



April 16, 2024

**Addendum #1
RP017-24 Singleton Road Corridor Technology Improvements Project**

Attachments:

Please see the attachments for Exhibits C-I for this solicitation.

This addendum should be acknowledged on page 9 under Firm Information.

Thank You,

Michael Milstein

Purchasing Associate II

SINGLETON ROAD CORRIDOR
TECHNOLOGY
IMPROVEMENTS
2022 SMART GRANT



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PROJECT NARRATIVE

PROJECT OVERVIEW

In the last 40 years, Gwinnett County has experienced rapid growth bringing immense diversity, making it one of the fastest growing U.S. counties and a minority-majority county with more than 140 spoken languages. It is projected to be Georgia's most populous county by 2050. With this growth in population has come a growth in traffic along with a need for expanding multimodal alternatives. To meet these diverse needs, Gwinnett plans and implements transportation infrastructure as well as conducts equitable engagement for underserved communities. The County recognizes the need to include intelligent transportation systems (ITS) and other emerging transportation technologies to continue to improve safety and transportation access for underserved communities within Gwinnett County.

Growth in Gwinnett County has led to a steady increase in traffic volumes, creating a pressing need to address safety, mobility, and operational concerns, with many of these hazards disproportionately affecting aging, low-income and minority communities. One example of an area with a high number of historically disadvantaged residents who have experienced an increased risk is the Singleton Road corridor. There are few marked pedestrian crosswalks and no pedestrian signs or leading pedestrian intervals at the traffic signals along the corridor. Singleton Road has seen several recent pedestrian fatalities. One pedestrian was killed in a hit-and-run in December 2021, while another pedestrian was also killed in a hit-and-run in August 2022. Since 2018, a total of six pedestrians have been killed by motorists. To help solve this growing problem, the County must incorporate new technologies and ITS, such as active pedestrian detection systems, enhanced transit delivery services, and connected vehicle technologies to reduce and prevent fatalities and serious injuries. These new technologies will also improve traffic operations, mobility, and overall quality of life for all residents, visitors, and employees.

Gwinnett County has already identified the need for a strong foundation and safety focus. Previous plans that have outlined this need include:

- [Destination2040](#), Gwinnett County's Comprehensive Transportation Plan and the update, [Destination 2050](#)
- Safe Trips in a Connected Transportation Network Project as part of the USDOT's ITS4US Deployment Program
- [Connected Vehicle Technology Master Plan \(CVTMP\)](#)

With these previous efforts, Gwinnett has conducted extensive public outreach to engage the community and gather feedback on safe and equitable solutions. They each included efforts to solicit input from the communities that will most benefit from these new technologies. Unfortunately, these studies either did not focus solely on new technologies or have since fallen out of date. The Strengthening Mobility and Revolutionizing Transportation (SMART) funding

will help identify new technologies available for the County to improve safety and mobility for all.

Stage I Planning and Prototyping funding will be used to address pedestrian safety issues along Singleton Road. The first step will update the CVTMP to account for advances in technology since the plan was first published, and to narrow the likely solutions for Gwinnett County. Next, the County will examine several possible safety and mobility technological solutions along Singleton Road. The CVTMP has already identified smart corridor deployment of connected traffic signals and pedestrian safety applications.

Additional mid-block pedestrian crossings are likely part of the overall solution, but there are complimentary improvements such as enhancing visibility to reduce the likelihood of pedestrian-vehicle interactions or providing more efficient transit service that will optimize service and minimize transit users wait times. The prototype will explore using pedestrian hybrid beacons, rectangular rapid flashing beacons, and other Federal Highway Administration proven safety countermeasures to facilitate mid-block crossing. The pedestrian signal and beacons will utilize passive pedestrian detection to ensure pedestrian crossing calls are made without action needed by the person attempting to cross. Another technology that will be assessed is transit treatment that interfaces with a transit signal priority to inform drivers of increased boarding and alighting activity levels at bus stops along the corridor and improve transit efficiency.

Other viable solutions that will be assessed include technology specifically aimed at pedestrian safety. These strategies will focus on state-of-the-art technology to detect non-vehicular traffic and capture that data in a unified platform that can facilitate the dissemination of information through a variety of platforms like active managed traffic beacons, dynamic message signs, and CV applications that directly interface with the traveling public. The County has recently begun exploring technology that could identify people and objects in the road to warn drivers of a hazard. Additionally, buses along the corridor would be equipped with this technology to detect people at bus stops and reduce the number of missed pickups. If no transit users are detected at a bus stop, the bus can continue its route to meet its arrival time. These ideas have not previously been identified but could be useful solutions. Once identified, the County will begin deploying these measures along Singleton Road to combat pedestrian fatalities.

Following the successful deployment of this technology along Singleton Road, Gwinnett County plans to apply for a Stage 2 Implementation Grant to implement similar solutions along other high-risk corridors throughout the County. The goals for the both the prototype project and the long-term countywide solution align with USDOT's SMART program priorities. The overall goal is to promote the connectivity of infrastructure, connected vehicles, and pedestrians in vulnerable areas. Safety and reliability will be improved by reducing risks to pedestrians and making public transportation more efficient. The expansion of safe access to alternative modes of transportation will both improve the quality of life for historically underserved communities and encourage its use, addressing equity, climate, and resilience concerns. Finally, the project will help make both the corridor and the county more economically competitive by providing residents with convenient, safe access to transportation that connects them to high-paying jobs and regional activity centers.

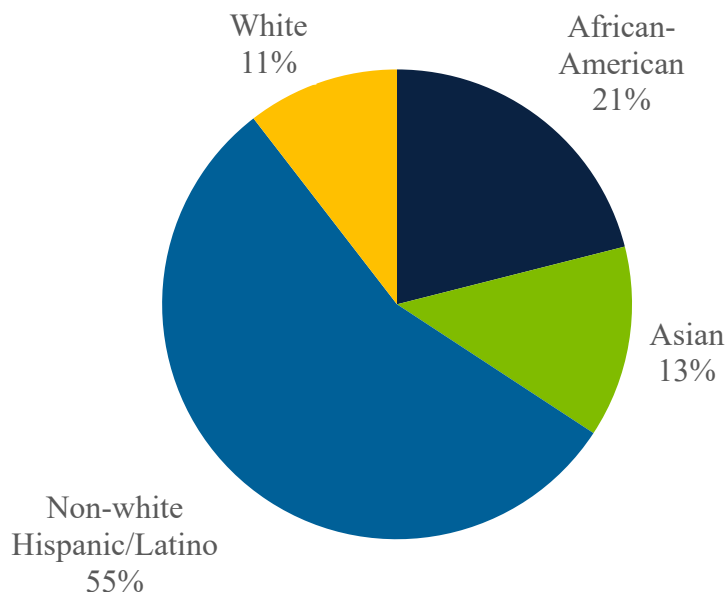
PROJECT LOCATION

The Singleton Road Corridor is located at Gwinnett Village and links Jimmy Carter Blvd with Indian Trail-Lilburn Rd NW. Singleton Rd is a minor arterial road that bisects a large suburban residential area of Gwinnett Village. The road extends through three census tracts (504.19; 504.21; 504.22) and is at the center of a 26-census tract cluster of historically disadvantaged communities. The DOT's Transportation Disadvantaged Census Tracts tool measures residents' overall transportation disadvantage by measuring their disadvantage across six indicators:

- Transportation access
- Health
- Environmental
- Economic
- Resilience
- Equity

Census tracts that exceed the 50th percentile (75th percentile for resilience) across at least four of these indicators are considered to be transportation disadvantaged communities. According to this tool, the census tracts surrounding Singleton Road are transportation disadvantaged. Specifically, all the tracts exceeded the threshold in the Transportation, Economic, Equity, and Environmental indicators. According to the DOT data tool, the population for the three census tracts along Singleton Rd is approximately 23,518 residents.

Figure 1: Demographic Breakdown of the Singleton Road Census Tracts



Additionally, the DOT tool identified a total of 43 transportation disadvantaged census tracts throughout Gwinnett County. If the prototyping is successful, this can be a model for replicating in other Gwinnett corridors with similar vulnerable road safety challenges.

COMMUNITY IMPACT

Gwinnett County has grown extensively since the 1980s. This growth has led to a steady increase in traffic volumes, which create safety hazards that often disproportionately affect low-income and minority communities, such as the 26 census tracts surrounding Singleton Road identified as historically transportation disadvantaged. Many residents in these communities do not have access to private vehicles and rely on alternative forms of transportation such as public transit, bicycles, or walking. As a result, corridors such as Singleton Road have experienced significant pedestrian and bicycle safety concerns over the past few years. From 2016 to 2020, the DOT FARS accounted for 288 fatalities throughout the County. Six fatalities have occurred along Singleton Road since 2018. This project aims to evaluate and implement ITS solutions that will mitigate safety risks and the detrimental quality of life impacts of pedestrian hazards along Singleton Road. Successful implementation will reduce pedestrian fatalities and injuries along the corridor and improve the quality of life of the surrounding disadvantaged communities. Ultimately, the technology deployed along this corridor will be implemented throughout Gwinnett County to increase transportation safety at a larger scale.

TECHNICAL MERIT OVERVIEW

This project will analyze the most advanced and applicable solutions for both the demonstration corridor along Singleton Road and the County at-large. With a 20-year history of ITS expansion and implementation in Gwinnett County, including active ITS projects that involve connected vehicle technology and the deployment of cellular communication devices that will result in 100% connectivity to all traffic signals, Gwinnett County has the technical knowledge and resources necessary to deliver projects predicated on using advanced systems and technology to facilitate the management and operations of their transportation network.

Technical Merit Criterion #1: Identification and Understanding of Problem to Be Solved

The Gwinnett County Department of Transportation is dedicated to advancing their use of state-of-the-art systems. By leveraging the existing assets and infrastructure, the County can diligently plan for the improvement of operations and management of the transportation network. This will be accomplished by assessing more than 750 existing traffic signals and opportunity to communicate via 248 miles of fiber optic cable or cellular communications. This network also supports 350 CCTV cameras that are actively monitored at the County's Traffic Control Center (TCC), which is staffed Monday through Friday from 6am to 7pm and for special events. An additional 463 traffic control beacons are also maintained by the County. The County currently has 102 dedicated short-range communications (DSRC) devices and 72 C-V2X Road-Side Units (RSUs) installed. However, a greater focus is needed. The County sees their current investment of systems, staff, and resources as an opportunity to grow and advance the state of their practice.

Using Singleton Road as the demonstration corridor will concentrate efforts on a primary concern of the County's. Singleton Road is a minor arterial with two through lanes in each direction and a center two-way left turn lane that carries nearly 23,000 vehicle trips daily. The

disproportionate occurrence of incidents and fatalities along this corridor make it an ideal candidate to be aggressive with identifying a state-of-the-art solution.

To address the safety concerns, the County intends to test systems along Singleton Road that are centered around pedestrians and other vulnerable roadway users. Advanced detection systems that can inform drivers of the changing roadway conditions and presence of other modes of traffic will be strategically planned for, designed, and implemented.

Technical Merit Criterion #2: Appropriateness of Proposed Solution

The proposed solution will be based on diligent planning to ensure the needs of the community along Singleton Road are being addressed appropriately. The projected benefits would be based on projects with similar needs and demonstrated benefits created by their deployment. Projects like the Tampa-Hillsborough Expressway Authority (THEA) CV Pilot deployment where sensors were installed to detect a pedestrian in the crosswalk of a mid-block crossing. The sensor communicates with roadside equipment that broadcasts information to nearby connected vehicles. The most advanced use of these systems can detect when a vehicle's speed and direction indicate a potential collision course with the pedestrian. In this situation, the driver then receives an alert. This solution would provide Gwinnett County with the ability to demonstrate an advanced use the latest technology to enhance the safety of the traveling public across all modes of travel.

Technical Merit Criterion #3: Expected Benefits

Deployment of new technologies along Singleton Road will help mitigate many of the pedestrian issues that have been identified. It will notify motorists of pedestrian traffic in the street with enough lead time to avoid a collision. This technology will also help buses detect the presence of people at bus stops, making transit routes more efficient and reducing wait times for riders. Completion of this project will improve transit efficiency along the corridor while reducing the number of pedestrian injuries and deaths within an historically disadvantaged community.

PROJECT READINESS OVERVIEW

Project Readiness Criterion #1: Feasibility of Workplan

The work plan associated with this project, shown in **Table 1**, includes considerations for all Stage 1 project phases necessary for exploring the advanced technologies that are intended to be deployed along the Singleton Road corridor. These activities include technical reports and documentation, project prototyping, and a post-prototype assessment. Each phase of the project is detailed in the table below.

Proposed improvements will take place utilizing existing infrastructure whenever possible to minimize impacts related to the procurement of materials. No improvements proposed to take place will occur outside of County Right-of-Way. Therefore, no permits are anticipated to be necessary to commence the work. During the public outreach portion of the project team will

measure and validate the project’s expected benefits based on the goals of the anticipated community impacts. This evaluation will include a performance improvements assessment and cost savings initiative to ensure all goals of the project can be reached within budget.

Table 1: Projected 18-Week Work Plan

Activity	Description	Duration (Weeks)
Technical Reports	Research and assessments performed to update the existing documentation to consider operations and maintenance. Perform Systems Engineering Analysis for the project.	22
Public Outreach	Perform a public outreach campaign and host a workshop in the area to obtain feedback related to the needs of the people utilizing the corridor.	2
Prototype Concept and Design	Conceptualize, and design a targeted deployment of the proposed technology along Singleton Road.	10
Prototype Demonstration	Deployment of the proposed technology, testing, integration, and validation. Operations and maintenance during the prototype.	36
Prototype Evaluation	Initial design activities based on the results of the prototype deployment. Includes up to 30% design plans.	8
Total Duration (weeks)		78
Total Duration (months)		18

Project Readiness Criterion #2: Community Engagement and Partnerships

As part of the Gwinnett County Connected Vehicle Technology Master Plan engagement efforts were utilized to connect with local jurisdictions, key stakeholders, and members of the public. Various local jurisdictions were interviewed, including Renew Atlanta (RenewATL), Cobb County Department of Transportation (CCDOT), and the City of Marietta Fire Department. Insight and feedback from these agencies were incorporated into the Smart Corridor considerations.

Additionally, local knowledge was gathered through two stakeholder meetings held in October 2018 and April 2019. This included City Staff from Braselton, Buford, Dacula, Duluth, Lawrenceville, Snellville, and Suwanee, State DOT Staff, CID Staff from Evermore, Gateway 85, Gwinnett Place, Lilburn, Sugarloaf), Fire Department, Police Department, and Georgia Institute of Technology. Engagement with these stakeholders included project prioritization surveys resulting in the prioritization of congestion relief, emergency vehicles, and pedestrian safety.

During the development of Gwinnett County’s Comprehensive Transportation Plan, Destination2040, various public engagement methods were used, including a robust outreach program that utilized both in-person and online tools to gather input and feedback to help shape Destination2040. The program included a variety of methods such as

- Facilitating discussions at committee and public meetings
- Meeting people where they were at community events
- Facilitating focused conversations with key stakeholder groups,
- Leveraging existing events and communication networks to spread the word, and providing plan materials in 4 languages (English, Korean, Spanish, and Vietnamese).

During this engagement effort, the public completed over 7,000 surveys that were used to develop the priority projects and policy recommendations.

An extensive community engagement program was designed to engage all members of Gwinnett’s very diverse community during the development of the 2040 Unified Plan, Gwinnett County’s Comprehensive Plan. Activities included hearings, community open houses, planning advisory committee meetings, speaking engagements, intercept interviews, pop-up events, and radio engagements. During the 2040 Unified Plan public engagement efforts, 16,228 online survey comments were collected from 1,165 survey respondents. 59 intercept interviews were completed around the County, and 20 percent of those were conducted in Spanish.

Project Readiness Criterion #3: Leadership and Qualifications

Gwinnett County implements and maintains an extensive intelligent transportation system. With 752 traffic signals, 361 closed-circuit television cameras, 470 flashing control beacons, and 258 miles of fiber-optic cable in its jurisdiction, Gwinnett is responsible for traffic signals on the state highway system as well as adjacent cities. Gwinnett has a successful partnership with the Georgia Department of Transportation (GDOT) on its active traffic management program, SigOps. The County has been at the forefront of using emerging transportation technologies to improve safety and mobility.

In 2019, Gwinnett developed the Connected Vehicle Technology Master Plan (CVTMP) with GDOT, the Georgia Institute of Technology, and neighboring jurisdictions (Braselton, Buford, Chamblee, Dacula, Duluth, Lawrenceville, Snellville, and Suwanee). The CVTMP was developed as one of the first Georgia Smart Communities Challenge grants. Since its inception, the CVTMP has deployed 72 roadside units at 400 signalized intersections and equipped 30 fire and emergency vehicles as well as 10 county vehicles with on-board units.

In 2022, Gwinnett received the Innovation: Outside the “Construction” Box Award from the Intelligent Transportation Society of Georgia. The [2022 Strategic Planning Session Report](#) identifies completing the transportation smart corridor and treating innovation as critical infrastructure. Gwinnett County Department of Transportation has 183 employees, an operating budget of \$71 million, and a capital budget of \$506 million with grant funding.

Because the County has already implemented connected vehicle technologies, it has the experience in applying, operating, and maintaining the SMART grant project after Stage 2.

