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February 20, 2019

Mr. Finch Fulton
Deputy Assistant Secretary for Transportation Policy
Office of the Secretary (OST)
U.S. Department of Transportation (DOT)
1200 New Jersey Avenue S.E.
Washington, DC 20590

Re: Docket No. DOT-OST-2018-0210;

Dear Deputy Assistant Secretary for Transportation Policy Fulton:

The American Association of State Highway and Transportation Officials (AASHTO) is pleased to provide comments on the U.S. Department of Transportation's "V2X Communications" Notice of Request for Comments (Docket Number DOT-OST-2018-0210), issued in Washington, D.C. on December 26, 2018. Representing all 50 states, the District of Columbia, and Puerto Rico, AASHTO serves as a liaison between state departments of transportation (DOT) and the federal government.

Safety has been, and will remain, at the forefront of AASHTO's policy goals as state DOTs have the primary responsibility for the safe and efficient movement of people and goods on our nation's highways and streets. An emerging technology that could significantly improve the safety of our transportation system are connected vehicles (CVs) that are enabled by Vehicle-to-Everything (V2X) communications. Cooperative systems achieved through communication between vehicles, infrastructure, and other users will provide an enhanced layer of safety and must be advanced. This ability to communicate will be essential for extending the range of vehicle-based sensing and achieving the full potential of safety benefits envisioned by connected and automated vehicles (CAVs).

As infrastructure owners and operators (IOO) of the nation's surface transportation infrastructure, state and local transportation agencies are at the core of the connected vehicle (CV) infrastructure. While automakers and device manufacturers (aka OEMs) will dictate availability of vehicular equipment, transportation agencies will control the deployment and operation of roadside infrastructure and the incorporation of CV technologies into infrastructure applications. Only through a strong partnership between USDOT, IOOs, and OEMs will the maximum potential benefits to safety and mobility be realized.

AASHTO's members understand that a CV environment holds the potential to support a fundamental advance in surface transportation. While the vehicle component and infrastructure component of the transportation system have traditionally been only loosely coupled (through static signing and markings, dynamic message signs, traffic censors, etc.), CV technology will allow the components to work actively together—creating a fully cooperative transportation environment. This provides the potential for significant safety improvements, reduction in congestion, reduced fuel consumption, lowered emissions, and improved traveler experience.

However, a CV environment can only be created if there is a spectrum available with which CV technologies can use to communicate. Unfortunately, there have been recent developments where other industries and associations have advocated for the 5.9 GHz band to be reallocated for another purpose. The reality is that in order to realize the full potential of a CV environment, an unprecedented amount of collaboration between the private and public sectors will have to occur on a scale not currently required between the IOOs and OEMs. This collaboration will take time and it is critical that the current 5.9 GHz band continue to be reserved for transportation safety purposes.

Currently, the only proven and deployed CV technology is Dedicated Short Range Communications (DSRC). There have been numerous deployments of DSRC technologies throughout the United States representing an investment of hundreds of millions of dollars. One of the biggest risks our member agencies face is the uncertainty over whether or not USDOT will fully support DSRC as the only proven technology that will enable the development of a CV environment. The transportation industry cannot wait on deploying what has been proven to work today with something that may hold better promise sometime in the future. State transportation agencies have a fiduciary responsibility to the taxpayers to ensure they follow a public process for planning and executing projects that efficiently and effectively utilize public funds to provide sustainable transportation solutions. At the same time, AASHTO supports the research, development, and deployment of other CV technologies. In fact, AASHTO and its member agencies realize that new and better technologies will continue to be developed at a rapid pace and we must not turn a blind eye to future developments. At the same time, we cannot afford to be paralyzed by waiting for the next generation of technology that is supposedly being developed. The sooner V2X communications are established the more lives that will be saved.

AASHTO believes that the CV environment, created by V2X communication technologies, will result in a significantly better transportation system for all users. And, state DOTs have already begun to prove the benefits of CVs through numerous state deployments of DSRC technologies. A significant concern of AASHTO involves multiple CV technologies operating in the same spectrum with the same goals but without a good understanding of how the different technologies will interact with each other. While AASHTO supports and encourages the research, development and deployment of CV technologies, this development must take place in a manner that does not interfere with or hinder the continued development and deployment of the only proven existing technology, DSRC. AASHTO sees opportunities where the DSRC deployments at the state DOTs could also serve as a test-bed to further develop future CV technologies in a realistic environment where technologies could be evaluated against each other.

