not really taken into consideration when we look at the benefit to cost ratio. That study is looking more at just the cost to change from orange lines and to maintain it at that level.

I also saw another related question down the list that was asking if the lifecycle was worked into that and yes, of course, if you use durable marking it's going to last longer, but it could be more of an upfront cost. But that is part of the cost analysis. Recessing the markings, you would just have to make that decision for your specific roadway. It can definitely be beneficial. Some studies have shown cases where it has been.

Kevin Elliott:

One more follow-up on the wider edge line. Does FHWA recommend or have a minimum level of retroreflectivity for edge lines?

Cate Satterfield:

Sure. So that will be in when the final rule comes out. Right now, inspection all markings must be visible at night must be or shall be retroreflective so they'll have to be retroreflective unless you have ambient illumination that ensures adequate visibility. So that's what it says right now. There is rulemaking on putting minimum levels of reflectivity for pavement markings, which has been ongoing for a while and is still ongoing. You have to watch the Federal Register to find out when that comes out.

Kevin Elliott:

Very good, thank you. A couple questions for Joe. How do CPFM and HFST specifically affect pavement quality metrics like IRI and PCI?

Joe Cheung:

I don't think, I'm not sure exactly are they talking about using that to measure the texture, that's what I'm assuming. It would not affect anything in terms of you, you apply the HFST on top of the existing road and you would get different data, but you know it is a treatment just like if you were resurfacing a road. In that case, at the intersection location or at a short section of the curve instead of the entire roadway. So I don't think it's actually affected. And then CPFM itself is a data collection device, the measurement. It does not put anything down, so it would not change the texture of the roadway. I don't think that changes the measurement as well for the methodologies they are talking about.

Kevin Elliott:

Thank you. A couple questions about HFST as it might affect cyclic and bicycle lanes. Can you speak to that?

Joe Cheung:

Yeah. For some of those I believe especially you'd probably see a green color bike lane. At times they label it as HFST bike lane but most of the time they would use a less abrasive aggregate, so you know because driving or riding a bicycle on a bike lane does not demand a lot of high friction, so sometimes they did it more for the demarcation than anything else. However, because the use a less abrasive aggregate while it provides much better traction especially with wet conditions, it would minimize the chance of you falling. However, if you do fall just like you fall on any pavement, the effect is the same. You'll probably skin your knee or whatever. I don't believe there is a lot of large impact on the bicycling community. We have not heard any feedback from jurisdictions that have used green bike lanes and received tremendous amount of complaints. Whenever we kind of ask them they say they had not heard anything about the complaints about the HFST bike lane.

Kevin Elliott:

Okay thank you. Next question – Does the use of variable speed limit presume motorists will obey speed limits?

Anyesha Mookherjee:

Yes, it does and just with any regular speed limits that also has the same implication, but remember they can be advisory or regular depending on jurisdictions, so that's the added twist. So you need to work with your law enforcement before you set up the system and implement to see how you can actually, whether you can enforce the speed limit or not, which can drive-up compliance.

Kevin Elliott:

Very good, thank you. Peter back to you on RRFBs. Did you examine or has it examined the use of raised crosswalks and where do they fit in with all of this?

Peter Eun:

The raised crosswalks were part of the STEP initiative and they do have their place, you can use RRFBs with raised crosswalks. A lot of these countermeasures can be used in combination. So the raised crosswalks as somebody was asking with another proven safety countermeasure, I don't know maybe in the next round or something. But they did make the STEP initiative and I will put a link in one of the responses to be published the STEP website has in addition to the RRFB, some other pedestrian treatments as well. Maybe we can put that link in.

Kevin Elliott:

Okay one more while we have you one more follow-up - Is there a significant safety difference between continental striping and continental plus the transverse lines, the latter type?

Peter Eun:

There was research or a report out with regard to this issue. It shows the continental were pretty similar but they did have much better detection over the transverse, the parallel lines, so I can put a link to that research report in the responses as well.

Kevin Elliott:

Okay, one more. RRFB was a popular topic. So, someone asks for advanced signing for crosswalks was recommended and advanced signing was not recommended. Can you clarify that?

Peter Eun:

So I guess I'm not sure where they heard that but depending on the site distance, and they say that in the approval as well, additional RRFB may be installed in advance of the crossing, shall supplement not replace. So the advanced signing with the RRFB, you do need to have the RRFB at the crosswalk as well. So really it is with regards to site distance. That's the issue.

Kevin Elliott:

Thank you. Back to Joe. Another HFST question. Should HFST be installed just in the travel lanes between edge line and centerlines or for the whole roadway?

