December 10, 2018

Ms. Heidi Renate King
Deputy Administrator
National Highway Traffic Safety Administration
U.S. Department of Transportation (DOT)
1200 New Jersey Avenue S.E.
Washington, DC 20590

Docket Number NHTSA-2018-0092: Pilot Program for Collaborative Research on Motor Vehicles with High or Full Driving Automation

Dear Deputy Administrator King:

The **National League of Cities, National Association of Regional Councils and the League of American Bicyclists (Local Stakeholders)** appreciate the opportunity to submit these comments on the impact of automated vehicle technologies on our nation's transportation networks and how a potential federally-driven pilot program may be beneficial. We appreciate the leading role that NHTSA must play in ensuring safety on our roads, and we encourage NHTSA to ensure a robust regulatory framework that keeps the safety of the public first as Automated Driving Systems (referred to within as "ADS" or "autonomous vehicles") are tested and brought to market.

Automation and artificial intelligence are rapidly changing the way we move through, work in and design cities and transportation systems. Automation brings opportunities and risks to the public and must follow a "safety first" approach both for today and the future. Local Stakeholders believe that new technologies should complement and enhance existing transportation systems and increase safety, and that NHTSA should be attuned to the unintended liabilities and potential consequences where pilot projects will be deployed.

The following represents guiding points from Local Stakeholders for NHTSA to consider for a national pilot:

Question 1. What potential factors should be considered in designing the structure of a pilot program that would enable the Agency to facilitate, monitor and learn from on-road research through the safe testing and eventual deployment of vehicles with high and full driving automation and associated equipment?

Innovations in transportation are an opportunity to reshape urban, rural and regional transportation networks with the goal of making them more people-centered, flexible and responsive. Some 50 percent of America's largest cities are preparing for these self-driving vehicles in their long-range transportation plans, but they are also watching the rise of other technology solutions that have benefits to safety, commuter times and efficiency.

The Local Stakeholders' perspective comes from cities nationwide which are now hosting autonomous vehicle pilot projects that are being developed in a multitude of ways, with different choices and approaches. Due to our diverse transportation network across the country, the Local Stakeholders know there is no "one-size fits all approach" to the incorporation of technology into communities and that autonomous vehicles are only one small piece of the broader transformations that are needed and are coming to the nation's roads. However, a national effort to learn from distinct pilots and connect data efforts for safety outcomes has great potential.

To explore findings from existing pilots in depth, the Local Stakeholders would direct you to review a **National League of Cities** study released this fall, *Autonomous Vehicle Pilots Across America.* This report highlights the paths of five leading autonomous vehicle pilots in the U.S., and other recent reports also share lessons learned for autonomation and the future of transportation and work:

- *Autonomous Vehicles: A Policy Preparation Guide*
- *Future of Work in Cities*
- *Assessing the Future of our Work*
- *City of the Future Initiative*
- *Workforce Investment Strategies to Support Local Economies*

The Local Stakeholders believe a national pilot can complement and benefit the ongoing implementation efforts across the country in alignment with the local and state legal powers focused on the safe operation of vehicles on our public roads. However, at the outset, we strongly encourage that any pilot program foster partnerships between local governments, regional organizations, and private companies. We also see the immense value in data sharing to encourage learning and the development of best practices around the deployment of autonomous vehicles in diverse transportation environments.

In designing a new pilot, USDOT should first strive to ensure that it is complementary to the existing environment of autonomous pilots within cities and does not disrupt or displace existing pilots or preempt agreements for data sharing. Pilot locations and activities should be pursued in partnership with localities that are prepared to pursue testing. Additionally, the proposed pilot program should take into consideration significant investments that have been made by regions in the planning and deployment of autonomous vehicles, including the previously designated proving grounds. Local stakeholders believe strongly that public communication as well as and full coordination with local law enforcement should be fully integrated into the pilot process.

The highest possible value of USDOT entering into the busy autonomous vehicle piloting space should be to ensure connectivity of commerce between states and cities, as that is the federal role, and to advance a pilot program that would fill in gaps in research, development or deployment that the current market is not enabled or incentivized to pursue without USDOT leadership and support. For example, current pilots are not reaching rural areas, mountainous areas, accessibly designed vehicles, focusing on equity, public user safety and interactions, and many other areas. Piloting is also severely limited by insufficient internet and mobile phone connectivity reinforcing an innovation barrier that must be overcome through policy. Further, broader deployment will require a closer look at the transition to an electric fleet and energy consumption and battery safety issues that are a looming challenge. Finally, any national pilot should also serve as a testing fleet to advance essential research on the viability of new revenue models for transportation that will reform today's broken model and ensure the viability of the system for the future.