APPENDICES

APPENDIX I – RESUMES

Jerry Oberholtzer, AICP - Manager, Transportation Planning Section Gwinnett County Department of Transportation

Jerry is a land use, zoning, and transportation professional with 15 years of experience in the private, public, and political sectors. He is a Gwinnett County native who has dedicated his career to enhancing communities through attention to detail, out-of-the-box thinking, and a commonsense approach to problem-solving and customer service. He excels at being a team leader who manages and motivates staff through positivity, professionalism, and approachability. He has particular experience in transportation planning, having worked on projects such as the Atlanta Regional Commission Bicycle & Pedestrian Taskforce, Gwinnett County Destination 2050 Comprehensive Transportation Plan, and the Gwinnett County Transit Development Plan.

Education and Credentials

- Bachelor of Science, Political Science, Clemson University
- Certificate of Local Government Leadership, University of Georgia
- American Institute of Certified Planners (AICP)
- Georgia Department of Transportation Plan Development Process (PDP) Certification
- Georgia Department of Transportation Local Administered Projects (LAP) Certification

Michelle S. Arnold, AICP, PE - Engineer V, Pre-Construction Program Delivery Gwinnett County Department of Transportation

Michelle is a transportation planner and traffic engineering professional with over 18 years of experience in the private and public sectors. Her background includes experience completing and review traffic impact studies for zoning and development impacts. In particular, she has extensive experience working connected vehicle and mobility projects, including managing the Interstate 4 Florida's Regional Advanced Mobility Elements project funded by USDOT's Advanced Transportation and Congestion Management Technologies Deployment grant, and managing FDOT's Vehicle-to-Everything Data Exchange Platform.

Education and Credentials

- Bachelor of Science, Environmental Science, Calvin College
- Bachelor of Science, Civil Engineering, Florida State University
- Master of Science in Urban and Regional Planning, Florida State University
- Professional Engineer, Georgia and Florida
- American Institute of Certified Planners (AICP)

**Thomas Sever, PE - Assistant Department Director
Gwinnett County Department of Transportation**

Thomas has 28 years of experience as an engineer, project manager and supervisor. Additionally, he has spent over 22 years serving the citizens of Gwinnett County and supporting the Gwinnett County Board of Commissioners and Department of Transportation leadership to provide safe and efficient mobility in several progressive roles. His role includes ensuring that department initiatives are consistent with the priorities of the Board of Commissioners.

Education and Credentials

- Bachelor of Science, Civil Engineering, Georgia Institute of Technology
- Certificate of Local Government Leadership, University of Georgia
- Professional Engineer, Georgia Board of Professional Engineers

**Kenneth R. Keena, PE - Engineer V, ATMS/TCC Section Manager
Gwinnett County Department of Transportation**

Kenneth is a professional engineer with 20 years of experience in progressive traffic engineering and intelligent transportation systems. His responsibilities include managing a team of ITS professionals and overseeing the build-out of the broadband infrastructure required for ITS systems. He has contributed to the deployment of Smart Corridors in Gwinnett County and to the creation of the Connected Vehicle Master Plan.

Education and Credentials

- Bachelor of Science, Civil Engineering, University of South Florida
- Professional Engineer, Georgia

**Edgardo E. Aponte, PE - Deputy Director, Traffic Engineering, Operations & Maintenance
Gwinnett County Department of Transportation**

Edgardo has over 25 years of experience in the management of highway/transportation programs and projects, including operations and maintenance of roadways, operations and maintenance of traffic signals, program management, design and construction administration. He is experienced in a wide range of infrastructure projects, including urban and rural highways, sidewalks, intersections, sanitary sewer, water distribution, and airport runways/taxiways. Edgardo has managed the design of numerous transportation projects, including Federally funded projects, GDOT, local SPLOST (City and County funded), LCI, and TE projects in the State of Georgia.

Education and Credentials

- Bachelor of Science, Civil Engineering, Marquette University
- Master of Science, Engineering Management, Polytechnic University of Puerto Rico
- Professional Engineer, Georgia
- Georgia Department of Transportation Plan Development Process (PDP) Certification
- Georgia Department of Transportation Local Administered Projects (LAP) Certification

**Kristin C. Phillips, PE – Traffic Signal Section Manager
Gwinnett County Department of Transportation**

Kristin is a professional engineer with 19 years of experience working in transportation. As Traffic Signal Section Manager, she is responsible for overseeing the maintenance and operations of over 750 traffic signals and 450 flashing beacons in Gwinnett County. Her responsibilities include project management, reviewing project plans for compliance with applicable regulations and adherence to project guidelines, and conducting signal performance evaluations. Kristin has worked on traffic signal projects across the Metro Atlanta region and the State of Georgia.

Education and Credentials

- Bachelor of Science, Civil Engineering, Michigan State University
- Master of Science, Engineering Management, Texas A&M University
- Professional Engineer, Georgia and Michigan
- IMSA Level II

**Natasha Tyler – Division Director, Transit
Gwinnett County Department of Transportation**

Natasha is a business professional with 16 years of experience in transportation. She has extensive professional experience with multi-million-dollar projects that involve planning, scheduling, budgeting and implementation of policies and procedures. She is responsible for managing the daily operation of the Transit Division through the use of professional service contractors and consultants, as well as ensuring compliance with county, state, and Federal regulations. Natasha is a resourceful and skilled problem solver with experience managing annual budgets over \$40 million.

Education and Credentials

- Associate Degree, Business Management, Henry Ford Community College

**China Thomas – Director, Transit Capital Projects
Gwinnett County Department of Transportation**

China has been the director of Transit Capital Improvement Projects since 2021, and has over 20 years of experience coaching, motivating, and developing teams. She has established business systems, processes, and organizational structures; increased operational efficiency and system safety and service quality. China has been leader in connecting communities and moving people. Her most significant career accomplishment was expanding a transit system from 27 routes to 35 routes in Long Beach, California. Thomas is an alumna of the Eno Center for Transportation Emerging Leaders Program and a member of the Women’s Transportation Seminar Los Angeles Chapter and the California Transit Association.

Education and Credentials

- Bachelor of Science, Business Administration, University of Redland

APPENDIX II – SUMMARY BUDGET NARRATIVE

The budget for the project will be divided into three activities, each with a variety of tasks, as shown in Table 2.

Activity 1: Technical Reports and Assessments

1.A - Connected Vehicle (CV) Master Plan Update

As a first step in completing the Singleton Road Corridor Technology Improvements project, the CV Master Plan will need to be updated. Updates will include assessment and research of new systems and applications that were not tested or available at the time of the completion of the plan. The current plan does not make considerations for operations and maintenance activities. These will need to be added to make completion of the project feasible.

1.B - CV Deployment Prioritization and Implementation Plan

As a follow-up to Task 1.A, connected vehicle priorities will be determined based on needs to implement similar systems throughout the County. This will include a plan for implementation of the project and future projects based on opportunities available; including but not limited to other County projects, locations with existing infrastructure to support CV systems, and funding sources available.

1.C - Systems Engineering Documentation

Systems engineering documentation will include preparing updates to the existing ITS architecture in Gwinnett County and develop a concept of operations that will guide the deployment of the prototype. The systems engineering analysis will also include a Project Systems Engineering Management Plan (PSEMP).

1.D - Public Outreach Plan and Public Participation Workshop

Although public outreach has already been conducted as part of the countywide master plan and the Connected Vehicle Master Plan, additional engagement activities will be incorporated into this project. It is important for residents within the project area to make their voices heard regarding the specific improvements that will be implemented along Singleton Road.

1.E - Project Feasibility Assessment

A benefit-cost analysis will be conducted to verify the feasibility of the project and that the best possible option is chosen. It is important to not only show that the benefits will outweigh the costs, but that the solution chosen is the most cost-effective. A full-scale benefit-cost analysis will be performed for Stage 2 of the SMART program grant or as needed based on other funding opportunity requirements.

Activity 2: Project Prototyping

1.A - Project Prototype Concept Layout and Planning

Several possible technology solutions will be considered for the Singleton Road corridor. After each potential solution has been evaluated, the option or combination of options that hold the most promise at providing expected benefits will be chosen. The concept will be further refined and planning for completion of the project will begin.

1.B - Project Prototype Design

This task will consist of an extensive design of the chosen solution to fit the needs of the Singleton Road corridor. This will include any preliminary engineering activities that will need to occur to prepare for implementation of the prototype.

1.C - Prototype Development and Implementation

Depending on the chosen technology solution(s), implementation of the prototype project will be completed. This includes any necessary deployment of infrastructure needed such as Roadside Units, On-Board Units, data collection devices, network/device servers, additional fiber optic cables or network components.

1.D - Prototype Integration and Testing

The full prototype will be integrated into the existing network along Singleton Road and the rest of the county. This integration will include testing of each component to ensure that no problems arise as a result of the project installation.

1.E - Project Prototype Results Reporting and Lessons Learned

Results from the implementation of the prototype will be carefully observed and recorded. An analysis of the data collected will be reviewed to ensure that the project is delivering expected benefits. Additionally, and unintended impacts will be measured to ensure that new costs associated with the deployment of the system do not outweigh the measured benefits.

Activity 3: Project Design Documentation

1.A - Pre-Design Activities

Pre-design activities include the supplemental development of any specifications needed to deliver the project for Stage 2. These specifications will identify more detailed parameters for establishing communications protocols, define infrastructure requirements not currently addressed in standard specifications, and provide clarification on any discrepancies or inefficiencies observed during the prototype.

1.B - Conceptual Engineering Design (up to 30%)

A 30% design will be completed in anticipation of applying for Stage 2 funding and expanding the system across all of Gwinnett County. The 30% design plans will provide conceptual level details that will help inform decisions being evaluated by the County and other project stakeholders.

Table 2: Project Budget Estimate

SINGLETON ROAD CORRIDOR TECHNOLOGY IMPROVEMENTS PRELIMINARY CONCEPTUAL COST ESTIMATE						
ACTIVITY	TASK	DESCRIPTION	QTY	UNITS	UNIT COST	VALUE
1		Technical Reports and Assessments				
	A	Connected Vehicle (CV) Master Plan Update (Operations and Maintenance Considerations)	1	LS	\$ 20,000.00	\$ 20,000.00
	B	CV Deployment Prioritization and Implementation Plan	1	LS	\$ 15,000.00	\$ 15,000.00
	C	Systems Engineering Documentation (ITS Architecture Update, Concept of Operations, etc.)	1	LS	\$ 20,000.00	\$ 20,000.00
	D	Public Outreach Plan and Public Participation Workshop	1	LS	\$ 30,000.00	\$ 30,000.00
	E	Project Feasibility Assessment (Benefit-Cost Analysis)	1	LS	\$ 40,000.00	\$ 40,000.00
			Technical Reports and Assessments Sub-Total			
2		Project Prototyping				
	A	Project Prototype Concept Layout and Planning	1	LS	\$ 8,000.00	\$ 8,000.00
	B	Project Prototype Design	1	LS	\$ 50,000.00	\$ 50,000.00
	C	Prototype Development and Implementation	1	LS	\$ 500,000.00	\$ 500,000.00
	D	Prototype Integration and Testing	1	LS	\$ 90,000.00	\$ 90,000.00
	E	Project Prototype Results Reporting and Lessons Learned	1	LS	\$ 28,000.00	\$ 28,000.00
		Project Prototyping Sub-Total				\$ 676,000.00
3		Project Design Documentation				
	A	Pre-Design Activities	1	LS	\$ 15,000.00	\$ 15,000.00
	B	Conceptual Engineering Design (up to 30%)	1	LS	\$ 100,000.00	\$ 100,000.00
		Project Design Documentation Sub-Total				\$ 115,000.00
		SUB-TOTAL				\$ 916,000.00
	1	Grant Compliance Requirements (5%)	1	LS	\$ 45,800.00	\$ 45,800.00
	2	Contingency 10% of Project Estimate	1	LS	\$ 91,600.00	\$ 91,600.00
		TOTAL COST ESTIMATE				\$ 1,053,400.00

APPENDIX III – LETTERS OF COMMITMENT



GWINNETT COUNTY
CONNECTED VEHICLE TECHNOLOGY
MASTER PLAN

Prepared for:

Gwinnett County Department of Transportation

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ACKNOWLEDGEMENTS

The Gwinnett County Department of Transportation would like to acknowledge the leadership provided by the Gwinnett County Board of Commissioners:

- Charlotte J. Nash, Chairman
- Jace W. Brooks, District 1
- Ben Ku, District 2
- Tommy Hunter, District 4
- Marlene M. Fosque, District 4

The Gwinnett County Department of Transportation would like to acknowledge the Georgia Institute of Technology's Georgia Smart Communities Challenge led by Debra Lam and Greg McCormick and the supporting partners of the challenge.

The Gwinnett County Department of Transportation would like to acknowledge the insights provided by the research team led by Dr. Angshuman Guin, Senior Research Engineer in Transportation Systems Engineering and Smart Cities at Georgia Institute of Technology. The team included Georgia Smart Community Corps Graduate Student Xixiu Fu of Georgia Institute of Technology and Civic Data Science Program Undergraduate Students Jason Chen of Purdue University, Angela Lau of Cornell University, and David Li of Stony Brook University.

The Gwinnett County Department of Transportation would like to acknowledge representatives from partner agencies who participated in thought sharing via interviews held early in the drafting of this plan. They include representatives from the following jurisdictions.

- City of Atlanta
- Cobb County Department of Transportation
- City of Marietta Fire Department

The Gwinnett County Department of Transportation would like to acknowledge the various stakeholders who helped in crafting this plan. They include representatives from the following jurisdictions.

- City of Braselton
- City of Buford
- City of Chamblee
- City of Dacula
- City of Duluth
- City of Lawrenceville
- City of Snellville
- City of Suwanee
- Gwinnett County Fire Department
- Gwinnett County Police Department
- Georgia Department of Transportation
- Evermore CID
- Gateway 85 CID
- Gwinnett Place CID
- Lilburn CID
- Sugarloaf CID

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LIST OF ACRONYMS

Acronym	Definition
API	Application Programming Interface
ARC	Atlanta Regional Commission
AV	Automated Vehicle
BSM	Basic Safety Message
CA	Certification Authority
CAMP	Crash Avoidance Metrics Partnership
CCDOT	Cobb County Department of Transportation
CCTV	Closed Circuit Television
CID	Community Improvement District
CTP	Comprehensive Transportation Plan
CV	Connected Vehicle
C-V2X	Cellular Vehicle-to-Everything
CVTMP	Connected Vehicle Technology Master Plan
DR-OPT	Drayage Optimization
DSRC	Dedicated Short Range Communication
Eco-CACC	Eco-Cooperative Adaptive Cruise Control
EVP	Emergency Vehicle Preemption
FCC	Federal Communications Commission
FRATIS	Freight Advanced Traveler Information Systems
FSP	Freight Signal Priority

Acronym	Definition
GCDOT	Gwinnett County Department of Transportation
GCT	Gwinnett County Transit
GDOT	Georgia Department of Transportation
GPS	Global Positioning System
HMI	Human Machine Interface
IBL	Intermittent Bus Lane
IEEE	Institute of Electrical and Electronics Engineers
INC-ZONE	Incident Scene Work Zone Alerts for Drivers and Workers
I-SIG	Intelligent Traffic Signal System
ITS	Intelligent Transportation System
MAP	Map Message
MMITSS	Multimodal Intelligent Traffic Signal System
NEMA	National Electrical Manufacturers Association
NHTSA	National Highway Traffic Safety Administration
NPRM	Notice of Proposed Rule Making
NTCIP	National Transportation Communications for Intelligent Transportation System Protocol
NYCDOT	New York City Department of Transportation
OBU	On Board Unit
OEM	Original Equipment Manufacturer
PED-SIG	Pedestrian Signal System
PKI	Public Key Infrastructure
PPA	Pedestrian Presence Alert
PREEMPT	Emergency Vehicle Preemption

Acronym	Definition
REL	Reversible Express Lane
RCVW	Railroad Crossing Violation Warning
RESP-STG	Incident Scene Pre-Arrival Staging Guidance for Emergency Responders
RSE	Road Side Equipment
RSU	Roadside Unit
RSZW/LC	Reduced Speed Zone Warning/Lane Closure
RTOP	Regional Traffic Operations Program
SAE	Society of Automotive Engineers
SAV	Shared Autonomous Vehicle
SCMS	Security and Credentials Management System
SPaT	Signal Phase and Timing
SRM	Signal Request Message
SSM	Signal Status Message
TCC	Traffic Control Center
THEA	Tampa-Hillsborough Expressway Authority
TMC	Traffic Management Center
TSMO	Transportation Systems Management and Operations
TSP	Transit Signal Priority
USDOT	United States Department of Transportation
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
V2X	Vehicle-to-Everything
VTPI	Victoria Transport Policy Institute

Acronym	Definition
VTRFTV	Vehicle Turning Right in Front of a Transit Vehicle
WHWZ	Warnings about Hazards in a Work Zone
WUWZ	Warnings about Upcoming Work Zone
WYDOT	Wyoming Department of Transportation

EXECUTIVE SUMMARY

Project Overview

“Connected Vehicles Can Sense and Communicate Things Drivers Cannot” - USDOT

Connected vehicles and automated vehicles have the potential to improve safety and efficiency across a range of mobility options, including private vehicles, emergency vehicles, freight, transit, and pedestrians. Connected and automated vehicle technologies will transform transportation in the near future, so planning for their deployment is critical to maximize the benefits.