Joe Cheung:

No. It depends on your crash data and metrics. I've seen many installations only cover one directional lane, not the entire lane, so they don't need to cover both lanes.

Kevin Elliott:

Okay thank you. A question back to VSL, has the use of speed governors been given serious thought?

Anyesha Mookherjee:

I am assuming the person asking the question is referring to some sort of intelligent speed adaptation. We are not considering that because the initiative is mostly focused on engineering countermeasures, but that is something more on the ground and it is used in Europe and I think that definitely has promise.

Kevin Elliott:

Okay thank you. Another question back to Peter. Peter will sleep well tonight with all of these questions. Doing a great job. Can you talk about putting RRFBs and PHBs at intersections and driveways? What are the pros and cons?

Peter Eun:

In the past there was, in the current limit started there. It says PHB should be at least 100 feet from an intersection. That's going to get changed next most likely because a lot of the research with regards to PHB shows that was not an issue. The concern was on the minor road if it's not controlled, drivers are stopping at a stop sign but on the major roads they have this PHB or stop condition, so there may be confusion. The research shows that was not an issue, so I suspect there's been no research with the RRFB, but I don't think that would be a problem as well. RRFBs and PHBs can be used at an intersection. I was responding to somebody who asked the question with regards to stop control. Once again, repeating, if you stop control on the minor road but not on the major roads you can put that RRFB on the major road crossing.

Kevin Elliott:

Very good, thank you. Previous studies on speed limits show changes in speed limits had very little effect on actual speed. Has that changed?

Anyesha Mookherjee:

I think what we would like folks to do is take into account the context of the roadway and not just change the speed limit. Definitely there is literature that says just changing speed limits does definitely have a benefit, a safety benefit. I think on the proven safety countermeasure, for the speed limit there is a study that backs that up.

Kevin Elliott:

Very good, thank you. There were a couple of questions related to the number of new Proven Safety Countermeasures versus existing. You mentioned the new name for USLIMITS2. Is the name Appropriate Speed Limits for All Road Users or different what's going on?

Phillip Bobitz:

USLIMITS2 was a proven safety countermeasure in previous iterations. We took a step back as noted, we looked at all the existing countermeasures specific to speed limits. We recognized there's a lot of other methods and approaches, considerations of factors and tools that can be utilized when setting speed limits and making speed limit setting decisions. So, USLIMITS2 is no longer a dedicated proven safety countermeasure but it is included under the new Appropriate Speed Limits for All Road Users, as a tool to be validated to make decisions. So it was stated previously ,we are replacing it with a newer broader PSC for setting speed limits with all the different tools and approaches that can be utilized by an agency to set speed limits.

Kevin Elliott:

Okay thank you. The next question is for on road bicycle lanes. It seems like lane width and narrowing lanes is often part of providing room for bike facilities with the added benefit of slowing traffic. Is there updated guidance on when lanes can be greater than 12 feet and when it is not an option for roadways at 55 miles per hour and under?

Brooke Struve:

What I would say is we have experienced and have an understanding using our highway capacity analyses and safety analyses that tell us reducing the lane by a foot or two feet will not have a significant impact on the motor vehicle travel, while we get a safety benefit from providing bike lanes that approved all users of the roadway just, not the bicyclist. That's where the CMFs we have highlighted today are applicable. If we're talking about speeds up to 55 miles per hour, these we have mentioned are applicable to local roads and collectors in a urban area and I would expect we would have much lower speeds on the corridors. If we don't, that might be something we should be rethinking.

Certainly, adding a bike lane next to motor vehicle traffic on higher-speed roadways, if you're getting above 35 miles per hour, is not going to be comfortable for the bicyclist. You will likely only have your highly competent bicyclist using those corridors and I would refer you to the bikeway selection guide, which has good guidance on the appropriate type of bicycle facilities for a given context. So if you are building these facilities, you're building them in such a way that it will serve the greatest portion of the population that would be interested in bicycle travel.

Kevin Elliott:

Thank you. I have a follow-up for you. Are we considering electronic bikes as regular bikes and how do they fit into this?

