

# Wisconsin Automated Vehicle External (WAVE) Advisory Committee

## Meeting Minutes

November 2, 2023 - 9:00 a.m. - 3:00 p.m.

Hill Farms state office building, 4822 Madison Yards Way, Madison, WI

### Attendance

**WAVE Members Present:** Representative David Considine, Arthur Harrington, Christopher Hiebert, Debby Jackson, Nick Jarmusz, Neal Kedzie, Jeff Lewandowski, Raymond Mandli, Cory Mason, Maggie McNamara, David Noyce, Damon Payne, Alexander Pendleton, Sia Prosper, Xiao (Shaw) Qin, Adonica Randall, Yang Tao, Evan Umpir, Patrick Vander Sanden

**WAVE-Member Organization Proxies Present:** Brian Scharles (TAPCO), Andrea Bill (UW-Madison Traffic Operations and Safety Laboratory), Tom Winker (Wisconsin Towns Association)

**Wisconsin Department of Transportation (WisDOT) Staff Present:** Carter Angelo, Dan Arneson, Brad Basten, Hannah Brown, June Coleman, Lea Collins-Worachek, Tracey Drager, Kyle Hemp, Michael Kessenich, Reed McGinn, Alex McMurtry, Jordan Montgomery, Casey Newman, Mathias Rekowski, Ian Ritz, Rodney Saunders, Michael Schwendau, Ethan Severson, Sarah Simonson, Ryan Spaight, Matt Sudac, Maryne Taute, Craig Thompson, Matt Umhoefer, Kaleb Vander Wiele, Chuck Wade, Marquis Young

### Meeting discussion

**Welcome and Opening Remarks** - WisDOT Secretary Craig Thompson thanked everyone for taking the time to attend WisDOT's first in person WAVE meeting. Exciting highlights for the day included an autonomous vehicle demonstration and presentations from leading Wisconsin researchers sharing what CAVs mean for Wisconsin. Secretary Thompson noted Racine Mayor Cory Mason and Dr. Noyce's work on the automated research vehicle, The Badger, located in Racine; the release of WisDOT's CAV Communication Plan; and the Law Enforcement and First Responder Training program. Secretary Thompson expressed his thanks for the WAVE members' diverse perspective and feedback throughout each of the previous WAVE meetings.

**Meeting overview and recap of April 2023 meeting** – WisDOT DBSI Administrator Lea Collins-Worachek provided a recap of the previous WAVE meeting highlighting updates on the federal BIL Implementation, WisDOT's CAV Strategic Work Plan, a panel on Cybersecurity of CAVs and WAVE member recommendations regarding cybersecurity.

**Federal Discretionary Grants** – WisDOT Federal Program Officer Jessica Wagner gave an overview of updates to WisDOT's website of BIL related resources, new discretionary grants and existing federally funded local programs, how to apply for a Discretionary Grant, tips for applying and where to find additional resources and links for Letters of Support.

WisDOT BIL Webpage – [wisconsindot.gov/BIL](https://wisconsindot.gov/BIL)

### University research in Connected and Automated vehicles

- Dr. Maggie McNamara from Marquette University (MU) noted that MU Law School has worked on the implications of CAV crashes on insurance and liability – how to apply existing court law. The School of Civil, Construction and Environmental Engineering has researched hard braking in areas like work zones to measure “safety”. New data uses and large data sets is an area that is targeted for future research.
- Dr. Xiaowei (Tom) Shi from UW Milwaukee discussed *Trajectory planning for AV Considering Conflicting Moving Objects – Methodology and Demonstration*. Their work looks at conflicting moving objects which could be pedestrians or other traffic. This includes advanced AV controller design, simulated AV verification, track simulation, full-scale AV verification, and multiple AVs coordination.
- Dr. Jiazhen Zhou from UW Whitewater explained their work in *A Security Framework for V2X Communications*. This work looks at vehicular communication networks, V2X communications, general V2X communication architecture, and V2X Attacks.
- Dr. David Noyce from UW Madison discussed CAV research projects in CAV Systems: City of Racine CAV Research and Pilot Testing, City of Madison Park Street Connected Corridor, development of a full-scale CAV testbed, Vision of Cooperative Driving Automation, CAVH Roadside Unit (RSU), and The Future of Trucking: Remote Operation of Automated Trucks. Other areas of research include Hydrogen fuel dispensing stations, Electric Road Systems (ERS), National Cooperative Highway research Program (NCHRP) -NCHRP 17-106 (motorist behavior, bicyclists, and rumble strips), Workforce Development and the new Wisconsin Transportation Center CAV and Technology Testing Facility in Fitchburg.