To prepare for the transformation of transportation, planning efforts should include state, local agency, and transportation-related stakeholders. This planning effort was made possible in part by the Georgia Smart Communities Challenge (“Georgia Smart”) led by the Georgia Institute of Technology’s Institute of People and Technology in partnership with Georgia Power and the Atlanta Regional Commission (ARC).

Transportation planners and practitioners are finding it increasingly challenging to analyze what connected vehicle applications are available now and what should be tested for future application as technology evolves at a rapid pace. There also exists uncertainty about when connected and automated vehicle technologies will achieve mass adoption status for public sector, private sector, and personal end users. The potential for risk begins with a lack of coordination across jurisdictions. It is critical that state and local agencies collaborate to support interoperability and consistent benefits for all road users. Gwinnett County has initiated the Connected Vehicle Technology Master Plan (CVTMP) to lay the groundwork for maximizing the potential for transportation transformation.

The CVTMP focuses on a 5-year timeline that includes near-term (1-3 years), mid-term (5-3 years), and long-term (5+ years). The CVTMP process included input from over 25 stakeholders from cities within and neighboring Gwinnett County, community improvement districts (CIDs), and partner agencies from across the metro area and state.

Connected Vehicles are vehicles that use wireless communication technologies to communicate with roadside infrastructure, vehicles on the road, and devices, such as mobile phones.

Automated Vehicles are vehicles that are capable of sensing their environment and navigating without human input.



Georgia Smart Communities Challenge Partners

Project Team

The project team consisted of the Gwinnett County Department of Transportation (GCDOT) staff, AECOM staff, and a Georgia Institute of Technology Professor. Team members are listed in **Table E1**.

Table E1. Project Team

Staff Name	Title	Organization
Tom Sever, P.E. Project Lead	Deputy Director for Traffic Engineering, Operations, and Maintenance	Gwinnett County Department of Transportation
Alex Hofelich, P.E., PTOE	Division Director for Traffic Engineering	Gwinnett County Department of Transportation
Ken Keena, P.E.	Engineer V	Gwinnett County Department of Transportation
Angshuman Guin, PhD	Senior Research Engineer	Georgia Institute of Technology
Suzanne Murtha	National Lead for Connected and Automated Technologies	AECOM
Marc Start, P.E., PTOE	Senior ITS/Traffic Engineer	AECOM Atlanta
Sinan Sinharoy	Smart Cities and Mobility Technology Specialist	AECOM Atlanta
Leslie Langley	Smart Cities and Mobility Technology Specialist	AECOM Atlanta

Project Motivations and Goals

The goals of the CVTMP are as follows:

- **Leverage the county's transportation system to improve economic vitality and quality of life**
 - Identify the potential safety and mobility benefits available to all road users with deployment of connected vehicle infrastructure
 - Reduce congestion and crashes to improve quality of life and commute times
- **Understand the needs and challenges to ensure regional and state-wide compatibility**
 - Provide benefits to those using motorized modes (drivers, transit riders, and first responders), ensuring the benefits are seamless across the county and neighboring jurisdictions
 - Provide benefits to those using non-motorized modes (pedestrians, cyclists, and construction and maintenance workers), ensuring the benefits are seamless
- **Establish guidelines for deploying a new and evolving technology**
 - Understand the current state of connected vehicle technology and the plans of automakers for equipping future models with the technology
 - Understand the capabilities of connected vehicle applications to prepare Gwinnett County for deploying this technology county-wide and supporting it into the future
 - Deliver a transportation system that uses the most recent advances in technology
- **Have broad applicability across the county, Atlanta region, and State of Georgia**
 - Improve mobility for congested corridors that serve local and regional (inter-county) trips
 - Demonstrate the capabilities of connected vehicle technologies in a Smart Corridor project, which will prepare Gwinnett County for deploying similar technology county-wide
- **Set the standard for implementing connected vehicle technology for a local government**
 - Ensure the recommended connected vehicle system is compatible with the state's system, to maintain functionality at a regional scale
 - Evaluate scalability and design considerations for short-term needs as well as needs for long-term growth

Project Timeline

Figure E1 provides an overview of the project timeline by major tasks from the kick-off in September 2018 through the completion of this plan in September 2019.

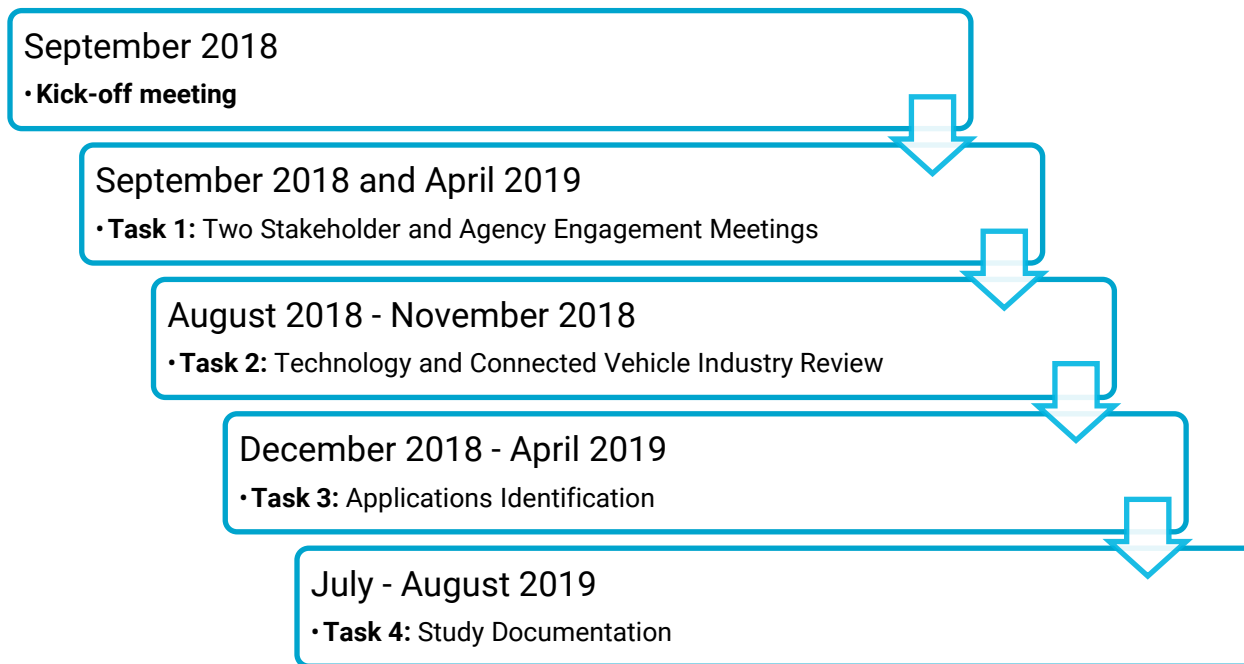


Figure E1. Project Timeline

Project Actions and Results

In addition to coordination with Gwinnett County staff, the project consisted of two stakeholder meetings with interested agencies, interviews with three peer jurisdictions, and coordination with Georgia Department of Transportation (GDOT). These meetings provided the background so that the plan addresses local needs, builds on lessons learned in other jurisdictions, and leverages opportunities that could have a state-wide impact.

The stakeholder meetings provided insights by local leaders on a variety of transportation issues, including where emergency vehicles or buses tend to be delayed. In addition, the project team leveraged lessons learned through interviews with peer jurisdictions that have implemented connected vehicle deployments since 2017.

Engagement with GDOT was helpful in amplifying the benefit of the forthcoming Smart Corridors deployment in Gwinnett County. Specifically, GDOT agreed to deploy dedicated short range communication (DSRC) at 56 intersections on state routes, in addition to the 36 originally planned for deployment on the Regional Traffic Operations Program (RTOP) corridors of SR 140 and SR 141. GDOT also agreed to share software as it becomes available to assist in deploying emergency vehicle preemption (EVP) and transit signal priority (TSP) at traffic signal locations.

The insight from stakeholders, jurisdictional peers, and GDOT will help implement the CVTMP recommendations at an accelerated pace with a greater potential for success and replicability in other communities throughout the State of Georgia.

Research Actions and Results

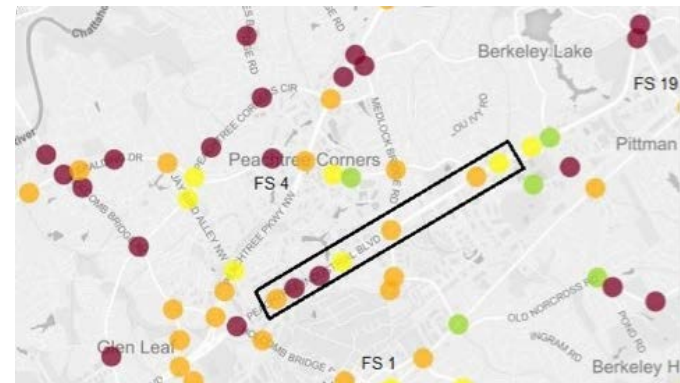
The research effort focused on evaluating intersections where emergency vehicles experience delay in Gwinnett County west of Interstate 85 (I-85). This geography is consistent with the focus area for the forthcoming Smart Corridor project. To best prepare for the deployment, the research focused on gaining insights on the current emergency response system by:

- Tracking live routes and evaluating where adjustments could be made to improve emergency vehicle response times
- Evaluating the emergency vehicle system dispatched from fire stations within the pilot project area
- Developing strategies for maximizing benefits and minimizing impacts



Emergency vehicle preemption is not a new concept. EVP is the ability for a traffic controller to change the lights from red to green or hold a green light longer when it receives a message from an emergency vehicle as it approaches the intersection. Non-connected vehicle systems depend on direct line of sight between the traffic signal and the emergency vehicle. A connected vehicle system allows for multi-signal preemption, meaning that a whole corridor or vehicle path can be cleared in advance of the emergency vehicle’s arrival. This approach allows for better clearance of traffic and minimizes the impact to normal traffic flow.

The research included a bottleneck analysis to identify hotspots for both emergency vehicles and normal traffic flow and a delay pattern analysis of common paths used by emergency vehicles. These insights will help in prioritizing locations for focusing EVP hardware and software deployment.



PIB Intersections	Phase	Vehicle-days of data	Average of speed
PEACHTREE CORNERS EAST	4	70	7
REPS MILLER RD	6	79	2
TECHNOLOGY PKWY SOUTH	6	81	8
MEDLOCK BRIDGE RD	6	91	4
SOUTH OLD PEACHTREE RD	6	119	8
HIGHWOODS CENTER	6	117	13

Research Recommendations

Recommendations from the research include the following:

- The emergency response community is welcoming connected vehicle technology. Demonstration and quantification of benefits, through pilot field applications, will be critical to gaining acceptance from the public and convergence from the manufacturers that are both necessary for widespread success of connected vehicle in improving mobility, safety, and sustainability.
- Identifying key data needs early in the project is critical to the success of short-term data-heavy projects.

Georgia Tech Student Engagement

Part of the Georgia Smart Communities Challenge is the Smart Community Corps, a group of cross departmental college students who are placed in the communities to support research efforts during their summer break. Gwinnett County had such a student who worked in the GCDOT Traffic Control Center. Their work focused on streamlining the transfer of high resolution/high volume data between Gwinnett County and Georgia Institute of Technology (Georgia Tech) and developed a data fusion Application Programming Interface (API) data feed of the global positioning system (GPS) signal status data.

Students who were part of the Georgia Tech Civic Data Science Team also supported the research effort by providing data quality checks on the various data feeds and by identifying the intersections at which emergency vehicles experience maximum delays.

Challenges

One challenge in developing the CVTMP is the pace at which emerging transportation technology is evolving both from developers of the technologies and local agencies who deploy the technologies. A second challenge in developing the CVTMP is verifying that the community needs are being addressed as best as possible. The project team strove to develop content for the CVTMP that would not become outdated in the short term. The stakeholder meetings assisted the process of capturing the concerns and needs of the stakeholder community.

Data Collection

Connected vehicle systems provide a wealth of information that will need to be analyzed to provide benefits to the full spectrum of transportation mode users. Cross-jurisdictional coordination with neighbors and GDOT will be needed to ensure continuous benefits along corridors that may cross jurisdictional boundaries. Data analysis will provide greater understating to improve mobility and safety at a speed not previously accessible.

Recommendations

The deployment plan focused on a 5-year approach as summarized in **Figure E2**. By 2024, a significant number of vehicles are expected to be manufactured with connected vehicle-enabled capability. The 5-year plan is intended to provide a period of testing connected vehicle applications as Gwinnett County expands to a county-wide deployment, anticipating that the market saturation level in private vehicles will remain relatively low until 2024.

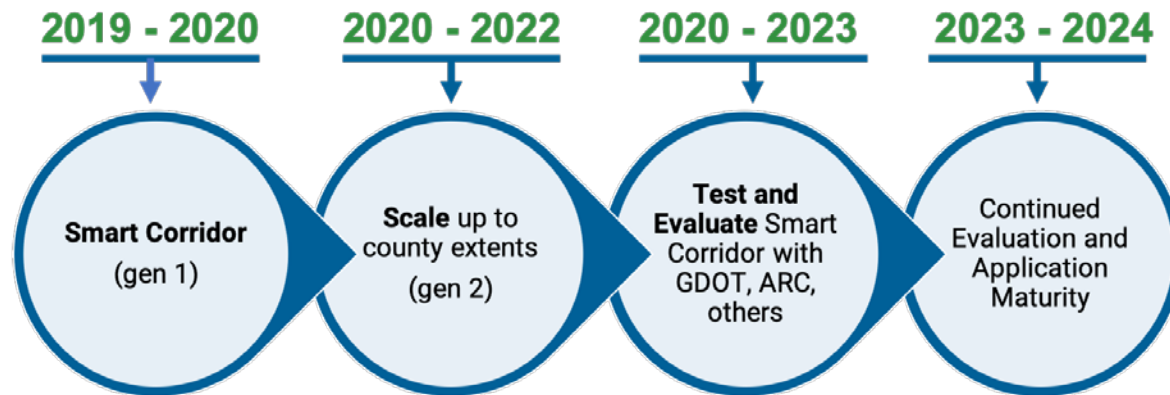


Figure E2. 5-Year Timeline

The deployment plan is summarized in **Table E2**. The approach begins with limited connected vehicle applications as part of the Smart Corridor project, which will demonstrate how connected vehicle applications can benefit a variety of users to improve safety and mobility and enhance traveler information. Then, Gwinnett County will coordinate with other agencies with respect to applications that have state-wide potential so that staff and financial resources are efficiently utilized. After testing and evaluating connected vehicle applications, the system can be expanded county-wide with applications that have proven benefits.

Table E2. 5-Year Deployment Plan

Application	Near-Term (2020)	Short-Term (2020-2022)	Long-Term (2020-2024)
	Smart Corridor project	In Coordination with ARC, GDOT	In Coordination with GDOT
1. All Solutions	<ul style="list-style-type: none"> Deploy RSUs in the Smart Corridor area Test connected vehicle data collection, analytics, and archiving 	<ul style="list-style-type: none"> State-wide; dashboard for intersection traffic signal operations (RR + EVP + TSP + FSP transition times) State-wide; manage RR + EVP + TSP + FSP conditional requirements Test connected vehicle-generated safety data alerts Cybersecurity; deploy SCMS or similar system 	<ul style="list-style-type: none"> Deploy RSUs county-wide Test county-wide connected vehicle data, analytics, and archiving Deploy mission-critical connected vehicle-generated safety data alerts
2. Signal Phase and Timing (SPaT) Information	<ul style="list-style-type: none"> Enable red light warning, phase termination/next signal phase, and green band speed applications 	<ul style="list-style-type: none"> Monitor benefits of safety applications related to fleet penetration of RSUs and cellular OBUs 	<ul style="list-style-type: none"> Monitor benefits of safety applications related to fleet penetration of DSRC/cellular OBUs
3. Emergency Vehicle Preemption (EVP)	<ul style="list-style-type: none"> Enable EVP Install OBUs on fire trucks 	<ul style="list-style-type: none"> State-wide; manage EVP conditional priority requirements 	<ul style="list-style-type: none"> Alerts for excessive transition time
4. Transit Signal Priority (TSP)	<ul style="list-style-type: none"> Enable TSP Install OBUs on transit vehicles 	<ul style="list-style-type: none"> Manage TSP conditional priority Test schedule adherence conditional priority Test bus occupancy conditional priority 	<ul style="list-style-type: none"> County-wide system development Alerts for excessive transition time
5. Freight Signal Priority (FSP)		<ul style="list-style-type: none"> Enable FSP State-wide; manage FSP conditional priority Develop commercial freight outreach program 	<ul style="list-style-type: none"> County-wide system development Alerts for excessive transition time
6. Construction and Maintenance Vehicle Alert	<ul style="list-style-type: none"> Enable alerts Install OBUs and HMIs on select GCDOT vehicles 	<ul style="list-style-type: none"> State-wide; manage alert conditional requirements 	<ul style="list-style-type: none"> County-wide system development
7. Rail Intersection Blocked Alert	<ul style="list-style-type: none"> Test railroad intersection blocked alert 	<ul style="list-style-type: none"> State-wide; evaluate railroad crossing safety applications Evaluate railroad crossing prediction accuracy 	<ul style="list-style-type: none"> County-wide system development Develop additional railroad crossing safety applications Enable predictive railroad crossing delay
8. Mobile Accessible Pedestrian Presence Alert (PPA)	<ul style="list-style-type: none"> Test alert from pedestrian push button activation at intersections 	<ul style="list-style-type: none"> Test transit and bus door open events County-wide system development Test applications for the visually impaired 	<ul style="list-style-type: none"> Test alert from pedestrian push button activation for mid-block pedestrians County-wide system development

As part of the Smart Corridor project, Gwinnett County will deploy roadside units (RSUs), onboard units (OBUs), and test software, in collaboration with GDOT. The first applications to be developed and tested in 2020 are Signal Phase and Timing Information (SPaT), EVP, TSP, Construction and Maintenance Vehicle Alert, Railroad Intersection Blocked Alert, and Pedestrian Presence Alert (PPA).