The Local Stakeholders encourages a proposed pilot program that employs a phased approached where the proof of capability would be transparent to the public. NHTSA should clearly define a process to measure the safety rate of the pilot vehicles in each location compared to human drivers. If the safety rate of the pilot location falls below that of humans, appropriate automated steps should be followed such as pausing the activity and alerting local stakeholders (e.g. local leadership, local law enforcement, etc.). The public should have the certainty that any pilot is not creating a greater safety risk than getting on the road today, which currently is one of highest risk activities for an American in their average day.

Finally, Local Stakeholders also concur with NHTSA and AASHTO in recognizing there is an interplay between the vehicles' technological capabilities and the types of local and state laws that may apply to the operation of those vehicles. As piloting continues, localities will continue to consider, evaluate and respond to the on the ground testing and how to best integrate and advance autonomous technology in their cities and embrace a cycle of continuous improvement. To further the cycle of continuous improvement, local stakeholders also recommend that NHTSA develop the pilot program in a manner that promotes full and live information sharing and transparency with state and local government, regional planning organizations, manufactures, transportation stakeholders, researchers, and other related industries. Rather than developing regulations in the dark, data-driven regulations provide an opportunity to shine a path towards the safe and effective operation of autonomous vehicles and ensuring long-term success, including the reduction of traffic deaths that we all agree is one of the most exciting opportunities that autonomous vehicles bring.

Question 2. If NHTSA were to create a pilot program, how long would there be a need for such a program? What number of vehicles should be involved? Should NHTSA encourage the conducting of research projects in multiple locations with different weather conditions, topographical features, traffic densities, etc.?

Any pilot program should be developed using a scientific approach, with a rigorous design and a sufficient sample size to answer clear and measurable research questions regarding the safety of vehicles for the public and meet the goals of solving unmet needs and gaps in research. If designed to meet unmet needs and gaps in research, the pilot program will likely test automated driving systems (ADS) in multiple and diverse locations and environments. The design should consider and include the various environments that vehicles will be operating – which would inform the sample size and needed duration to yield statistically significant findings. The length of the pilot and the number of vehicles involved should be informed by the study designed to sufficiently address questions regarding safety – not the reverse.

Question 3. What specific difficulties should be addressed in designing a national vehicle pilot program for vehicles with high and full driving automation either through the exemption request process relevant for FMVSS or more broadly related to other areas of NHTSA and/or other authorities.

Given that a NHTSA pilot program will be operating on public roads and using public resources, Local Stakeholders believe that any exemption process should not come at the sacrifice of public safety. Demonstrating that autonomous vehicles can operate more safely than traditional vehicles will be important towards winning over public trust and adoption. Accordingly, public outreach should be an important component of any pilot project and cities and regional planning organizations are well situated to be partners in such an effort.

Further, the use of exemptions should be used in a deliberate and transparent manner. Exemptions should only be a temporary tool while the FMVSS is updated to develop minimum safety standards for autonomous vehicles. Pilot projects offer an opportunity for the development of data driven standards. Finally, the Local Stakeholders encourage NHTSA to ensure any updating of the FMVSS is done in a transparent manner that allows for an opportunity for public comment.

Question 4. How can existing statutory provisions and regulations be more effectively used in implementing such a pilot program?

The current challenge around deployment of autonomous vehicles is there are no minimum safety standards for both the vehicle and software. This is the opportunity of pilot projects under the leadership of USDOT – to

gather data that promotes the development of data-driven regulations and develops best practices for the safe and effective deployment of autonomous vehicles.

However, any pilot program also needs to consider and recognize the important local police powers of cities. While NHTSA has jurisdiction over the safety of vehicles themselves, that authority does not extend into the operational domain and the ability for local governments to enforce local traffic laws should not and cannot be undercut. Any pilot project should ensure and require coordination with local governments, particularly law enforcement.