Brooke Struve:

That is a very good question. One of those emerging topics and every agency is sort of addressing it in their own way. One thing I would refer you to is the Pedestrian and Bicycle Information Center. There is a website for that if you type it in, we have a page that talks about micro-mobility and what's happening across the country. Right now, we don't have standardized data collection on these different modes. We don't necessarily distinguish between bikes and we don't necessarily have data on things like scooters or other things that are out there now, so it's hard to capture some of that unless someone is doing direct observational studies in an area where you have a lot of activity. My own feeling is that electronic bike speeds, scooter speeds are generally going to be consistent with what is happening in a bicycle lane and I think that's a reasonable place for them to be but there are some products that are allowing users to travel at much higher speeds so, in that case, maybe some local municipal ordinances are appropriate. Some agencies

have put some different restrictions in different areas on what type of bikes you are allowed to use in those facilities.

Kevin Elliott:

Take you. This next question goes to Joe on lighting. Does the lighting PSC include recommendations on spectrum? For cities that are dark sky cities and other considerations to control the lights?

Joe Cheung:

We're in the process of putting together an update of the average lighting handbook so that should be available early next year. It does include taking into account the spectrum when using sign lighting. Something about LED is you can target the lighting and provide including the hue so you can target the light where you wanted to go maybe on the roadway or the sidewalk and minimize the spillage or the so-called vibrating that allows upward light to impact the dark skies. The lighting community is fully aware of that and they're putting in a huge effort to minimize any impact that will change the dark sky and all that. So in the new handbook there will be a writeup including that major lighting designers take that into account.

Kevin Elliott:

Thank you Joe. We had a couple questions on the website itself, people asking do you know roughly when the filter tool might be available? There's a lot of interest in the filter tool.

Phillip Bobitz:

We recognize that, I think I mentioned when we got into the webpage updates it is not currently shown or enabled at this time. The rush to meet the rollout with a timeline to get this initiative rolled out officially, we did have to make some last-minute adjustments and I included just getting the countermeasure-specific pages uploaded to the public facing webpages. We are hopeful within the next few weeks that the search tool and the filter tool will be added. They will show up directly on the Proven Safety Countermeasures homepage. So toward the top like my screenshot showed from the test site that should mimic similarly with the search toolbox will look like and it will appear at the top of the homepage before you get into the categories where the groupings of the countermeasures but not currently shown on the webpage we understand. We encourage you to keep an eye on those webpages for when that goes live.

Kevin Elliott:

Great, think you. Joe, with CPFM, is it limited to certain surface coatings or increased gravel size of asphalt?

Joe Cheung:

No. However, you know CPFM is a methodology using a particular type of device to collect the data. However, their contact points occasionally when the wheel is kind of dragging across the pavement. So it is independent of the aggregate size but it will not work with loose gravel because then it would just give inaccurate readings.

Kevin Elliott:

Very good thank you. Peter has had enough of a rest, so back to Peter. Are there any specific crosswalk visibility enhancements for trail crossings?

Peter Eun:

Actually, both the RRFB crosswalk visibility enhancements can be used at trail crossings in addition to the countermeasures, so we're pulling these particular ones out but if you go to the STEP website or the pedestrian website we have a lot of great tools for trail crossings.

Kevin Elliott:

Okay very good. Peter, while we have you, is there a CRF for curb extensions only?

Peter Eun:

Yes. Actually, that is right now. Hopefully we will get that shortly, but that is under research and hopefully the results will come out shortly, but curb extensions are trying to develop those crash reduction factors.

Kevin Elliott:

Okay thank you. Joe, high friction surface treatment. Would you recommend high friction surface treatment for bridge spans or tunnels?

Joe Cheung:

No, I would not recommend bridge span because a lot of agencies have used that but they use it to seal the bridge deck, which you don't need HFST for that. However, if the bridge is on the curve and has experienced a lot of wet crashes on the road type, then you can treat them with HFST. For tunnel, I would limit to the approach into the tunnel because that's the time where because of the change in the lighting inside of the tunnel versus outside, a lot of vehicles will start to brake, so you want to make sure there is adequate friction provided. However, once you're inside the tunnel, unless you have your lanes narrow, then you want them to stay in the lane and then you put in HFST. Otherwise it's not needed.

Kevin Elliott:

Okay thank you. Brooke, another question for you. Is there a study for the difference between protected bicycle lanes versus nonprotected?

Brooke Struve:

As I mentioned, we are doing research right now to study separated bike lanes. That's the terminology we are using. What we mean by separated is something that has a buffer and a vertical element like a delineator or post or a raised island or something of that nature separating the bicyclist from motor vehicle travel. So that research is ongoing; we anticipate we will have that available in the next year.

Kevin Elliott:

Very good and a follow-up on the same topic. CMFs for bicycle lanes only built upon pedestrian and bicycle exposure?