The Smart Corridor project will include an “innovation solution” component, which is intended for the technology industry to showcase the most effective ways in which to apply connected vehicle technology and quickly provide benefits to the public. As part of the Smart Corridor project Request for Proposals, the contractor teams will be challenged to provide solutions that provide short-term public benefit, additional value, mobility benefits, and safety benefits. The outcome of the innovation solution is that Gwinnett County will improve the project value to the transportation users in Gwinnett County.

Before completing the Smart Corridor project, Gwinnett County will increase the level of technical staffing to support the goals for a successful connected vehicle program. The technical staffing level changes will occur in engineering and information technology (IT).

Years 2021 to 2022 will focus on further testing and evaluating the deployed solutions and developing additional applications, including pedestrian present at transit stops and Freight Signal Priority (FSP). An expansion of the connected vehicle-related communications system is also planned during this timeframe.

During this time period, the number of vehicles manufactured with connected vehicle-enabled capability will grow. Gwinnett County will experience first-hand learning about how drivers respond to messages generated by connected vehicle applications, as the market penetration of OBUs occurs over time.

Years 2023 to 2024 will focus on further evaluating and refining the developed applications and scaling the applications to other parts of Gwinnett County. A deployment timeline or the order of deployment to other parts of the county has not been determined but a strategy is outlined in **Chapter 6**.

By 2024, a significant number of new vehicles will be manufactured with connected vehicle capabilities. The applications that are appropriate and ready for county-wide deployment will be deployed, including further expansion of the connected vehicle-related communications system.

While all connected vehicle applications may not yet be fully mature, Gwinnett County will select and prioritize applications based on the results of the testing and evaluation phase. The anticipated safety and mobility benefits, number of users, cost, staffing, and amount of required hardware and software will be considered in making decisions regarding county-wide deployment.

Collaboration with GDOT and ARC will remain critical as technology and connected vehicle applications change. For instance, some applications may be better served by applications that can be displayed via human machine interface (HMI) installed in a vehicle, and some applications may be adequately served by a mobile device.

The mission-critical nature of providing first-line safety applications requires the connected vehicle system to be robust, redundant, and secure to the extent practical. To reduce pressure on the network communications system, applications that can be served at the “edge,” such as by a local intersection, will be deployed first. Applications that require external triggers to be sent to the intersection through the network communications system will be considered supplementary.

As with any technology-oriented plan, potential exists for the plan to become obsolete before the horizon year occurs. As a result, the long-term recommendations will be considered advisory in nature. As Gwinnett County experiences the Smart Corridor project, the applications and communications approach will be reviewed to take advantage of the most beneficial methods of delivering connected vehicle benefits.

Gwinnett County and stakeholders understand that regional collaboration is critical to the success of connected vehicle deployments, especially when measured by value added to the general public. To ensure that investments made in deploying and developing connected vehicle solutions are responsible, strategic, and sustainable, the regional collaboration roadmap on **Figure E3** was developed. The roadmap spans 5 years and identifies four areas of focus under one unified vision.

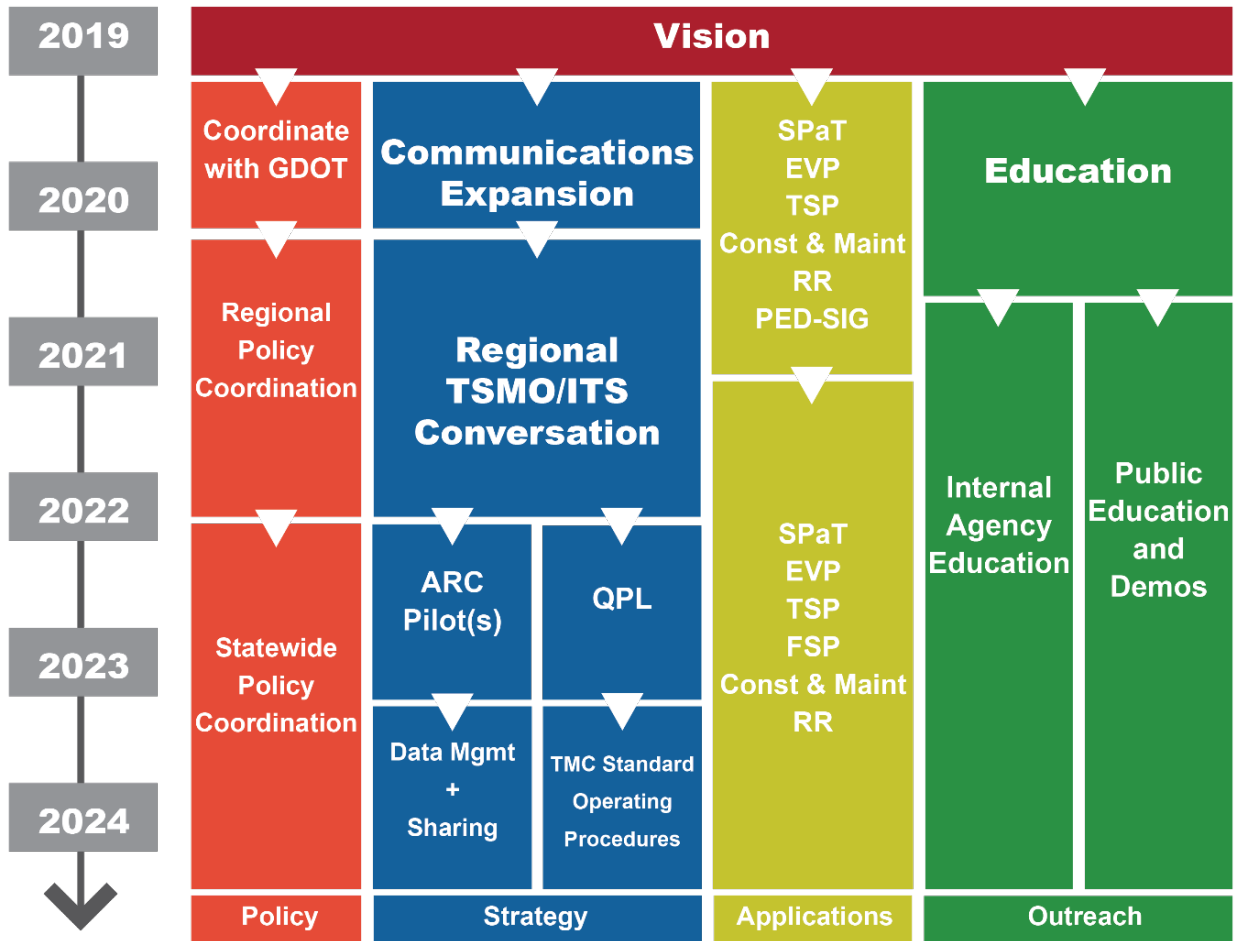


Figure E3. Regional Collaboration Roadmap

The first column, in red, focuses on coordination with GDOT and ARC for policy development. Policy coordination will focus on data governance, ensuring interoperability for the Atlanta region, and security of the system.

The second column, in blue, focuses on infrastructure and standards to be deployed and developed to ensure success. These tasks include expanding communications in areas to support connected vehicle deployments, developing performance-based standards for qualified product lists, continuing to collaboratively support innovation via efforts like the ARC pilots, and continuing regional TSMO and intelligent transportation system (ITS) conversations to establish data governance. For the plan for future fiber optic communications infrastructure, refer to the Gwinnett County *Intelligent Transportation Systems Master Plan (2017)*.

The third column, in yellow, focuses on application development. Most communities across the State of Georgia have similar needs of improving safety for all roadway users and improving mobility for all modes. The focus will be on developing software that can be applied across a variety of community types with minimal cost and effort.

The fourth column, in green, focuses on education and marketing of the solutions first with the stakeholders of the CVTMP and the communities in which the first round of connected vehicle solutions will be made available. Before 2021, the deployed connected vehicle solutions will have been properly tested and calibrated so that communicating them across agencies and the general public can begin. For the connected vehicle solutions to have the greatest positive impact, mass adoptions of these solutions must be the main focus.

Future Plans

The current funding identified for the Smart Corridor project is \$2.6 million. Expanding the connected vehicle system beyond the Smart Corridor area will require additional funding, which may be allocated via local funding and additional matching funds.

Expansion will need to be strategically prioritized to deliver the greatest benefit for road users with the available technology. For example, the county is made up of many cities, CIDs, fire districts, and transit routes, all of which must be considered.

CVTMP Contents

- **Chapter 1** discusses the vision, goals, objectives, approach, application of the CVTMP to the State of Georgia, and overview of Gwinnett County.
- **Chapter 2** provides a review of the industry both nationally and locally.
- **Chapter 3** provides a technology review of connected and automated vehicles, including details such as communication methods, messaging capabilities, national considerations, and system-level considerations.
- **Chapter 4** discusses the stakeholder engagement process and how the insights influenced the priority development process.
- **Chapter 5** provides an overview of available connected vehicle applications.
- **Chapter 6** discusses the connected vehicle deployment plan for Gwinnett County.
- **Appendix A** Interview Guiding Questions Regarding Recent Smart Mobility Deployments
- **Appendix B** Stakeholder Insights by Zone
- **Appendix C** Applications Being Tested Nationwide
- **Appendix D** CVTMP Presentation

CHAPTER 1 INTRODUCTION

CVTMP Vision

Gwinnett County aspires to identify and test the standard for the application of connected vehicle technology. The CVTMP will advance the use of technological enhancements in traffic management systems to improve traffic congestion and reduce crashes. The Peachtree Industrial Boulevard Corridor has been identified as a Smart Corridor project and will be the site of the first connected vehicle technology deployment as part of a separate effort.

A connected vehicle system will support economic development in Gwinnett County and will result in user cost savings associated with safety and mobility benefits, providing an attractive environment for business growth. County leadership envisions that the Smart Corridor project will be the first of several such projects to stem from this CVTMP and will have broad applicability not only in Gwinnett County, but in the Atlanta region and across the State of Georgia.

The CVTMP identifies how to set up a connected vehicle system, including costs, benefits, applications, equipment (both hardware and software), and personnel requirements. It will also help agencies charged with traffic safety and mobility manage expectations and costs and fully realize the benefits of these new technologies as envisioned in existing public documents published by the United States Department of Transportation (USDOT) (**Figure 1**).



Source: USDOT. Connected Vehicles Pilot Deployment Program

Figure 1. Visual Representation of Connected Vehicle Applications

CVTMP Goals and Objectives

The goals of the CVTMP are as follows:

- **Leverage the county's transportation system to improve economic vitality and quality of life**
 - Identify the potential safety and mobility benefits available to all road users with deployment of connected vehicle infrastructure
 - Reduce congestion and crashes to improve quality of life and commute times
- **Understand the needs and challenges to ensure regional and state-wide compatibility**
 - Provide benefits to those using motorized modes (drivers, transit riders, and first responders), ensuring the benefits are seamless across the county and neighboring jurisdictions
 - Provide benefits to those using non-motorized modes (pedestrians, cyclists, and construction and maintenance workers), ensuring the benefits are seamless
- **Establish guidelines for deploying a new and evolving technology**
 - Understand the current state of connected vehicle technology and the plans of automakers for equipping future models with the technology
 - Understand the capabilities of connected vehicle applications to prepare Gwinnett County for deploying this technology county-wide and supporting it into the future
 - Deliver a transportation system that uses the most recent advances in technology
- **Have broad applicability across the county, Atlanta region, and State of Georgia**
 - Improve mobility for congested corridors that serve local and regional (inter-county) trips
 - Demonstrate the capabilities of connected vehicle technologies in a Smart Corridor project, which will prepare Gwinnett County for deploying similar technology county-wide
- **Set the standard for implementing connected vehicle technology for a local government**
 - Ensure the recommended connected vehicle system is compatible with the state's system, to maintain functionality at a regional scale
 - Evaluate scalability and design considerations for short-term needs as well as needs for long-term growth

The 2017 Comprehensive Transportation Plan (CTP) effort collected insight from Gwinnett County citizens on what they prioritize when it comes to improving mobility within the county (Figure 2). The feedback was incorporated in this planning effort to ensure that the proposed solutions are a direct response to the needs of Gwinnett County citizens.

Citizen Priority Rankings (Weighted)

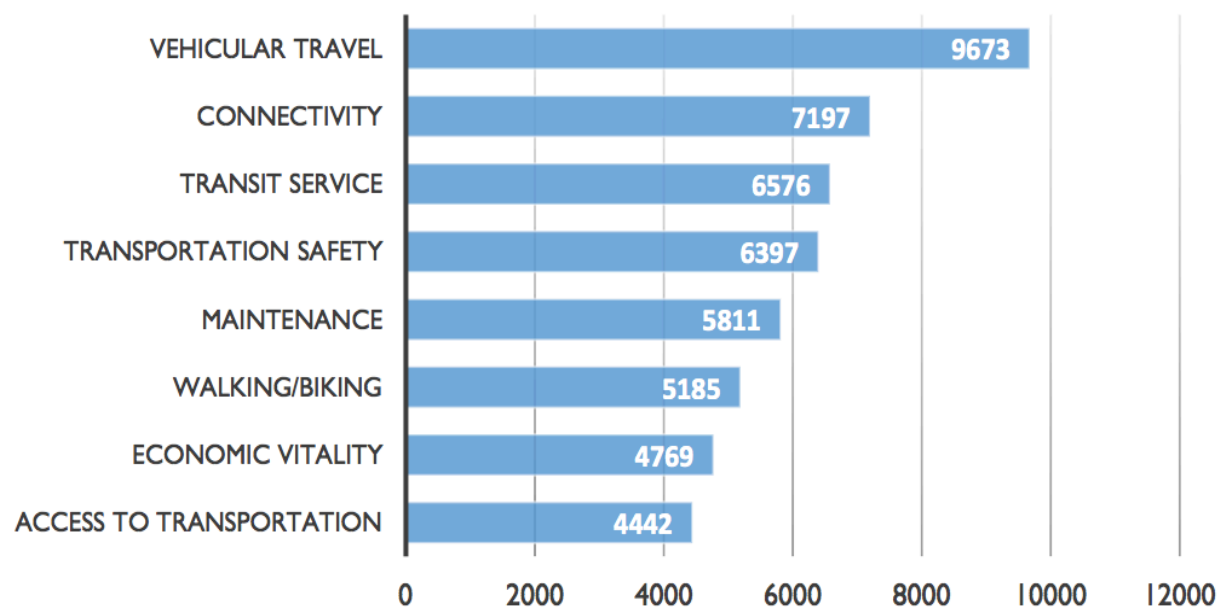


Figure 2. Citizen Priority Rankings from the 2017 CTP

In addition to incorporating citizen priority rankings, the CVTMP focuses on the following questions to ensure that all road users are considered. This allows for a focus on unintended impacts of new technology solutions. Some of the CVTMP considerations are illustrated in Figure 3.

- How can technology improve the balance between safety and efficiency?
- How can high vehicle market penetration be achieved for application usability?
- How can equitable access be provided to support relevant safety messages to all road users?
- How can data, system ownership, and security concerns be managed properly?

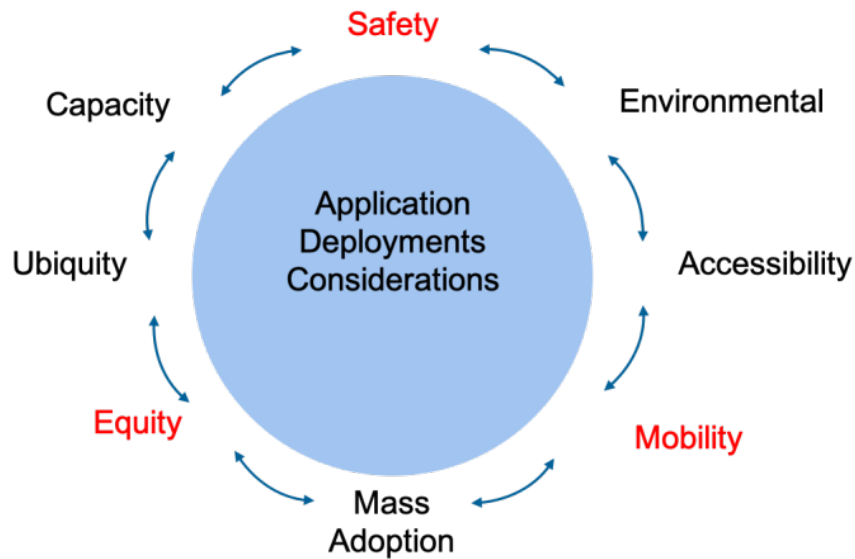


Figure 3. CVTMP Considerations

The objectives of the CVTMP are as follows:

- Meets Gwinnett County's needs based on stakeholder input and identified needs

- Supports the goals of the 2017 *Comprehensive Transportation Plan (CTP)*, 2018 *Connect Gwinnett Transit Plan*, and 2017 *Intelligent Transportation Systems Master Plan*
- Is compatible with GDOT deployments so that the system operates seamlessly within the county, Atlanta region, and State of Georgia
- Is compatible with the vision of USDOT and supports the national conversation about the future of transportation
- Is interoperable using the protocols and standards adopted by industry
- Can be replicated by other jurisdictions
- Is scalable and flexible with respect to expanding the system with future deployments
- Is deployment friendly in that system expansion can be planned, designed, constructed, and operated efficiently

CVTMP Approach

The CVTMP has a phased approach for deploying connected vehicle technology solutions based on opportunity and need in three zones of the county, as shown in **Figure 4**.