Question 5. Are there any additional elements of regulatory relief (e.g., exceptions, exemptions, or other potential measures) that might be needed to facilitate the efforts to participate in the pilot program and conduct on-road research and testing involving these vehicles, especially those that lack controls for human drivers and thus may not comply with all existing FMVSS?

One of the challenges that cities and private companies have struggled to overcome is removing the competitive disadvantages of sharing data from pilot projects. A reasonable concern from the private sector side is the protection of proprietary and confidential information. The Local Stakeholders recognize and appreciate the significant resources being invested in autonomous technologies; however, the effective sharing of anonymized higher-level data from all pilot projects to federal, state and local is important for the U.S. to advance testing as quickly as possible and to tackle the challenges that citizens care most about - safety, congestion and cost-effective freight and people movement. A variety of suggestions could assist to meet this goal – standardization of data sharing requests and anonymization, open records request exemptions for a brief pilot period during this early stage of development of the technology, or the use of third-party data repositories to assist with data storage and analysis, especially when those data repositories are connected to universities.

Question 6. What vehicle design elements might replace existing required safety equipment and/or otherwise enhance vehicle safety under reasonably anticipated operating conditions?

Vehicle design elements and the function of the driver will likely require an FMVSS for autonomous vehicles to be performance-based in replacing traditional elements with functional equivalents and/or redundancies. A common example is the FMVSS currently requires vehicles to have a horn. Horns are universally understood to communicate a potentially dangerous situation or to make their vehicle's existence known. The horn will likely shift from human control to control by the automated driving system. With an exemption rather than a FMVSS, this functionality must be effectively substituted, yet the effectiveness of the substitute may require an additional item; for example, an internal horn button for passengers to use in an emergency along with a programed, automated horn by the vehicle's software may both be needed.

Another significant example for the safety of the public is incident documentation. We strongly suggest that a NHTSA pilot must include a data recorder to capture all sensor data for 30 seconds prior to a collision so that the circumstances during an incident are recorded for the police report and for further learning by the company and NHTSA. Further, even a data recorder is not fully able to report on the incident so other equivalent replacements must be determined. Even with these two very basic examples, the need for an autonomous vehicle FMVSS is clear, and NHTSA must put full effort into developing an acceptable version in a timely manner. While the pace of technology is daunting and the FMVSS may be outdated even as it is released, there is no excuse for not setting a standard when it can be adapted over time; FMVSS exceptions should not become the rule.

Question 7. What types of performance measures should be considered to ensure safety while allowing for innovation of emerging technology in vehicles with high and full driving automation participating in a pilot program?

NHTSA should engage with cities who have existing pilots to establish a valuable set of performance measures based on existing data and experience. Local stakeholders also concur with the RAND Corporation report, *Measuring Automated Vehicle Safet*y, which recommends that performance measures should be valid, reliable, feasible and non-manipulatable. NHTSA could consider creating a universal definition for the safety envelope violation as proposed in the RAND report and could consider applying this performance measure during pilot testing.

Question 8. How should the Operational Design Domains of individual vehicle models be defined and reinforced and how should Federal, State and local authorities work together to ensure that they are observed?

As part of any pilot program, NHTSA should seek to define a common ODD terminology. Operators are currently using many versions of ODD which could be a stumbling block for the industry to communicate with governments and for both industry and governments to communicate with the public.

We also recommend that NHTSA seek to develop a metric or ODD that categorizes environments according to their complexity, such as the number of scenarios encountered, the type and density of stationary and moving objects that must be perceived and responded to as part of the driving task, and the maximum speed at which such perception and response must be accomplished to operate safely in an environment as part of a uniform classification system for ODDs. In a recent review of the complexity of maneuvers and scenarios, General Motors in its *2018 SELF-DRIVING SAFETY REPORT*, showcases a compelling chart showing the complexity of navigating in a city like San Francisco compared to the Phoenix suburbs:

Maneuver / Scenario	San Francisco	Phoenix Suburbs	Ratio
Left turn	1462	919	1.6:1
Lane change	772	143	5.4:1
Construction blocking lane	184	10	19.1:1
Pass using opposing lane	422	17	24.3:1
Construction navigation	152	4	39.4:1
Emergency vehicle	270	6	46.6:1