## Government research in Connected and Automated vehicles

- Connected Vehicle FHWA Pooled fund study TPF-5(389) – Dr. Brian Smith from the University of Virginia explained that the goal of this project is to help deployment and use of connected vehicles in an interoperable way. The program prepares state, local, and international transportation agencies for the deployment of CV technologies and includes several areas of work: Connected Vehicle Traffic Signal Control Algorithm, Pavement Maintenance Support Algorithm, Evaluation of Signal Phase and Timing Data, CV Certification Program, Aftermarket On-Board Equipment, Traffic Management Centers in CV Environment, Basic Infrastructure Message Development and Standards Support for CV Applications, 5.9 GHz Dedicated Short Range Communication Vehicle Based Road and Weather Condition Application. A related FHWA pooled fund study includes Connected Traffic Controls Systems (CTCS) and Multi-Modal Intelligent Traffic Signal System. Other current research areas include Model Connected Vehicle Data Architecture, Guidance Document for MAP Messaging, Connected Intersections Program, Connected Intersections Message Monitoring System, and Connected Work Zones.
- NCHRP 20-102(16) CAVs and Traffic Incident Management – WisDOT traffic engineer and Traffic Incident Management (TIME) lead Marquis Young discussed goals of the project to develop guidance materials, documents, and strategies to prepare emergency responders in joining the CAV technology development process. Potential interaction scenarios are explored, goals, resources and activities shared between stakeholders is considered. Groups engaged in this research include academia, EMS, towing, emergency communication, fire and rescue, emergency management law enforcement and transportation agencies. To communicate the findings of the project a single page flyer will be created with an online SOP repository, an input form for responders to connect with OEMs, CAV-relevant content for responder training and a project overview.
- Smart Park Street corridor – City of Madison – Dr. Yang Tao from the City of Madison Engineering department shared that the Madison Smart Park Street Corridor is the 1st CV corridor in the state and part of the Madison Smart City Plan which aims to improve safety, mobility, bus on time performance, and equity for residents. The project is funded by a Strengthening Mobility and Revolutionizing Transportation Program (SMART) grant from FHWA. The project tests out the data pipeline with several entities. A transportation award from ITS recognizes the early success in tackling real world transportation challenges, supporting academic research, fostering private sector technology development in Wisconsin, and encouraging a Public Private Partnership.
- Research partnerships: Racine Badger AV Shuttle – City of Racine Mayor Cory Mason told the WAVE how the automated vehicle (AV) shuttle effort grew out of Racine’s SMART city planning. Making technology and research work for the city residents needs to be a priority. Using existing infrastructure in the city can help create real world environments for research and contribute to infrastructure upgrades. Partnerships with Racine, Gateway Technical College, and UW – Madison provide exposure to all participants but is a unique opportunity for students at technical colleges to train on the mechanics of AVs and electric vehicles. Funding has been a challenge but it’s important to build up the work on SMART cities and make our cities more sustainable.

## Industry research in Connected and Automated vehicles

- Intelligent Transportation Systems – ITS Wisconsin Treasurer Sia Prosper shared how ITS America and ITS Wisconsin are a leading voice advocating for the scaled deployment of innovative transportation technology through policy, thought leadership and diverse workforce development. Technology areas of interest are: Smart Infrastructure, V2X and Connected Transportation, Automated Vehicles, Mobility on Demand, Emerging Technology, and Sustainability and Resiliency. Vehicle-to-Everything (V2X) technologies allow a vehicle to sense and communicate with all road users, including motorists, bicyclists, and pedestrians. Implementation of V2X technologies could reduce the frequency and severity of crashes by non-impaired drivers by up to 80% and could reduce travel time and emissions by relieving congestion making research in these areas a priority. Examples of connected technology in Wisconsin: Trek Bicycle Corporation incorporating V2X software into bikes; Bluetooth, and 5G cellular networks to allow all road users to sense and communicate with each other; Oshkosh Corporation’s TerraMax which converts wheeled military vehicles into unmanned CAVs with one remote operator able to monitor and direct up to five ground vehicles simultaneously.
- Crash Test Equipment and research – Jeff Lewandowski from MGA Research Corporation described the benefits of using the Thor crash dummy that has been under continuous improvement for approximately 20 years and can provide a better understanding of human impacts in crashes. AVs may introduce unconventional seating arrangements and advanced test

dummies containing 150 sensors will help evaluate passenger safety. There are only 200 Thor dummies in the world and MGA in Burlington has two of them.