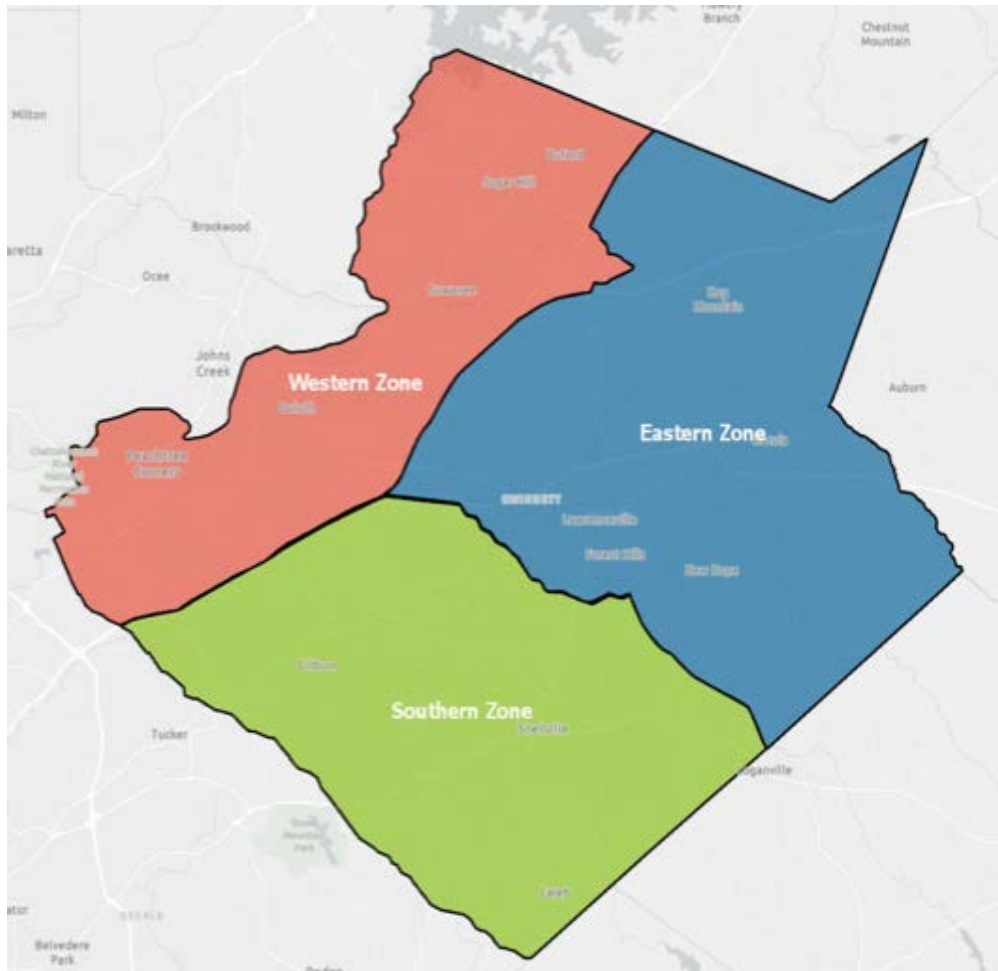


Figure 4. Deployment Zones

The Smart Corridor project covers most of the western zone. The eastern and southern zones will build on the findings of the Smart Corridor project but do not have identified timelines associated with deployment of connected vehicle technology. The deployment of traffic signals could be divided in a similar manner, should project funding be available in amounts that support wide-scale deployment.

The approach is to deploy and test connected vehicle technology and application as part of the Smart Corridor project before expanding to the rest of Gwinnett County based on a strategy detailed in **Chapter 6**. A recommended strategy is to identify where and when to expand the connected vehicle system. This includes:

- Coordinate with GDOT to outfit additional intersections with RSUs
- Deploy connected vehicle infrastructure in batches of 75 to 175 traffic signals per phase
- Focus on outfitting signals that serve FSP and TSP

If funding is available in smaller increments, then deployments will be targeted at:

- Area surrounding the Mall of Georgia and Coolray Field
- Area surrounding Gwinnett Place Mall
- Major commuter corridors, such as Sugarloaf Parkway
- Downtown areas, such as Lawrenceville, Lilburn and Snellville

Deployments will need to be cognizant of Fire District boundaries

Application to the State of Georgia

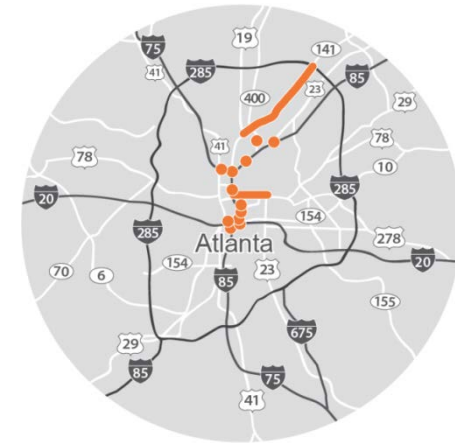
One of the main goals of the project is to develop connected vehicle-based solutions that meet the needs of Gwinnett County and can be easily replicated across the State of Georgia. State-wide application will also meet one of the goals of the Georgia Smart Communities Challenge program.

GDOT has initiated the deployment of infrastructure that supports connected vehicle technology. The GDOT approach focuses on four primary areas: safety, mobility, freight, and partnerships. Through the process of developing the CVTMP, GDOT and Gwinnett County coordinated extensively to coordinate interoperability of the connected vehicle systems deployed by each jurisdiction. This collaborative approach has the potential to leverage additional funding and begin to standardize configurations and processes from which other jurisdictions would benefit.

GDOT's goals related to connected vehicles are as follows:

- **Primary goal:** Develop back-end infrastructure, network components, and business processes to support broad vehicle-to-infrastructure (V2I) and infrastructure-to-vehicle applications that are broadcast-medium agnostic, scalable, and sustainable.
- **Secondary goal:** Begin broad installation of RSUs and equipped vehicles to facilitate applications that improve safety and mobility.

To this end, GDOT has deployed RSUs at the locations illustrated on **Figure 5**. GDOT is moving forward with deploying RSUs along RTOP corridors shown on **Figure 6**.



Source: GDOT

Figure 5. GDOT Phase 1 Pilot Deployment of RSUs



Source: GDOT

Figure 6. GDOT Phase 2 Planned RSU Deployments

Overview of Gwinnett County

Gwinnett County is a diverse and vibrant county located approximately 30 miles northeast of Atlanta (Figure 7). The county is approximately 433 square miles and has 105 miles of Chattahoochee river front. Gwinnett County contains 16 cities and 5 CIDs (Figure 8, Table 1).



Figure 7. Location of Gwinnett County in Relation to Metro Atlanta

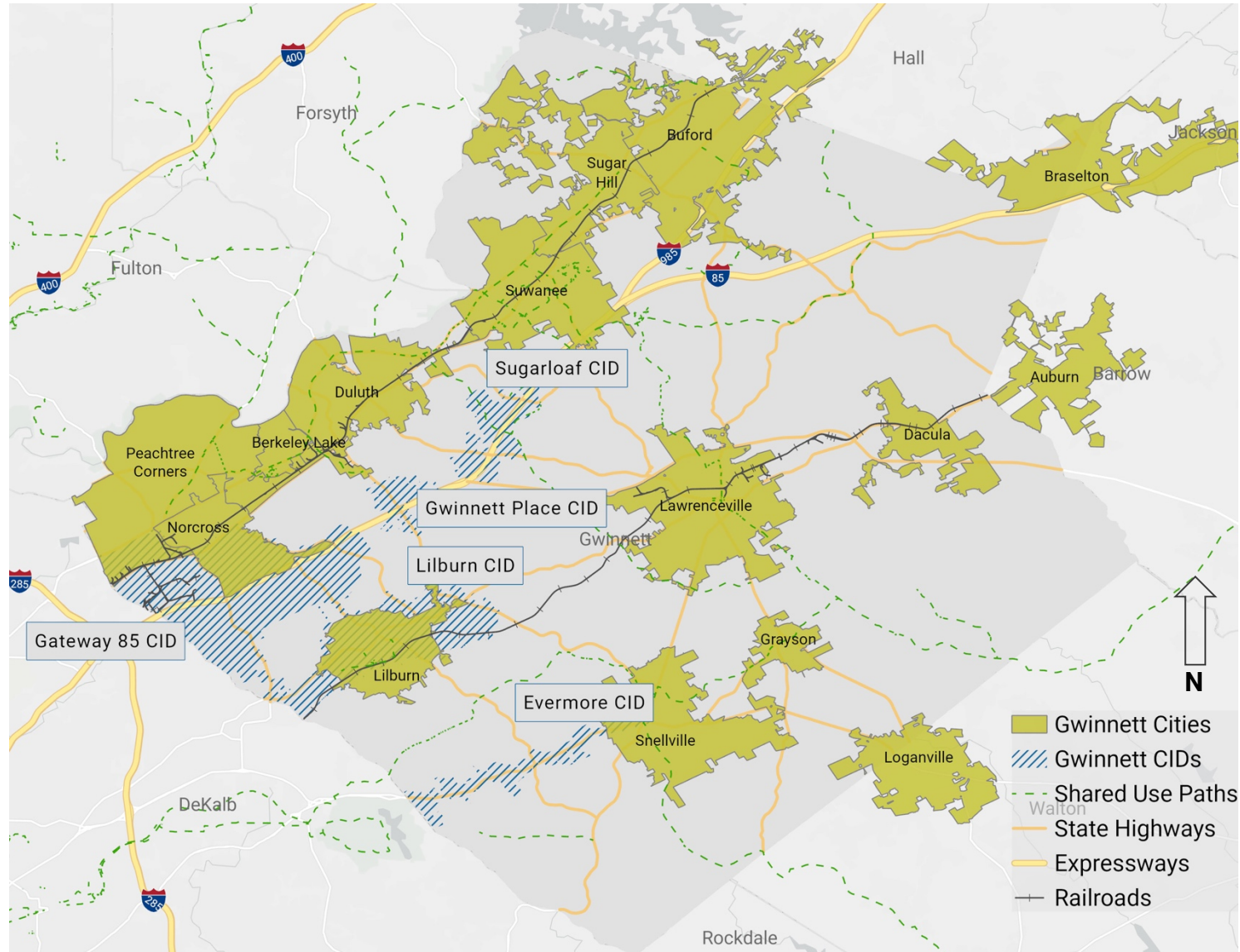


Figure 8. Overview Map of Gwinnett County

Table 1. Cities and CIDs in Gwinnett County

Cities	Cities	CIDs
Auburn	Lilburn	Evermore
Berkeley Lake	Loganville	Gateway 85
Braselton	Norcross	Gwinnett Place
Buford	Peachtree Corners	Lilburn
Dacula	Rest Haven	Sugarloaf
Duluth	Snellville	
Grayson	Sugar Hill	
Lawrenceville	Suwanee	

Planning Efforts

Over the past few years Gwinnett County has developed several planning documents each of which was referenced for insight during this planning effort. The referenced plans include:

- *Destination 2040 – Gwinnett’s Comprehensive Transportation Plan (CTP), 2017*¹
- *Gwinnett Countywide Trails Master Plan, 2018*²
- *Connect Gwinnett Transit Plan, 2018*³
- *2040 Unified Plan, 2018*⁴
- *Intelligent Transportation Systems Master Plan, 2017*

¹ <https://www.gwinnettcounty.com/web/gwinnett/departments/transportation/comprehensivetransportationplan>.

² https://www.gwinnettcounty.com/static/upload/bac/52/20180220/m_2018.02.20%20-%20Briefing%20Unofficial%20Minutes%201030am.pdf.

³ <https://www.gwinnettcounty.com/web/gwinnett/departments/transportation/connectgwinnett>.

⁴ <https://www.gwinnettcounty.com/web/gwinnett/Departments/2040UnifiedPlan>.

Growth

Gwinnett County has experienced rapid growth over the past few decades. From 2000 to 2010, the population grew 36% from 588,488 to 805,321 people and is expected to grow by 66% to 1,341,000 people by 2040.

Employment has increased by 8,700 jobs annually since 2013. Based on the historical growth rate, 120,000 jobs are expected to be added by 2030. Retail trade currently has the largest share (15%) of current jobs in the county. The largest employment growth sectors between 2003 and 2015 are education, healthcare, professional and scientific, retail, accommodations and food services, public administration, and information.

Mobility

Gwinnett County currently manages over 2,600 miles of public roadways and 729 traffic signals. Approximately 550 traffic signals communicate with the Gwinnett County Traffic Control Center (TCC). There are also 230 miles of fiber optic cable, approximately 260 closed circuit television (CCTV) cameras, and approximately 220 flashing beacons. The transportation assets are shown on **Figure 9**.

Two top concerns for Gwinnett County as mitigating congestion and ensuring public safety, the ITS Master Plan focused on strategies to address both. The 2017 ITS master planning effort identified 8 short-term projects, 11 mid-term projects, and 6 long-term projects. Identified projects of relevance to Gwinnett County are identified in **Chapter 6**.

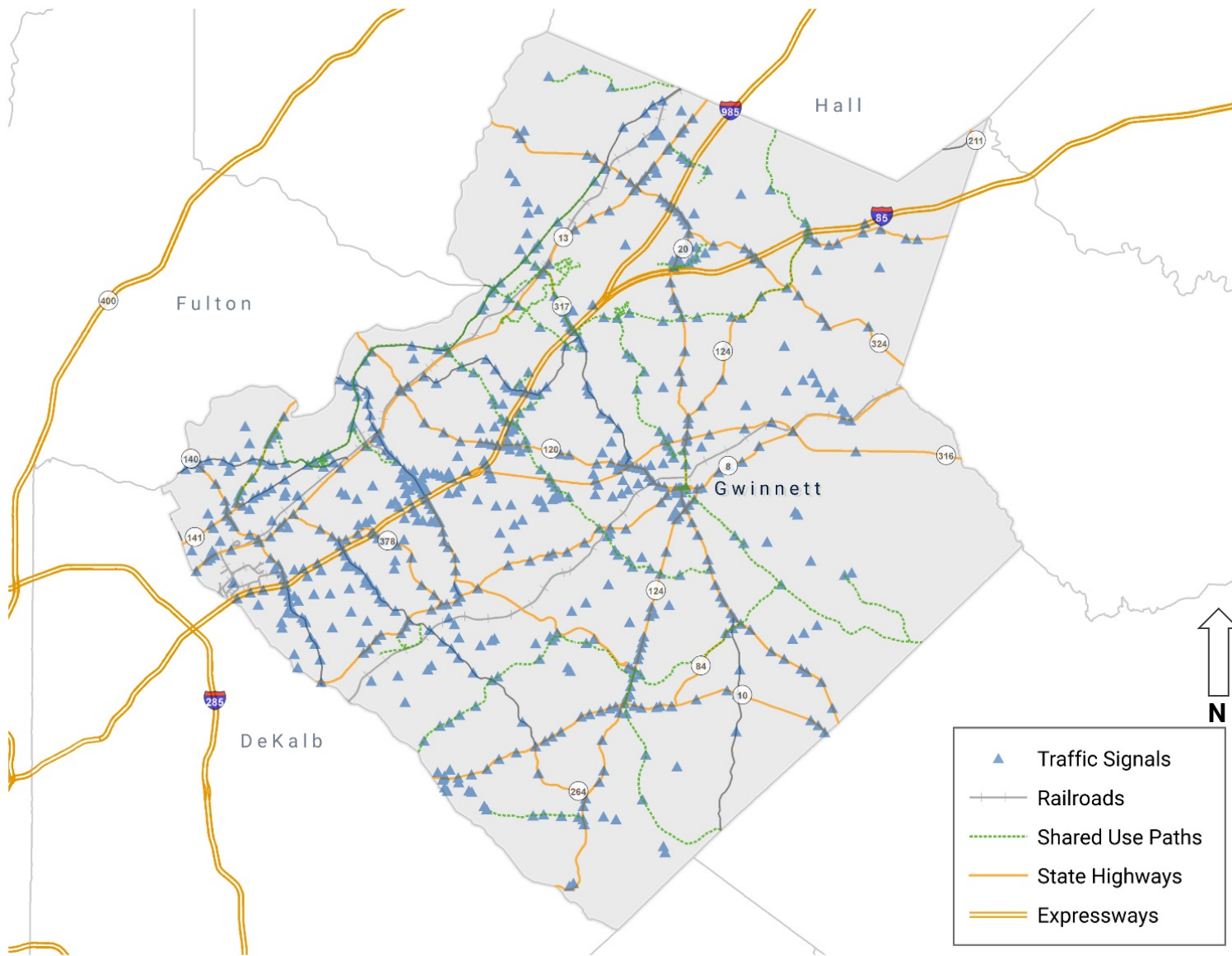


Figure 9. Map of Traffic Signals in Gwinnett County

As documented in the CTP, Gwinnett County serves a significant amount of freight activity to and through the county. Gwinnett County has six major freight distribution facilities and 141 miles of truck routes.