Per 1,000 miles of autonomous driving

NHTSA should consider the dangers that ADS vehicles may pose when they exceed their ODD and fallback to their minimal risk condition, which may be to pull over to the side of the road and stop. In urban environments, becoming a fixed object on a roadway is a danger itself. There should be a control in place that prevents ADS equipped vehicles from operating outside their ODD. For example, an autonomous vehicle should not be operated in light rain if the weather report predicts heavy rain. Moreover, information should be analyzed and shared with the public as to why, where and when a vehicle exceeded its ODD and why, where and when a vehicle assumed its minimal risk condition if not for exceeding its ODD. There is particular concern regarding how an autonomous vehicle engages with safety personnel both in an emergency or event where an officer is using hand signals or when it enters a fallback position that conflicts with emergency personnel instructions.

In order for Federal, State, and local authorities to work together to ensure ODDs are observed, NHTSA should consider testing a feature on the outside of the vehicle that communicates to local and State authorities, and other road users, that the vehicle has exceeded its ODD, so that people know how to drive around the vehicle or approach it in an emergency.

NHTSA should work with cities and other local entities to determine if there are any maneuvers or dynamic or static environmental factors that are unique to a geographic area and may impact the application of a uniform ODD to their jurisdiction.

Question 9. What type and amount of data should participants be expected to share with NHTSA and/or with the public for the safe testing of vehicles with high and full driving automation and how frequently should the sharing occur?

Participants should be required to file and make publicly available data for all collisions—including those with property damage only, injury or fatal collisions. Injury data shared should be as consistent as possible with the shared statewide data provided by all police departments and include the data elements shared with the public on California's Statewide Integrated Traffic Records System (SWITRS) maintained by the California Highway Patrol and based on data collected on the state's collision report (CHP 555 Form) – including crash location, date, time of day, roadway conditions (e.g., lighting), as well as victim characteristics (e.g., age, sex, race, degree of injury). The data collected should also include the speed of the vehicle at the time of impact and other data elements that should be predefined as a part of the pilot related to the performance of the autonomous vehicle at the time of the crash. Minimum reporting should include location (latitude/longitude), date, time, weather conditions, if the ADS system was engaged, and if the pilot spans multiple ODDs, the ODD at the time of the crash should be reported. Participants should also be expected to share information in an appropriately common file to authorized parties and in a timely manner to accomplish the research purpose of a pilot. For instance, if a pilot is meant to better understand interactions between ADS vehicles and vulnerable users such as bicyclists and pedestrians, it may be appropriate to share information about "close call" incidents in the same manner data is shared for collisions in other pilots.

Question 10. In the design of a pilot program, how should NHTSA address the following issues—confidential business information? privacy? data storage and transmission? data retention and reporting? other elements necessary for testing and deployment?

Data and privacy are significant areas where cities have led with their partners in finding a path forward, and NHTSA can learn from their arrangements and lean into them for best results. NHTSA may want to look at how cities and other local agencies have addressed these issues with other mobility solutions, including scooter and bike share, which often include significant data sharing requirements and other pilot program elements. All data should be in a standardized format and available in real-time to NHTSA and other agencies.

Evaluating privacy should be an important focus of the proposed pilot program. Already, concerns are mounting over the collection of data from smart phones that almost all citizens carry around daily. Autonomous vehicles are expected to collect a large of amount of data, not only related to vehicle operation, but also human interaction. Accordingly, the proposed pilot project should seek to better understand what personally identifiable information may be collected by autonomous vehicles so that appropriate protections can be developed for user data that is not essential for the operation of autonomous vehicles. Privacy and cybersecurity will be important considerations around the public adoption of autonomous vehicles.

The Local Stakeholders refer back to the answer above to Question 5.

Question 12. Are there any additional critical areas to consider in the design of a safe pilot program for the testing and deployment of vehicles with high and full driving automation?

As of mid-October 2018, the California DMV reported 49 autonomous vehicle test vehicle collisions; of those, more than half were rear-end collisions which largely occurred when the ADS system was engaged. Public and media reports point to first-hand experiences where an ADS equipped vehicle stopped abruptly to respond to a traffic signal, leading to a collision. NHTSA should consider testing a vehicle design element that alerts other drivers that a vehicle is being operated by an ADS and should provide funding for public education campaigns in test locations to inform the public that ADS equipped vehicles are programmed to follow the law and may not take driving risks that might be expected of human drivers.