- Natural Language Modeling and AI in using ADS Data - Ray Mandli, representing ACES and Mandli Communications discussed Generative AI, or generative artificial intelligence, and how it creates human-like content after learning from vast datasets (Training Data) to produce text, images, audio, or video. Vast amounts of data gathered by CAVs (text, images, audio, or video) can provide widespread, up-to-date, real-world datasets. Limitations with generative AI: it doesn't possess consciousness or true understanding. Its capabilities are rooted in learned data patterns and algorithms; generative AI revolutionizes content generation; it is not a replacement for humans and human understanding.
- TAPCO Connected Vehicle Pedestrian Crosswalk – Brian Scharles shared how TAPCO research is focused on safety and safety products and has developed a CV interface, the *TAPCO Intelligent Warning System*, to communicate with Smart City Roadside Units (RSUs) to relay ITS activation data to connected vehicles via cellular vehicle to everything (C-V2X) radios providing drivers with instant in-vehicle alerts. CV infrastructure can provide motorists with critical real-time information that can prevent accidents and reduce fatalities. Pedestrian Safety, Horizontal Curve Safety, and Wrong Way Vehicle Awareness are improvements being investigated by TAPCO and their partners. Connected vehicle applications can warn about red-light violations, upcoming traffic lights about to change, wrong-way driving vehicles, school zone or construction zones, or presence of construction workers.
- AAA Recent Research on Connected and Autonomous Vehicles – Nick Jarmusz from AAA Auto Club shared results from annual CAV surveys the group has been sponsoring since 2020. Which indicate that the public has grown more skeptical of “Self-Driving” vehicles in recent years. Surveys did not ask why people feel this way but suspect it stems in part from select media reporting and social media. Mr. Jarmusz discussed research on the benefits and limitations of AV features such as Active Driving Assistance Systems (ADA Systems) and Automatic Emergency Braking (AEB).

#### **Automated Vehicle demonstration**

- Dr. Xiaopeng (Shaw) Li from the Connected & Autonomous Transportation Systems (CATS) Laboratory at the University of Wisconsin-Madison presented a static display of their automated research vehicle. The operation and functioning of the vehicle sensors were explained with demonstrations of how the vehicle perceives and displays the environment shown to attendees.

#### **Research Posters**

- Posters of university research were on display with researchers present to explain and answer questions about their projects.

#### **Small Group Discussions**

Attendees moved into facilitated small group breakout groups to discuss the following four questions.

1. What current research is most impactful to Wisconsin?
2. What additional research is needed for Wisconsin to move forward?
3. What MASTO regional research would be valuable for coordination with MASTO states?
4. What research should be handled at a national level?

#### **Report-out of small group discussions**

Each small group was asked to share main takeaway and highlights from the WAVE meeting and the small group discussions.

1. What current research is most impactful to Wisconsin?
  - a. Safety of AVs, safety related CV and infrastructure
  - b. Road conditions, maintenance data collection, interoperability of maps and data exchange
  - c. Privacy and cybersecurity
  - d. Economic impacts
  - e. Communication and outreach to share safety benefits with the public
2. What additional research is needed for Wisconsin to move forward?
  - a. Interoperability of maps
  - b. Disparities/differences of urban-rural divide
  - c. Transportation goals and strategy to equally spread infrastructure improvements
  - d. Data governance: security, privacy, ethics, ownership

- e. AI: beneficial uses and protection against abuse
  - f. Adapting AV deployment to the environment and residents' benefits
3. What MAASTO regional research would be valuable for coordination with MAASTO states?
- a. Deployment in winter weather: challenges and benefits, snowplow connectivity
  - b. Interstate interoperability of operations, data and interoperability of maps
  - c. Operation in areas without cell coverage
  - d. Shipping and freight corridors
4. What research should be handled at a national level?
- a. Vehicle safety, components, sensors, standards, cybersecurity
  - b. Requiring On Board Units (OBU)
  - c. Workforce affects from deployments and new industries
  - d. Harmonization across states
  - e. MUTCD
  - f. National commerce and freight
  - g. Work zone operability with CAVs
  - h. Digital infrastructure for navigation CAV maps

**Closing Remarks** – WisDOT DBSI Administrator, Lea Collins-Worachek, thanked the members for their time and to the panelists, presenters, and researchers for their support in our first in-person meeting of the WAVE Advisory Committee. The insights and expertise provided during this meeting and our previous virtual meetings is helping to shape policies around a complex issue with many stakeholders and it is deeply appreciated by WisDOT.