Below are our responses to the nine questions asked in the docket:

1. Please provide information on what existing or future technologies could be used for V2X communications, including, but not limited to, DSRC, LTE C-V2X and 5G New Radio. What are the advantages and disadvantages of each technology? What is the timeframe for deployment of technologies not yet in production? Please provide data supporting your position.

   Currently, the only existing technology ready for deployment to enable V2X communications is DSRC. As documented in numerous different reports, demonstrations, and research projects on the subject[1], there are many advantages to using DSRC, the most important being that it is ready for deployment today. For example, an effort led by State and local public-sector transportation infrastructure owners and operators is the national Signal Phase and Timing (SPaT) Challenge[2]. Under this initiative, over 200 infrastructure communications devices have already been deployed with more than 2,100 planned by 2020 under this initiative in 26 States and 45 cities with a total investment of over $38 million. Furthermore, it is the goal of the SPaT Challenge to deploy a DSRC-based V2X communications infrastructure with SPaT broadcasts in at least one corridor with at least 20 signalized intersections, in each of the 50 States by January 2020. While other V2X technologies are being developed and tested, the most important advantage of DSRC is that it is ready for deployment ***today*** *which no other technology can claim at this time.*

   AASHTO reiterates that the only technology ready for deployment now is DSRC. Both LTE C-V2X and 5G New Radio are either in the testing phase or concept stage at this point. If the industry is to successfully reserve the 5.9 GHz spectrum for transportation safety use, it is imperative that we focus on deploying the technologies that are ready now with the understanding that the technologies will evolve.

2. Of the V2X communications technologies previously discussed, at present only DSRC is permitted to be used in the 5.9 GHz spectrum band for transportation applications. If that allocation were to be changed to allow any communication technology for transportation applications, could DSRC and other technologies (e.g., C-V2X, 5G or any future technology) operate in the same spectrum band or even the same channel without interference? Why or why not? If there are any technical challenges to achieving this goal, what are they and how can they be overcome?

   At this time it is unknown to what extent, or whether at all, C-V2X or 5G New Radio could operate in the same band and simultaneously with DSRC. The 5.9 GHz band is currently the subject of comprehensive testing to evaluate the impacts of sharing DSRC devices with Unlicensed National Information Infrastructure (U-NII or Unlicensed) devices[3]. The first phase of a three phase testing plan to determine the technical characteristics of prototype unlicensed devices and how they are designed to avoid causing harmful interference to

[1] Please see http://cav.transportation.org
[2] More information on the SPaT Challenge is available here: https://transportationops.org/spatchallenge
[3] ET Docket No. 13-49

DSRC devices has been completed. However, Phase II, which will involve basic field tests with a few vehicles at a Department of Transportation facility to determine whether the techniques to avoid interference to DSRC that were evaluated in Phase I's lab tests are effective in the field, has not yet started. Until such time as these real-world tests are undertaken and completed, we will not know conclusively to what extent, or whether at all, DSRC and other technologies could operate together without interference. As such, because CV technologies have the potential to provide critical lifesaving applications, it is absolutely critical that DSRC operates properly without any negative interference.

3. To what extent is it technically feasible for multiple V2X communications technologies and protocols to be interoperable with one another? Why or why not? Can this be done in a way that meets the performance requirements for safety of life applications, as they were discussed in the V2V NPRM? What additional equipment would be needed to achieve interoperability or changes in standards and specifications? What is the projected cost of any necessary changes? How soon can these changes and equipment prototypes be available for testing?

   AASHTO defers to others concerning the technical feasibility of multiple V2X communication technologies and protocols being interoperable with each other. However, AASHTO fully appreciates the fact that there will be an evolution of CV communication technologies and that this evolution needs to take into account the need to have technology and systems that are interoperable with other. Currently, DSRC is the only technology ready for immediate deployment. Ensuring interoperability must use DSRC as the foundational technology with which other technologies will have to work.

4. To what extent is it technically feasible for different generations of the same V2X communications technologies and protocols to be interoperable with one another? Why or why not? Can this be done in a way that meets the performance requirements for safety of life applications? What additional equipment or changes in standards and specifications would be needed to achieve interoperability? What is the projected cost of any necessary changes?

   AASHTO defers to others for more information on Question #4. Similar to Question #3, AASHTO fully appreciates the evolution that will take place concerning different generations of the same V2X communication technologies. Again, DSRC is currently the only communication technology ready for immediate deployment. In order for new generations to be developed and deployed, the industry must first deploy what currently is ready.