Question 13. Which of the following matters should NHTSA consider requiring parties that wish to participate in the pilot program to address in their applications?

NHTSA should establish a robust process for participation in any proposed pilot and following off the success of the FAA UAS Integration Pilot Program, a process of pairing appropriate teams of public and private partners, would encourage collaboration and complement existing arrangements of city-technology partners. NHTSA should also require parties that wish to participate to address their "safety case" through a demonstration of safety capability based on objective performance criteria and adherence to NHTSA's existing voluntary guidance, including submitting a safety self-assessment. NHTSA should require parties to describe their research goals, methods, objectives, and how their pilot will lead to the development and facilitation of improved road safety. The goal of the pilot program should be safety and the development of safety regulations that will be useful to NHTSA, cities and states, private companies, and the public in the long-term each of the matters raised in Question 13, and likely others, may be important to consider in order to accomplish that purpose.

For example, NHTSA should require parties to consider other road users unless their proposed pilot exists in an Operational Design Domain where other road users are not legally allowed (e.g. a controlled access highway). Considerations for other road users should include, but may not be limited to: the scope of the Operational Design Domain, including maximum operating speed; crashworthiness features of the exterior of the vehicle; the necessity of a human-machine interface to communicate with other road users if drivers will not be engaged in driving or present; vehicle behavior when overtaking bicyclists; and vehicle behavior when yielding to bicyclists or pedestrians crossing the street inside or outside of a crosswalk or trail crossing. By specifying and developing methodologies to report objective system safety analysis on specific considerations like those mentions above, the pilot program will further the development of appropriate safety regulations for non-occupant protection, such as the scope and methodology appropriate for an automated vehicle "vision test."

NHTSA may want to look at how cities and other local agencies have addressed privacy and data issues with other mobility solutions, including scooter and bike share, which often include significant data sharing requirements and other terms and conditions for the deployment of vehicles.

Question 15. What value would there be in NHTSA's obtaining one or more of the following potential categories of data from the participants in the pilot program? Are there other categories of data that should be considered? How should these categories of data be defined?

All of the mentioned potential categories of data from the participants in the pilot program have value and should be considered in the development of the pilot program. Often the value of these categories may be

heightened by data from other categories. For example, sensor data from each crash or near miss may supplement data regarding difficult scenarios and/or information related to community, driver and pedestrian awareness, behavior, concerns and acceptance related to vehicles with high and full driving automation operation. Access to sensor data may be critical to determine the difference between a pedestrian or bicyclist inappropriately forcing an automated vehicle to yield and an automated vehicle appropriately yielding for the safety of a pedestrian or bicyclist. Relying on private partners to report on community behavior is likely inappropriate without access to the underlying data of those incidents.

Question 22. If there are any obstacles other than the FMVSS to the testing and development of vehicles with high and full driving automation, please explain what those are and what could be done to relieve or lessen their burdens. To the extent any tension exists between a Federal pilot program and State or local law, how can NHTSA better partner with State and local authorities to advance our common interests in the safe and effective testing and deployment of ADS technology?

Local stakeholders fully support a collaborative and informed addition of federal resources that complements existing efforts. However, as this question asserts, a pilot that is not designed well could be counterproductive to advancing safe testing and deployment of autonomous vehicles. In designing a new pilot, USDOT should first strive to ensure that it is complementary to the existing environment of autonomous pilots within cities and does not disrupt or displace existing pilots or preempt agreements for data sharing. Any federal pilots should acknowledge and support the significant investments that have been made by regions in the planning and deployment of autonomous vehicles, including the previously designated proving grounds. Ideally, it should also help to level the playing field of information sharing to achieve the safety benefits.

To avoid tension with cities and local laws, NHTSA should engage local governments fully, along with their transportation advisors, law enforcement, emergency response, and public health officials, throughout the design and implementation of their pilot to provide local perspective, test scenarios, ODD elements, and mitigation measures to improve safety through the establishment of a consultation process, working group or another forum. NHTSA should also be ready to create an appropriate process for pausing certain functions or testing as needed for emergencies, special events or safety concerns at the local level. Local stakeholders fully support a collaborative and informed addition of federal resources that complements existing efforts.

Thank you for the opportunity to submit comments on this important topic. If you have any questions regarding our responses, please feel free to reach out to:

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Sincerely,

National League of Cities
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