Brooke Struve:

What we highlighted today are for the safety of all users and the crashes related to all road users, not specific to bicyclist or pedestrians or anybody else. Part of the reason for that is we have a lot more data when we look at all road users. If we look just at bicycle trouble, sometimes it's hard to get enough significant data that we can make some observations on those trends, so if you're looking at the Crash Modification Factor Clearinghouse, you will often see when you look at crash modification factors specific to bicycle trouble, the ratings are not as high as they are if you're looking at the crash reduction for all modes of travel. That being said, the crash modification factors are showing that there is a safety benefit for everybody, not just for the bicyclist, which I think is good news. It's not just a bicycle specific piece of infrastructure.

Kevin Elliott:

Very good thank you. Peter, I had another question for you. Will the RRFBs be an acceptable solution at multilane roundabout crossings?

Peter Eun:

Yes. When I read the question originally was I think there is concern about multilane in the access and my understanding—and maybe Brooke can jump in—but my understanding is that multilanes, because of the multi-threat situation, you need to enhance those and the RRFB is one of those devices that can be done, signing is another for raised crosswalks or a signal. Those are the four I currently understand that are allowable. Currently, I know of RRFBs that are at roundabouts. Multilane roundabouts.

Brooke Struve:

Let me jump in to further clarify. I understand where the concern is because the currently available draft version says you have to have for multilane approaches to channel turn lanes and roundabouts. However, I am anticipating we might see something different when the finalized version comes out. We do have research that shows us various design treatments that can be used, including RRFBs, and that is report 834. I would refer you to that. It may be because of your local State laws and policy standards that you might be told you can't use those in those contexts. So there might be some local reasons you are having to do that, but if it is simply because it is what is in the draft I would question further and feel free to engage with the working group. I am a member of the working group as well as Elizabeth Hilton in the Office of Infrastructure. Melissa Anderson in the Office of Civil Rights. And then Jeff Shaw in the Office of Safety, he has been heavily involved as well. We can provide further verification if you need additional discussion.

Kevin Elliott:

Very good, thank you. Joe, another question. Typically, the HFST countermeasure is implemented as part of a resurfacing project, spots like intersections or intersection approaches, ramps are more likely to be at a spot location. What is the general practice for implementation in this kind of situation?

Joe Cheung:

Let me say you are much better off if you do it for curves or intersections or ped crossings that you bundle them up together and include as part of a resurfacing contract. You'll get much better pricing and you can also have better attention because you can get better contractors to do the work. When you have resurfacing, most likely they will add onto the overhead for the general contracting so you end up getting high pricing even for those sections. So unless your location is spread out three or four hours from each other, I would recommend you bundle them together and get them at the same time.

Kevin Elliott:

Okay. Let's see. A lot of good questions. On certificates and also the recording of this. What are we doing as far as that and where can they find a recording after we are all done?

Phillip Bobitz:

The easy question first. The recording will be posted along with the transcript to the Proven Safety Countermeasures webpage. Again, on the homepage in the box that has the overview flyer booklet and the memos posted in there. As far as PDH goes and offering PDH, although I know various licensing boards depending on your State may honor proof of registration or have other requirements that don't necessarily require a PDH certificate to be honored for those credits. That's something we can look into further. I know it has come up in other webinars so, again, we are not offering them, but yeah. It's going to vary from State to State.

Kevin Elliott:

Very good, thank you. Joe, where can people find guidance for intersection lighting?

Joe Cheung:

The go-to guides people can refer to - one of them is the Illuminating Engineering Society. RP 818 design guide or the tech guide transportation Association of Canada. They should also have that and also the lighting guide seventh edition. Between those three that should cover the intersection design for lighting.

Kevin Elliott:

Okay thank you. Another resource question. Is there a reference for a practitioner to determine if State and local law allow speed limit enforcement in the jurisdiction?

Anyesha Mookherjee:

You will have to check with your State law. It has to be allowed specifically and call that out if the automated speed enforcement safety cameras can be allowed for your jurisdiction, before you can go ahead and start working toward implementation. And I believe the question was specifically for Florida.

Kevin Elliott:

Correct. Peter back to you. RRFBs shown in the presentation are shown with black poles. Is using black poles recommended to get the crash reduction benefit or what's the difference?

Peter Eun:

When I read that I was thinking of the talking about regular poles, not the reflective striping. Not sure, maybe some others on the team can address that with regard to black poles specifically, I do with retroreflective striping that draws more attention and that is recommended. As far as black does anyone have a thought on that?