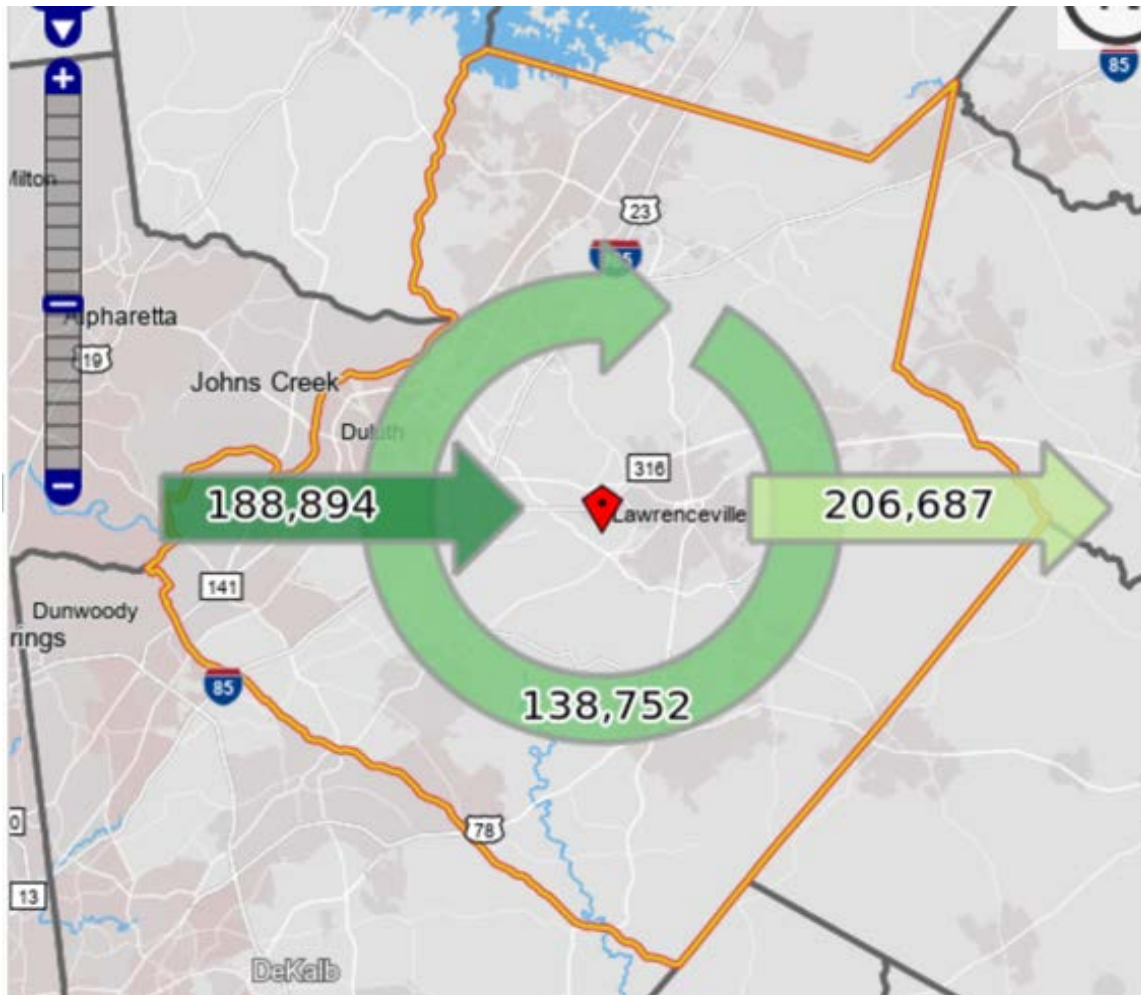
OnTheMap (US Census) provides insights about mobility characteristics for where people work and live. **Figure 10** shows work-based trips for Gwinnett County. In 2015, 327,646 people were employed in Gwinnett County. Of those employed, 58% (188,894) employed in Gwinnett County lived outside of the county and 42% (138,752) worked and lived in Gwinnett County. Of those who lived in Gwinnett County, 60% (206,687) were employed outside of the county and 40% (138,752) were employed within the county.

Gwinnett County Transit (GCT) operates seven local bus routes, five express commuter bus routes, and a microtransit pilot project in Snellville. GRTA Xpress runs four routes from Gwinnett County. The *Connect Gwinnett Transit Plan* needs assessment found that in 2015 184,000 people were served by fixed route transit (express service excluded) and that by 2040, if the transit plan is implemented, the population served could increase to 294,000.⁵

See **Figure 11** for the railroad system in Gwinnett County, which includes 55 miles of railroad lines.⁶

⁵ https://www.gwinnettcountry.com/static/departments/transportation/pdf/Connect_Gwinnett_Needs%20Assessment_Report.pdf.

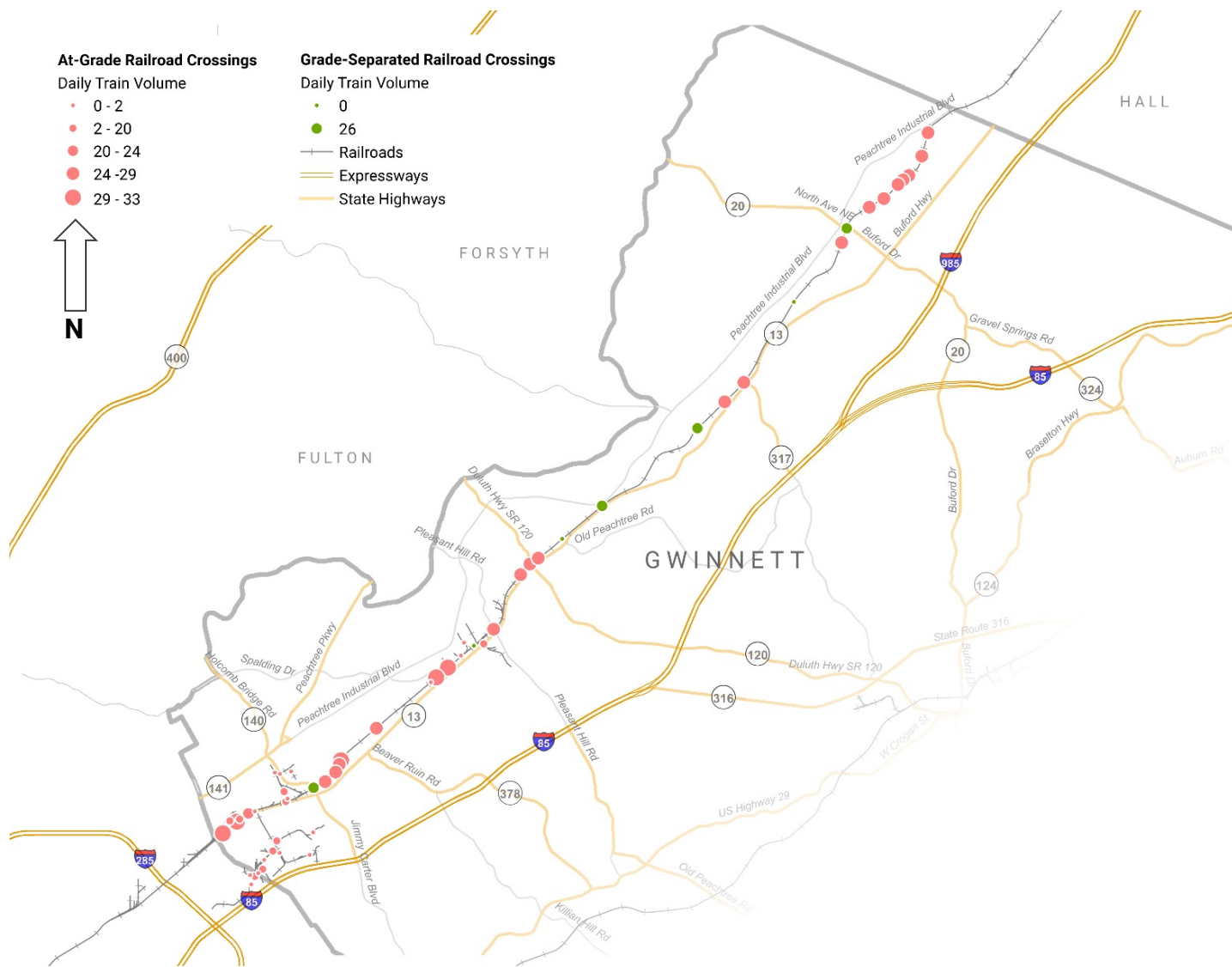
⁶ <https://www.gwinnettcountry.com/static/departments/transportation/CTP/pdf/CTP%20Existing%20Conditions%20Report%20-%20December%202016.pdf>.



Source: U.S. Census Bureau, Center for Economic Studies

Commuter movements in Gwinnett County: 188,894 trips travel into the county for work, 138,752 stay within the county, and 206,687 trips leave the county for work.

Figure 10. Work-Based Origin and Destination Trip Flows for Gwinnett County (2015)



Source: GDOT Office of Transportation Data

Figure 11. Map of At-Grade Rail Crossings in Western Gwinnett County

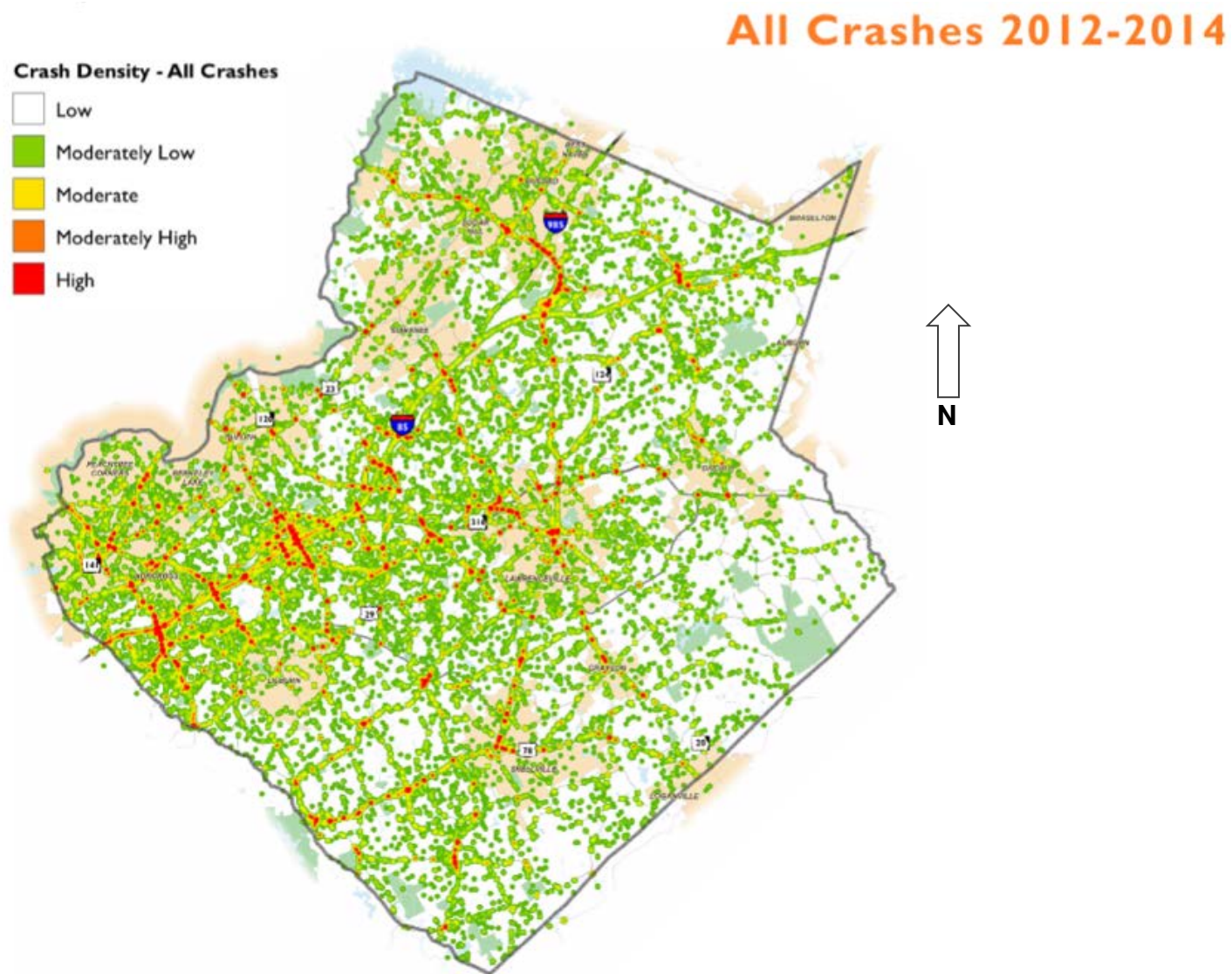
Safety

In 2016, automobile-related crashes claimed 38,758 lives in the US.⁷ Vehicle crashes are a leading cause of death for people under the age of 45.⁸ Over time, connected and automated vehicle deployments are anticipated to have a significantly positive impact on transportation safety.

The Gwinnett County CTP analyzed three years of crash data (2012 to 2014). A total of 94,022 crashes and 257 fatalities were reported during the three-year period. **Figure 12** illustrates the distribution of all reported crashes in Gwinnett County. In total, 4,754 (5%) involved a truck, 822 (1%) involved a pedestrian, and 167 (0.2%) involved a bicyclist.

⁷ McKinsey & Company. "Gauging the disruptive power of robo-taxis in autonomous driving." October 2017. <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/gauging-the-disruptive-power-of-robo-taxis-in-autonomous-driving>.

⁸ CDC Nonvital Statistic Reports. https://www.cdc.gov/nchs/data/nvsr/nvsr67/nvsr67_05.pdf.



Source: Gwinnett County CTP

Figure 12. Crash Density Across all Crashes in Gwinnett County (2012-2014)

CHAPTER 2 INDUSTRY REVIEW

United States Department of Transportation Connected Vehicle Pilot Deployment Program

USDOT is supportive of deploying connected vehicle technology, including DSRC technology, and testing cellular vehicle-to-everything (C-V2X) technologies, to support safety, mobility, and automation. The USDOT connected vehicle research program is a multimodal initiative to enable safe, interoperable, networked wireless communications among vehicles, infrastructure, and personal communications devices. USDOT has funded connected vehicle deployments in Tampa, Florida; New York City, New York; and Wyoming. Those deployments support hundreds of RSUs and thousands of in-vehicle units. Below are descriptions of the three pilot deployments.

Tampa Hillsborough Expressway

Tampa's tolling agency, Tampa-Hillsborough Expressway Authority (THEA), is hosting another USDOT DSRC deployment. The deployment includes the Selmon Reversible Express Lanes (REL), which has a morning commute endpoint intersection on major routes into and out of the downtown Tampa commercial business district. The THEA pilot (Figure 13) will deploy a variety of vehicle-to-vehicle (V2V) and V2I applications to relieve congestion, reduce collisions, and prevent wrong way entry at the REL exit. THEA also plans to use connected vehicle technology to enhance pedestrian safety and speed bus operations and reduce conflicts between street cars, pedestrians, and passenger cars at locations with high volumes of mixed traffic. The THEA Connected Vehicle Pilot will employ DSRC to enable transmissions among approximately 1,600 cars, 10 buses, 10 trolleys, 500 pedestrians with smartphone applications, and approximately 40 RSUs along city streets.



Figure 13. THEA Connected Vehicle Pilot Area Overview

New York

The focus of this pilot is intersections in a major urban area. New York City will be deploying nearly 500 RSUs and roughly 8,000 OBUs. The New York City Department of Transportation (NYCDOT) Connected Vehicle Pilot Deployment project area encompasses three distinct areas in the boroughs of Manhattan and Brooklyn (see **Figure 14**). The first area includes four one-way corridors in Manhattan. The second area covers a 1.6-mile segment of Flatbush Avenue in Brooklyn. The third area includes a 4-mile segment of Franklin D. Roosevelt (FDR) Drive in the Upper East Side and East Harlem neighborhoods of Manhattan. The fleet will include approximately 5,800 cabs, 1,250 Metropolitan Transit Authority buses, 400 commercial fleet delivery trucks, and 500 city vehicles that will be fit with the connected vehicle technology. Using DSRC, the deployment will include approximately 310 signalized intersections for V2I technology. In addition, NYCDOT will deploy eight RSUs along the higher-speed FDR Drive to address challenges such as short-radius curves, a weight limit, and a minimum bridge clearance and 36 RSUs at other strategic locations throughout the City to support system management functions.