5. Even if they are interoperable across different technologies and generations of the same technology, would there be advantages if a single communications protocol were to be used for V2V safety communications? What about other V2X safety applications, such as those involving V2I and V2P communications?

   AASHTO believe that the role of Government is to ensure that safety is enhanced and not compromised as a result of any decisions made on future communications protocols. As such, interoperable communications between all modes of transportation, each other

(V2V, V2P, etc.), and the infrastructure (V2I, V2P, etc.) is critical to realizing the full benefits of V2X. However, the full potential of vehicle to everything applications may require more than one communication protocol. Understanding the use cases of a specific roadway and operational environment is critical to identifying the needs of that particular transportation system. What is most important is that each vehicle is able to hear and understand every other vehicle. This would realize the full potential of V2X communications and result in more lives saved and increased mobility. .

6. How would the development of alternative communication technologies affect other V2I and V2P communications, such as those supporting mobility or environmental applications? Do these applications have the same or different interoperability issues as V2V safety communications? Do different V2X applications (e.g., platooning) have different communication needs, particularly latency?

    - *A critical aspect is that the communication technologies are interoperable with each other both inter-generational and among different technologies.*
    - *V2X safety applications are critical to the goal of zero fatalities on U.S. roadways. Thus, V2X safety applications, those that will directly be affected, must take priority over all other non-safety applications. Further, if different communication technologies are deployed, they must be interoperable to ensure all vehicles (and infrastructure components) equipped with the V2I technologies are able to derive the safety benefits.*
    - *The simple answer is yes, different application will have different communication needs. Vehicles electronically coupled for platooning will require lower latency than an application identifying significant road wear for asset management purposes.*

7. Do different communication technologies present different issues concerning physical security (i.e., how to integrate alternative communication technologies into vehicle systems), message security (i.e., SCMS design or other approaches), or other issues such as cybersecurity or privacy? Would these concerns be affected if multiple but still interoperable communication technologies are used rather than one?

    AASHTO believe that the role of Government is to ensure that safety is enhanced and not compromised as a result of any decisions made on future communications protocols and cybersecurity requirements. Each communication technology will offer a new attack vector and another way in which security and privacy can be compromised. These will have to be carefully considered during system design and deployment.

8. How could communications technologies (DSRC, C-V2X, 5G or some other technology) be leveraged to support current and emerging automated vehicle applications? Will different communication technologies be used in different ways? How?

    AASHTO strongly believes that if we are to see the safety benefits of AVs (reduction in fatalities and serious injuries) while maintaining and/or improving operational capacities then the communication technologies that create a connected vehicle infrastructure are critical to that achievement. While automobile and AV system manufacturers have strongly insisted that AVs can operate independently of being connected with either other vehicles or

the infrastructure, AASHTO has serious questions and concerns about this. Furthermore, the availability of V2I, V2V, and V2X can only enhance safety and the benefits that would be derived from the deployment of CAVs. Thus, AASHTO believes that the CV technologies are critical to leveraging the AV applications.

9. How could deployments, both existing and planned, assess communications needs and determine which technologies are most appropriate and whether and how interoperability could be achieved?

   Many industry experts are adamant that we are NOT looking at a "VHS vs Betamax" scenario. AASHTO supports that notion that this should not become a Technology A vs Technology B debate, but instead should be a discussion of how fast can we deploy what is currently proven today (DSRC), while still exploring future technological advancements (C-V2X) in such a manner they can be complementary and not competitive. From an infrastructure owner/operator perspective, currently available C-V2X technology requires much of the same roadside hardware as DSRC, yet is less proven and less available because it's still being developed. We support deployment of DSRC now, remain open to additional testing of C-V2X as the development progresses, and encourage a future where DSRC, C-V2X, and/or other technologies can one day enjoy compatibility/coexistence.

AASHTO and the state DOTs appreciate USDOT's continued leadership to help clear the way for the safe and timely adoption of CAVs. More specifically, we applaud USDOT's efforts to further explore V2X development and technology compatibility issues. Governments can play a key role in working with the private sector to facilitate deployment and remove regulatory barriers to the widespread deployment of proven technologies.

If you would like to discuss the issues raised in this letter, please contact Matthew Hardy, Ph.D., AASHTO's Program Director for Planning and Performance Management at (202) 624-3625.

Sincerely,

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Executive Director, Utah Department of Transportation