Brooke Struve:

Peter I will jump in and I would be surprised if we found that our research on RRFB took into account anything to do with the color of the type of pole. I would expect you have the galvanized or whatever it is you're currently using. I think it could be any sort of pole, but it is one of our safety countermeasures to have retroreflective striping on sign poles and that is something you could apply. I don't know if that in particular has been addressed as part of your crash modification factors for the reticular rapid flashing beacon.

Kevin Elliott:

Thank you. A follow-up question with Brooke and maybe Cate: It’s a hybrid question about wider edge lines and bicycle lanes. Would there ever be a scenario in which both wider edge lines and bicycle lanes would coexist?

Cate Satterfield:

Let me start off with, so we find the wider edge lines are most effective. At least the research is showing in rural areas. So as far as whether there would ever be one, I'm sure there are probably already because wider edge lines are used everywhere already in some States. I think the question was whether it would go between on the edge, which side of the bike lane. So, between the vehicle and the bike would make the most sense but go ahead and add to that.

Brooke Struve:

Usually when we are defining lane width, we don't subtract out the width of striping when we do that. So I would assume you are centering your pavement markings right on what you define as the edge of the lane. With that, I don't know you're not necessarily reducing the motor vehicle lane or bicycle lane, motor vehicles and this is my conjecture. Motor vehicles are not hugely influenced by a few inches of striping in terms of making them crowd one way or another, but a bicyclist who might be traveling in a bike lane where they have parking on the right and motor vehicle lanes on the left they might be crowding the edge line and if you

got a narrow bicycle lane and a narrow parking lane the few inches might make a difference and it might encourage bicyclists to crowd the park cars where they would be a greater risk for type crashes which can be a severe type of crash where a motorist opens the car door and the bicyclist hits the open car door. That might be something to keep an eye on, but I don't think we have research that tells us anything substantive. On the other side, having more emphatic striping maybe heightens the conspicuity that there is a bike lane there so there may be a trade-off.

Cate Satterfield:

As you mentioned. If we are putting the stripe on where we think it is and we are splitting it going from a four inch stripe to six inches, if one of the extra inches goes in the motorist's lane and one in the bike lane, probably not a big deal, but every once in a while, while recommended or required wide lines twice as wide as your regular line, so that is getting more into eight inches or even wider if you're currently using six inches, the standard. So more of an issue where we have much wider lines. We don't have research on it and I don't see a difference with one inch.

Brooke Struve:

I would agree. It's a great idea to be cognizant of that because if striping is all along one side, maybe it does make a bigger difference.

Kevin Elliott:

Okay, time for one last question and then Phil is going to close it off. We thank everybody for your great questions and we will do our best to answer every single one of them. Almost 200 questions total so far. The last question: Can setting the speed limit too low for function or environment create other road problems and how does that play into this?

Anyesha Mookherjee:

I think the question is just for regular speed limits. And I think the key is the context. What we're trying to do with appropriate speed limit is to try to make you aware of all the other factors that you need to take into account. Look at the roadway context, look at your user population, use expert systems and then set the speed limit. And then where a lower speed limit is recommended is in the urban areas, that's where we recommend because a lot of these factors come together. So, take into account all of those factors.

Kevin Elliott:

Thank you, yes that was for the appropriate speed limits, thank you. Okay, so I'm going to turn this back over to Phil to bring this to a close and again thank everyone.

Phillip Bobitz:

Thank you Kevin and, yes, thank you everyone. A lot of good discussion in the Q&A session. We understand a lot of questions have not been answered. We will do our best to follow up directly if a question was not answered. I know a number of them were submitted anonymously so that might be a challenge to respond but if you do have a question, if you did submit anonymously, please reach out to us. Contact information should be up on your screen now. For myself and also all the SMEs that presented on the various new countermeasures. We will do our best to follow up accordingly but, again, if you submitted the question anonymously, please reach out directly with that question.

That does bring us to the end of our session. Please reach out to us, if there's anything we can do to help and, with that, I would like to thank all of our speakers today, leadership for providing remarks. Everyone that has contributed to the project along the way and I would like to thank support staff, the contractor team, and all of you for participating in this session today. As a reminder, the recorded session and transcript will be posted to the Proven Safety Countermeasures homepage and keep an eye out for the added functionality.

Hopefully by the time the webinar recording is available we will have that additional functionality enabled on the webpages. We will leave this screen open but officially we will conclude the audio and thank everyone for their attendance. We look forward to rolling this out and working with you to advance the implementation of the transfer. Have a great rest of your day and have a happy and safe Thanksgiving. Thank you.

[Event concluded]