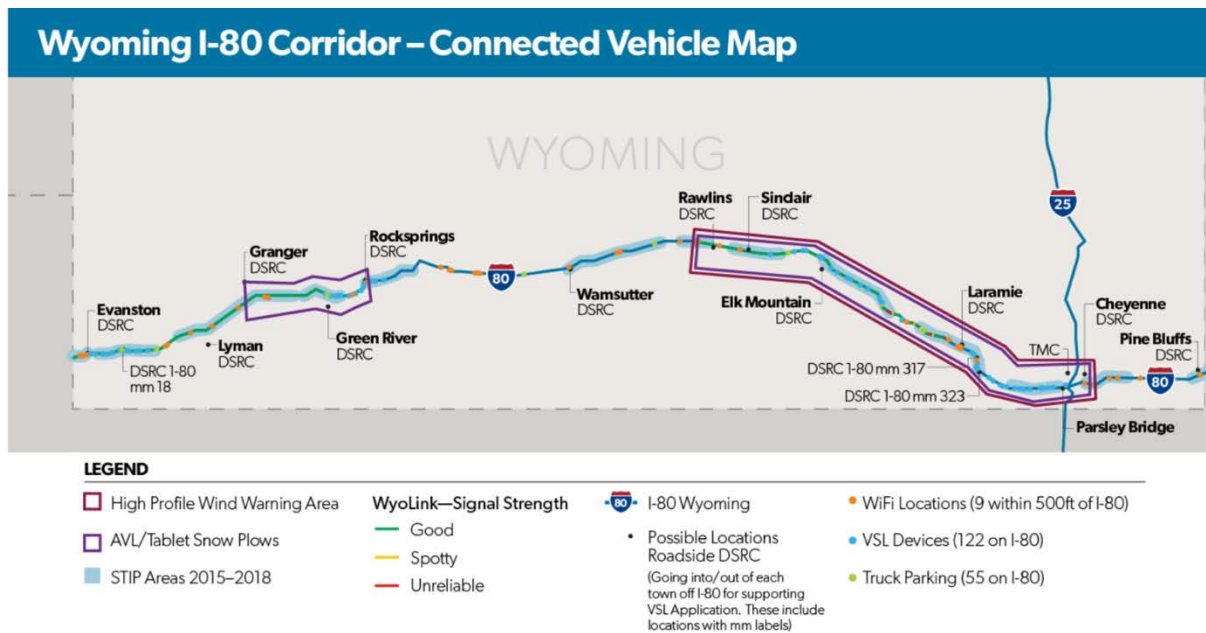


Source: USDOT

Figure 14. New York City Connected Vehicle Pilot Area Overview

Wyoming

Interstate 80 (I-80) in southern Wyoming is a major corridor for east-west freight movement and moves more than 32 million tons of freight per year (**Figure 15**). During winter seasons when wind speeds and wind gusts exceed 30 mph and 65 mph, respectively, crash rates on I-80 have been found to be three to five times as high as summer crash rates. Wind speeds resulted in 200 truck blowovers within 4 years and often led to road closures. This pilot site focuses on the needs of the commercial vehicle operator in the State of Wyoming and will develop applications that use V2I and V2V connectivity to support a flexible range of services from advisories including roadside alerts, parking notifications, and dynamic travel guidance. The Wyoming Department of Transportation (WYDOT) Connected Vehicle Pilot is expected to reduce the number of blowover incidents and adverse weather-related incidents in the corridor to improve safety and reduce incident-related delays.



Source: USDOT

Figure 15. Wyoming Connected Vehicle Pilot Area Overview

WYDOT will develop systems that support connected vehicle technology along the 402 miles of I-80 in Wyoming. Approximately 75 RSUs that can receive and broadcast messages using DSRC will be deployed along various sections of I-80. WYDOT will equip around 400 vehicles, a combination of fleet vehicles, and commercial trucks with OBUs. Of the 400 vehicles, at least 150 would be heavy trucks that are expected to be regular users of I-80. In addition, of the 400 equipped-vehicles, 100 WYDOT fleet vehicles, snowplows, and highway patrol vehicles will be equipped with OBUs and mobile weather sensors.

Connected Vehicle Projects in Georgia

The past few years have proven to be exciting in the Metro Atlanta area as municipalities and local agencies have begun deploying and testing connected vehicle applications and automated vehicles. Projects involving connected vehicle technology are identified on **Figure 16**.

- In 2018, GDOT announced that by 2020 the agency would install 1,700 RSUs across the Metro Atlanta area.⁹
- In 2017, the City of Atlanta released a request for proposal for a Smart Corridor deployment on North Avenue, which has culminated in several deployments, including RSUs that communicate with DSRC and cellular technology along and near the corridor highlighted in orange.¹⁰
- In March 2018, the City of Chamblee published Phase 1 planning work for a shared autonomous vehicle (SAV) shuttle to operate in mixed traffic along Peachtree Street. The City of Chamblee is also part of the inaugural Georgia Smart cohort. As part of the challenge, the City of Chamblee will “produce a ‘Best Practices Manual,’ a set of recommendations for Chamblee and other local governments to follow as they introduce SAVs onto public streets.”¹¹
- In 2018, the City of Peachtree Corners announced that they were preparing to deploy an automated vehicle shuttle along Tech Parkway. Since then, the City of Peachtree Corners has announced that DSRC OBUs would be installed at traffic signals within the City.
- In 2019, ARC along with other critical partners including GDOT began efforts to deploy at least 1,000 C-V2X devices throughout Metro Atlanta via an initiative called CV1k.

All of these projects have been considered in the development of the CVTMP and the leaders of those projects have been engaged during the CVTMP process. In addition to these projects, which are in the vicinity of Gwinnett County and along which many vehicle trips in Gwinnett County originate or terminate, other initiatives have also begun. For example, Cobb County and the City of Marietta have deployed and plan to deploy more connected vehicle projects.

⁹ <https://traffic.transportation.org/wp-content/uploads/sites/26/2018/07/GDOT-Connected-Vehicles.pdf>.

¹⁰ <https://www.govtech.com/civic/Atlantas-Smart-Corridor-to-Serve-as-Living-Lab-for-Smart-Transportation.html>.

¹¹ <https://www.chambleega.com/530/Georgia-Smart-Communities-Challenge>.

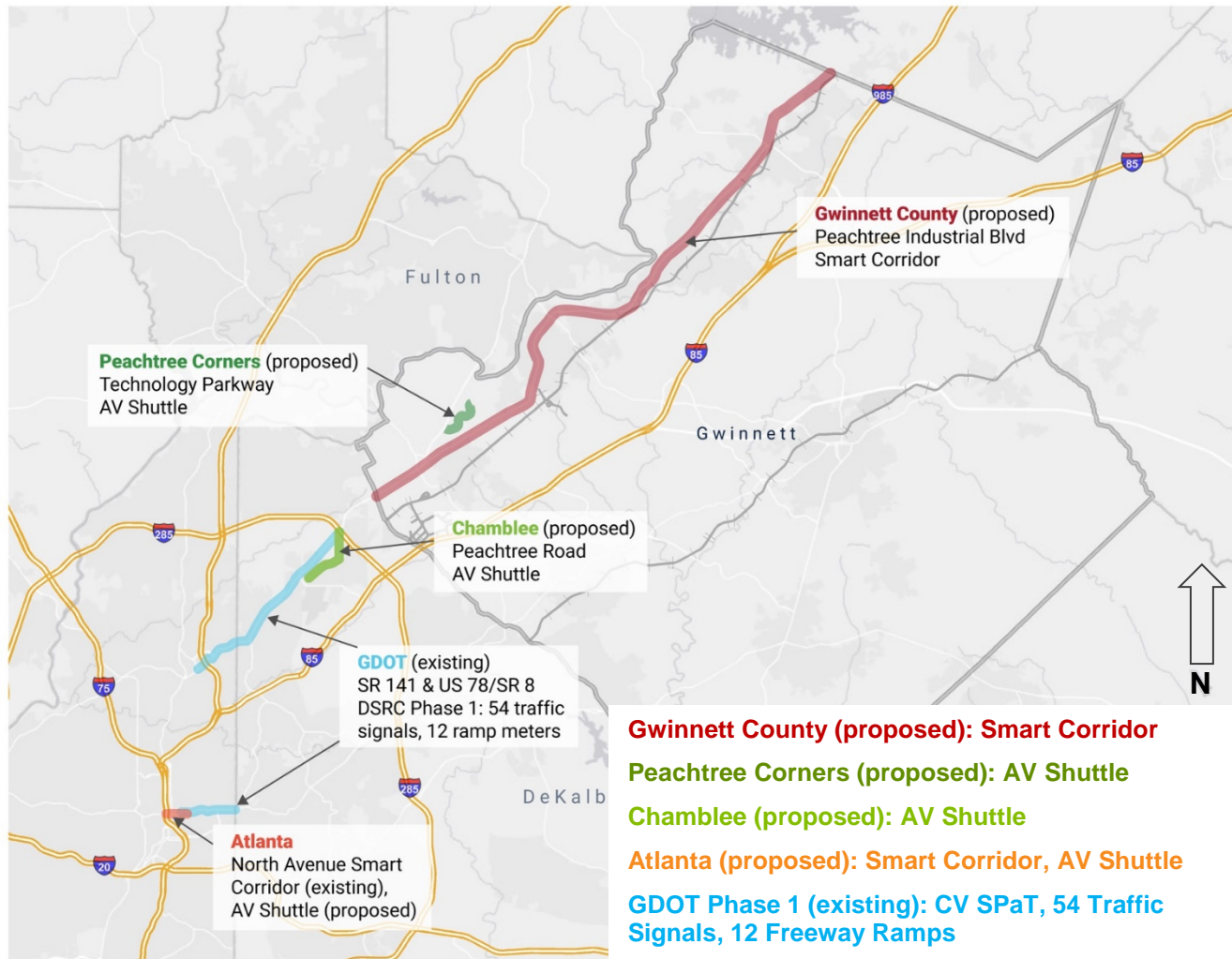


Figure 16. Existing and Proposed Connected Vehicle Projects near the Smart Corridor Area

Georgia Department of Transportation

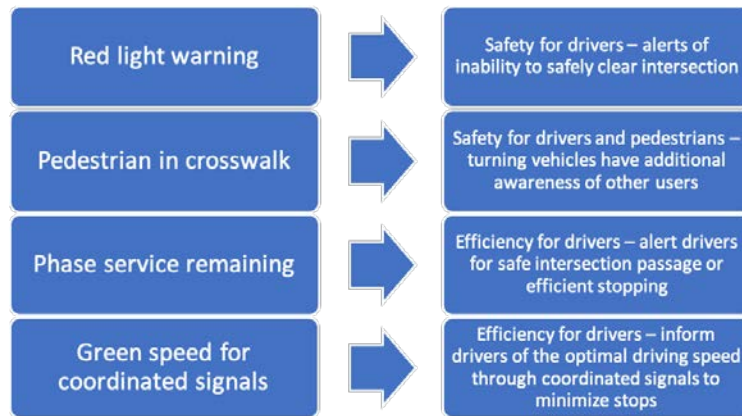
GDOT plans to deploy 1,700 RSUs within the corridors managed by the RTOP as shown on **Figure 17**. The system is designed to support connected vehicles through communication with infrastructure.

The first phase deployment is intended to focus on the safety and mobility applications listed in **Figure 18**. GDOT was awarded an Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) grant in the summer of 2019 to distribute and install 950 RSUs and 1,000 OBUs. This will allow for safety information from RSUs to be received by a limited number of road users: those who have a GDOT-issued OBU and cars with built-in DSRC communications like the 2017 Cadillac CTS and newer.¹² As more vehicles are able to receive broadcasted information from infrastructure, whether through DSRC or cellular communications, the benefits related to connected vehicle applications will emerge and grow over time. Collaboration across private and public agencies is critical to the success of the connected vehicle applications.



Source: GDOT

Figure 17. RTOP Corridors in Metro Atlanta



Source: GDOT

Figure 18. GDOT Phase 1 SPaT Applications

¹² <https://media.cadillac.com/media/us/en/cadillac/news.detail.html/content/Pages/news/us/en/2017/mar/0309-v2v.html>.

Partnerships

GDOT is partnering with providers of connected vehicle technology as well as local jurisdictions to ensure the interoperability of deployed systems. GDOT is open to connected vehicle technology that is proven, available, and interoperable and conforms to national standards. Throughout development of the CVTMP several coordination meetings were held with GDOT staff. GDOT has agreed to partner with and support Gwinnett County in deploying connected vehicle solutions by:

- Filing Federal Communications Commission (FCC) license for GDOT RSUs
- Providing guidance on FCC filing requirements associated with GDOT RSUs
- Obtaining laboratory results of DSRC compatibility testing from the Southwest Research Institute
- Providing guidance with the intersection permitting process at intersections under GDOT's jurisdiction, which is managed by the GDOT Office of Traffic Operations
- Providing EVP/ TSP software that functions in coordination with DSRC and OBUs
- Providing controller interface technology (MaxTime CV) to local agencies at no cost
- Providing web feed application of CV (MaxView CV) to local agencies at no cost

Freight

Freight is a key part of advanced transportation deployment. Due to the value of time to the freight industry, freight fleets are most likely to purchase and deploy quantities of in-vehicle equipment. Freight-related connected vehicle solutions will improve freight company profitability through mobility improvements in safety and efficiency. Freight movers have historically been early adopters of telematics and connected vehicle systems. Given the geography of Georgia with respect to freight movement, Georgia is a logical location to continue this trend. GDOT previously conducted planning studies for freight connectivity and is considering dedicated lanes for freight movement, including integration with the major shipping ports. For example, the Port of Savannah is an opportunity for more intensive technology applications for multimodal freight movement.

Atlanta Regional Commission

Transportation Systems Management and Operations (TSM&O)

ARC serves as the Metropolitan Planning Organization for Metro Atlanta and has supported TSM&O projects since the announcement that Atlanta was to host the 1996 Olympics. The extensive preparation for the 1996 Atlanta Olympics was the catalyst for deploying the advanced transportation management system called NaviGator.

In 2016, ARC hosted a TSM&O Capability Maturity Model Self-Assessment Workshop to help move TSM&O efforts in local jurisdictions forward. In 2017, ARC published the *Transportation Technology Policy Document* to assess how emerging technologies could help move TSM&O efforts forward while assessing the uncertainty that exists with new technologies like connected and autonomous vehicles, drone delivery, and new data opportunities. ARC plotted the area of interest based on whether emerging technologies would have a positive or negative impact and the certainty of the impact.¹³ For example, the report found that the impact of emerging technologies on safety will likely be positive and there is a high level of certainty that the technologies will be deployed.

All the research and planning efforts undertaken by ARC serve to guide local jurisdictions in how to prepare to best manage traffic operations on Metro Atlanta roadways with all users in mind.

Regional TSM&O/ITS Plan Update

To build on the TSM&O work completed to date, in 2018 ARC began an update to the *Regional TSM&O and ITS Plan*. The project team coordinated with ARC to ensure that the two efforts supported one another. The *TSM&O and ITS Plan* update will have a 20-year vision with a 5-year action plan, which matches up well with the 5-year horizon of this plan. Other aspects of the update are as follows:

- Develop a regional TSM&O vision
- Document current TSM&O inventory

¹³ <http://atlantaregionsplan.org/wp-content/uploads/2017/03/ARC-Transportation-Technology-Policy-Document-2017.pdf>.

- Research data governance best practices
- Update regional ITS architecture
- Identify pilot concepts for advanced technology deployment
- Develop local agency deployment guide
- Develop regional technology assessment and strategic deployment plan

Of particular interest to the connected vehicle technology planning effort are data governance best practices and pilot concepts for advanced technology deployment. The data effort is of great importance because sharing insights from connected vehicle data obtained from edge devices will help improve operations and planning efforts. The pilot effort could help further test solutions identified in this planning effort that may have a regional impact.

CHAPTER 3 TECHNOLOGY REVIEW

Connected Vehicle Technology

Connected vehicle technologies transform self-contained, independent vehicles by enabling the transfer of vital transportation and safety information via various communication platforms.¹⁴ Currently two types of communication transfer are prevalent: DSRC and cellular network connections. DSRC is similar to Wi-Fi in that it transfers data on a two-way network broadcasted on the 5.9 GHz spectrum to provide a low latency, secure, and reliable link between devices. Cellular network connections utilize current cellular spectrums, with anticipation of the forthcoming 5G network for lower latency communications. Connected vehicle technologies are applicable to infrastructure, vehicles, and all connected devices.¹⁵

Connected vehicle technology is critical to support future deployment of fully automated vehicles. The CVTMP does not include deployment details of automated vehicles; however, the foundational elements upon which a successful automated vehicle deployment will operate are provided.

Types of connected vehicle applications are discussed in the following sections.

Vehicle-to-Vehicle

Vehicle-to-vehicle (V2V) technology allows vehicles to share information between V2V-equipped vehicles. Vehicles can communicate and avoid conflicts while making intended movements on the road. V2V can be used to help traffic flow smoother through an information sharing mechanism. On-board DSRC devices are used to transmit basic safety message (BSM) and other messages that include data about a vehicle's speed, direction, brake status, and other vehicle information to surrounding vehicles, and receive the same information from them.

Vehicle-to-Infrastructure

Vehicle-to-infrastructure (V2I) technology allows mutual communication between vehicles and devices in the infrastructure. It allows the sharing of real-time information such as traffic

¹⁴ USDOT, "Connected Vehicles." https://www.its.dot.gov/cv_basics/. Accessed October 2018.

¹⁵ CAAT, "Connected and Automated Vehicles." http://autocaat.org/Technologies/Automated_and_Connected_Vehicles/.

condition, roadway condition, roadway signage, and downstream traffic signals. This eliminates the need for drivers to capture and interpret the information. V2I can also serve as a traffic management hub, where agencies can use the collected real-time information to reroute traffic to optimize the system.

Vehicle-to-Everything

Vehicle-to-everything (V2X) includes V2I and V2V and can be vehicle-to-pedestrian, vehicle-to-device, and vehicle-to-grid. This technology allows the surrounding environment to have a better understanding of the intentions of a vehicle and help to reduce injuries and fatalities. For example, pedestrians receive notification of when it is safe to cross the street by connected vehicles or infrastructure and could transmit their own location to improve safety of the various users of the right-of-way.

Automated Vehicle Technology

Connected vehicles are equipped to communicate with something external whether it is roadway infrastructure or other vehicles. Automated vehicles are designed for the vehicle to perform some or all driving tasks such as braking, steering, and changing speeds, replacing the driver's role for managing control of the vehicle. The combination of connected vehicles and automated vehicles will lead to improving safety outcomes on our roadways.

The USDOT National Highway Traffic Safety Administration (NHTSA) has adopted the six-level definition of automated vehicles as published by the Society of Automotive Engineers (SAE International). The definitions summarized on **Figure 19** divide vehicles into levels based on the capability of the automated system and when it is implemented.¹⁶

¹⁶ NHTSA, "Automated Driving Systems 2.0: A Vision for Safety," https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/13069a-ads2.0_090617_v9a_tag.pdf.

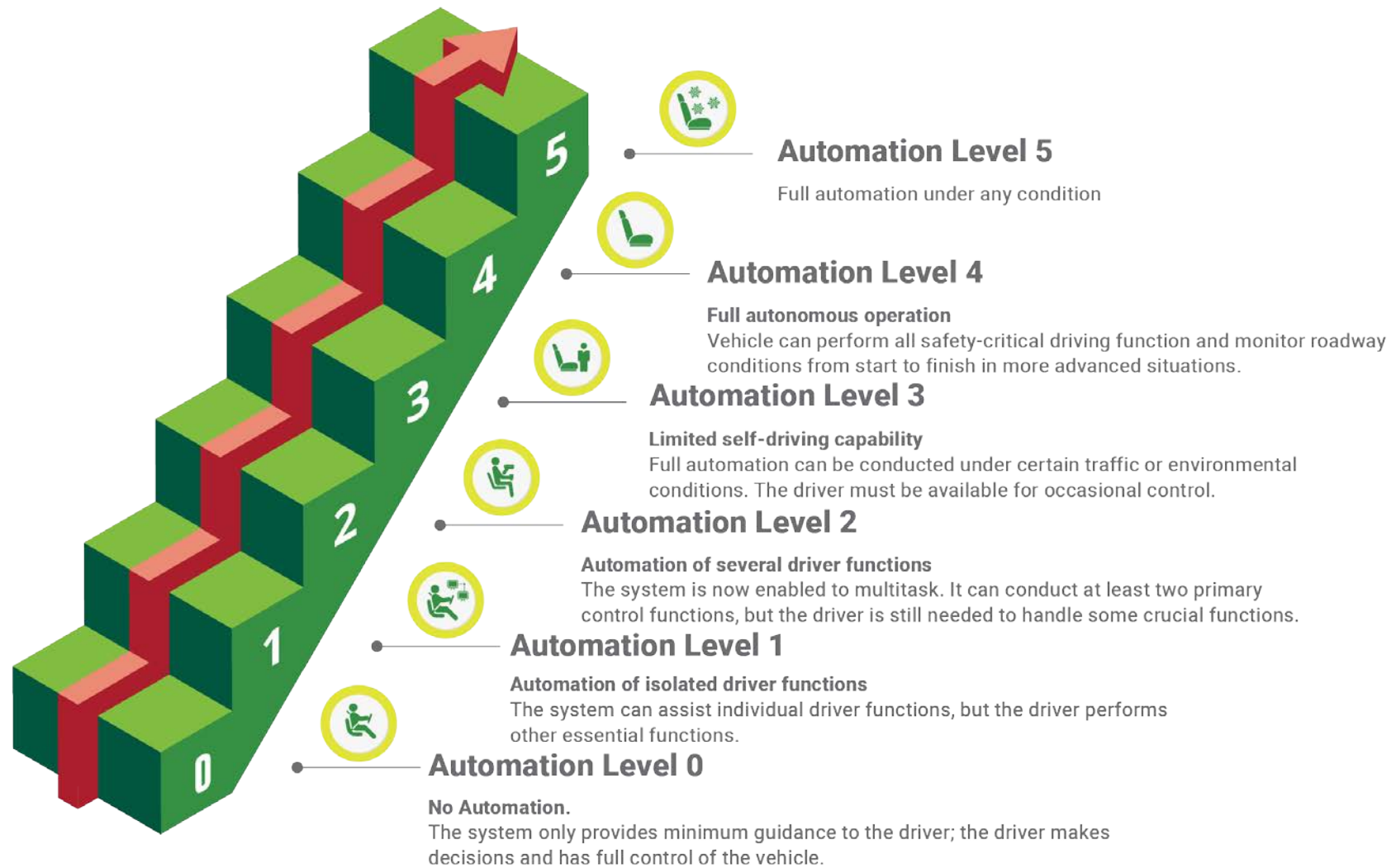


Figure 19. Society of Automotive Engineers Levels of Automation

Connected Vehicle Communications Technology

Three communication technologies currently exist that make it possible for vehicles to communicate with other vehicles, infrastructure, and other things. Each technology has positives and negatives, which makes it a challenge to navigate how the technologies will compare and experience adoption in the future. In 2019, the FCC decided to consider opening the 5.9 GHz spectrum for C-V2X.¹⁷ The opportunity to consider an alternative technology allows automakers greater flexibility. This section discusses some of the capabilities of the communications technologies.

Dedicated Short Range Communication (DSRC)

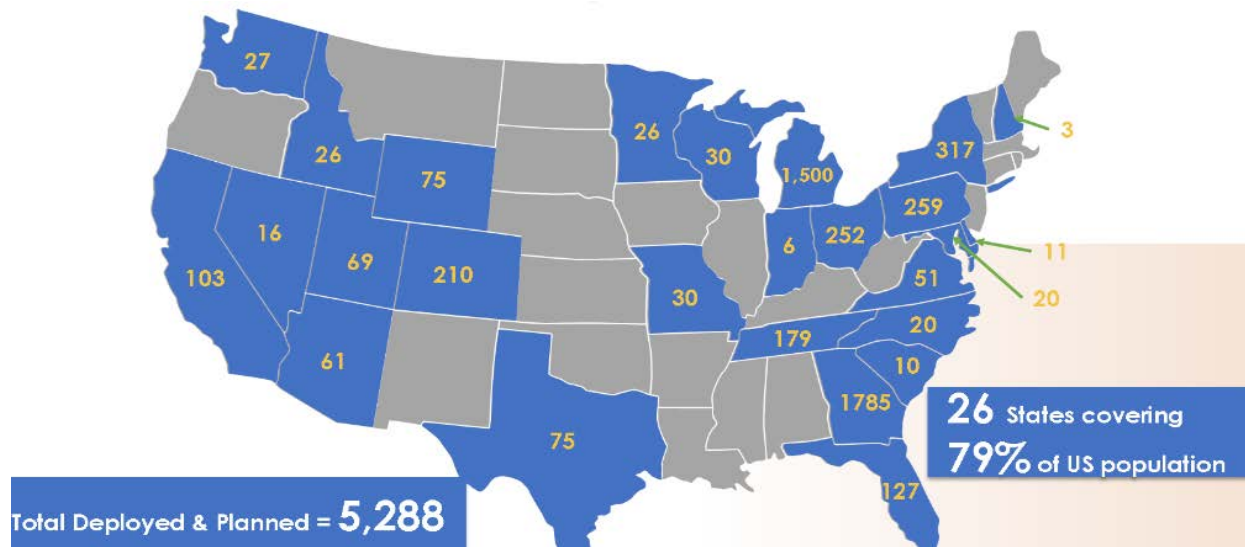
DSRC has been available since the FCC allocated the 5.9 GHz spectrum for DSRC use in 1999. DSRC is a low-latency technology that makes it possible to automate data collection about traffic and roadway status using probe vehicles. DSRC offers more security and privacy than traditional wi-fi and works well in a moving vehicle environment. The main goal for developing DSRC is to enable vehicular safety applications. Since 1999 a wealth of Institute of Electrical and Electronic Engineers (IEEE) specifications and SAE standards have been developed to ensure DSRC delivers the possibilities V2V, V2I, and V2X offer.

DSRC is the leading proven technology for connected vehicle technology. Both General Motors and Toyota had initiatives to begin deploying DSRC as part of upcoming model years. More recently, Toyota released a statement on April 26, 2019, that they are pausing the deployment of DSRC-based OBUs in its fleet,¹⁸ but also reaffirmed its support of DSRC as its long-term technology selection for OBUs.

Figure 20 shows existing and planned deployments of DSRC technology at intersections in the US.

¹⁷ <https://www.rcrwireless.com/20190514/policy/pai-puts-dsrc-spectrum-in-fccs-sights>.

¹⁸ <https://static1.squarespace.com/static/596fb16003596e0fa70a232f/t/5cc36cda0d92970826c3655b/1556311258955/4-26-2019+Toyota+FCC+Comment.pdf>.



Source: Toyota. September 2018

Figure 20. Operational and Planned National DSRC Deployments.

Cellular

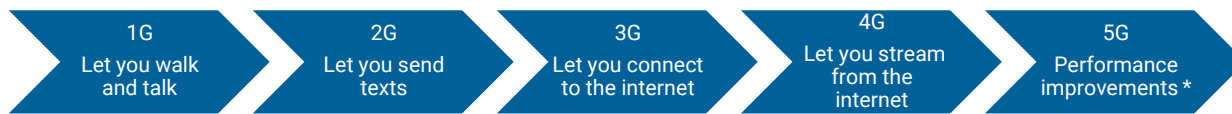
Cellular technologies are also used to connect vehicles. 4G technology is currently used for telematics applications, including the following:

- Audi works with a company called Traffic Technology Services (TTS) to enable intersection SPaT data for select vehicles. TTS partners with local jurisdictions to predict SPaT and then communicates that cycle to vehicles over 4G via a product called Personal Signal Assistant.¹⁹
- Vehicle manufacturers use 4G-based telematics systems to understand the status of new equipment and systems in vehicles and to execute post-crash assistance messages as with OnStar.

¹⁹ <https://www.psrc.org/sites/default/files/rtoc20180104-pres-ttspersonalsignalassistantsupplier.pdf>.

- Most new vehicles have some level of cellular connectivity and provide access to vehicle data to select providers. Currently, the data set obtained from vehicles is not intended for use in safety applications, and typically has a minimum of a 30 second delay before the data is available.

Figure 21 provides a high-level view of how cellular network capabilities have improved over a relatively short period of time.



* Performance improvements including but not limited to reduced latency and higher bandwidth which translates to dramatically reducing download speeds to nearly eliminate buffering of videos and similar media. This can lead to really launching the internet of things industry.

Source: [MIT Technology Review](#)

Figure 21. Progress in Cellular Communications

Cellular Vehicle-to-Everything

Cellular vehicle-to-everything (C-V2X) provides connected vehicle functionality similar to DSRC, with the difference being that it works over the cellular network instead of a dedicated short-range spectrum. This technology is supported by the 5G Automotive Association (5GAA), a global, cross-industry organization comprised of over 120 automakers, mobile operators and equipment suppliers.

C-V2X is currently a 4G LTE-based technology and is being tested in a USDOT facility in Aberdeen, Maryland, and in Colorado. Early outcomes indicate the technology works well.²⁰ However, cellular

²⁰ <https://www.nhtsa.gov/speeches-presentations/traffic-safety-and-59-ghz-spectrum>.

testing has not been completed and communication standards are slowly being developed. Ford has announced that it will begin installing OBUs that use C-V2X across its 2022 model line.²¹ Other automotive manufacturers are concerned that there has not been enough testing and that cellular-based applications may not be sufficiently robust for safety-oriented applications.

The timeframe for widespread deployment of 5G technology that would support expanded C-V2X functionality is unclear. 5G networks are currently deployed by individual telecom companies at small pilot scales in some cities including but not limited to Atlanta, Georgia; Providence, Rhode Island; and Chicago, Illinois²²; however, they are not available for vehicle-based communication. The advantage of 5G is that it will be device-to-device-based communication, which is a change from 4G-based systems, which require connectivity via a network of cellular towers and/or small cells. The device-to-device communication will enable communications directly between vehicles and between vehicles (V2V) and the infrastructure (V2I). Current concerns related to deploying a 5G network include 5G cells can only communicate short distances and do not communicate well through physical barriers, like buildings, which requires a high number of cells to be deployed, spectrum licensing, and more robust testing to alleviate concerns about impact to other frequencies.

Globally, China has embraced 5G and is building toward making it commercially available in 2020.²³ The European Union was facing the same questions as the FCC: should the spectrum currently dedicated for short-range communications (DSRC in the US, ITS-G5 in the EU) be shared with cellular communications? The European Union's Electronic Communications Committee (ECC) has recommended to not share the spectrum, but rather supports a hybrid approach in which ITS-G5 remains the standard baseline for V2I and V2V communications and cellular to provide additional communications via remote infrastructure and/or cloud services.²⁴

6G technology will be device-to-device, and the deployment horizon is not known. There have also been concerns of the mobile device manufacturers' willingness to take on the liability of safety-based applications. Vehicle communications using mobile devices may be postponed to 6G,

²¹ <https://www.cnet.com/roadshow/news/ces-2019-ford-c-v2x/>.

²² <https://www.lifewire.com/5g-availability-us-4155914>.

²³ <https://www.technologyreview.com/s/612617/china-is-racing-ahead-in-5g-heres-what-it-means/>.

²⁴ <https://iot.eetimes.com/europe-has-defined-dsrc-wifi-as-the-v2x-standard-and-now-faces-5g-vendors-revolt/>.

although chipset manufacturers indicate that 5G will be ready to enable low latency communications between vehicles and mobile devices.²⁵

Connected Vehicle Applications

A large number of applications have been researched, tested, and/or deployed across the nation that have relevance for Gwinnett County. **Chapter 6** discusses applications identified for Gwinnett County to research, test, and deploy in the near-term, short-term, and long-term.

Table 2 lists the applications identified for testing and deployment by several agencies across the country over the next 5 years. The list is divided into three sections based on implementation timeline: near-term (1-3 years), short-term (3-5 years), and long-term (5+ years). The list presents a “snapshot in time,” and it is likely that application deployment will be accelerated or relaxed as the needs and priorities of agencies change over time.

Appendix C lists near-term and short-term applications and includes a description, potential benefits, and deployment status from agencies across the country. Applications in the long-term list have not yet reached advanced planning and deployment stages.

²⁵ <https://arxiv.org/pdf/1901.03239.pdf>.

Table 2. Connected Vehicle Applications to be tested over the next 5 Years by Agencies across the US

Near-term (1-3 years)	Short-term (3-5 years)	Long-term (5+ years)
Curve Speed Warning	Advanced Traveler Information Systems	Eco-Traffic Signal Timing
Emergency Vehicle Preemption (PREEMPT)	Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)	Freight Advanced Traveler Information System (FRATIS)
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)	Vehicle Turning Right in Front of Bus Warning	Freight Drayage Optimization
Intelligent Traffic Signal System (I-SIG)	Work Zone Traveler Information	Freight-Specific Dynamic Travel Planning and Performance
Mobile Accessible Pedestrian Signal System (PED-SIG)		Intermittent Bus Lanes (IBL)
Multimodal Intelligent Traffic Signal System (MMITSS)		In-Vehicle Signage
Pedestrian in Signalized Crosswalk Warning		Pedestrian in Signalized Crosswalk Warning
Red Light Violation Warning		Pedestrian Mobility
Reduced Speed/Work Zone Warning		Railroad Crossing Violation Warning (RCVW)
Transit Signal Priority (TSP) and Freight Signal Priority (FSP)		Reduced Speed Zone Warning (RSZW)
		Restricted Lane Warning
		Road Weather Information and Routing Support for Emergency Responders
		Road Weather Information for Freight Carriers
		Road Weather Information for Maintenance and Fleet Management Systems
		Transit Pedestrian Indication
		Transit Stop Request
		Transit Vehicle at Station/Stop Warnings
		Warnings about Hazards in a Work Zone (WHWZ)
		Warnings about Upcoming Work Zones (WUWZ)

Source: AECOM

Connected Vehicle/Automated Vehicle Messaging

Table 3 provides the standard messages used by a connected vehicle system. Most of these messages have been standardized by dictionaries and protocols developed by the industry for a DSRC-based communications system. The messages are currently not standardized for a C-V2X (cellular) communications system.

Table 3. Connected Vehicle Applications

Acronym	Name	Definition
BSM	Basic Safety Message	Provides a vehicle's speed, direction, brake status, and other vehicle information
SPaT	Signal Phase and Timing	Provides the current signal/phase timing data (times at which signals will change) for one or more signalized intersections
MAPs	Map Message	Provides intersection and roadway lane geometry data for one or more locations
SRM	Signal Request Message	Used by authorized parties to request services from an intersection signal controller
SSM	Signal Status Message	Serves as a means to acknowledge signal requests
Traveler Information Message	Traveler Information Message	Provides the means to inform the public about both incidents (traffic accidents) and pre-planned roadwork events

Source: SAE J2735 Dedicated Short Range Communications (DSRC) Message Set Dictionary

To illustrate how information from BSMs can be used, **Figure 22** shows the location of hard braking events from the Tampa Connected Vehicle Pilot.²⁶

²⁶ Sample BSM data from Tampa CV Pilot. <https://data.transportation.gov/Automobiles/Longitudinal-Deceleration-Map-for-Tampa-CV-Pilot-B/4bmy-af6s>.

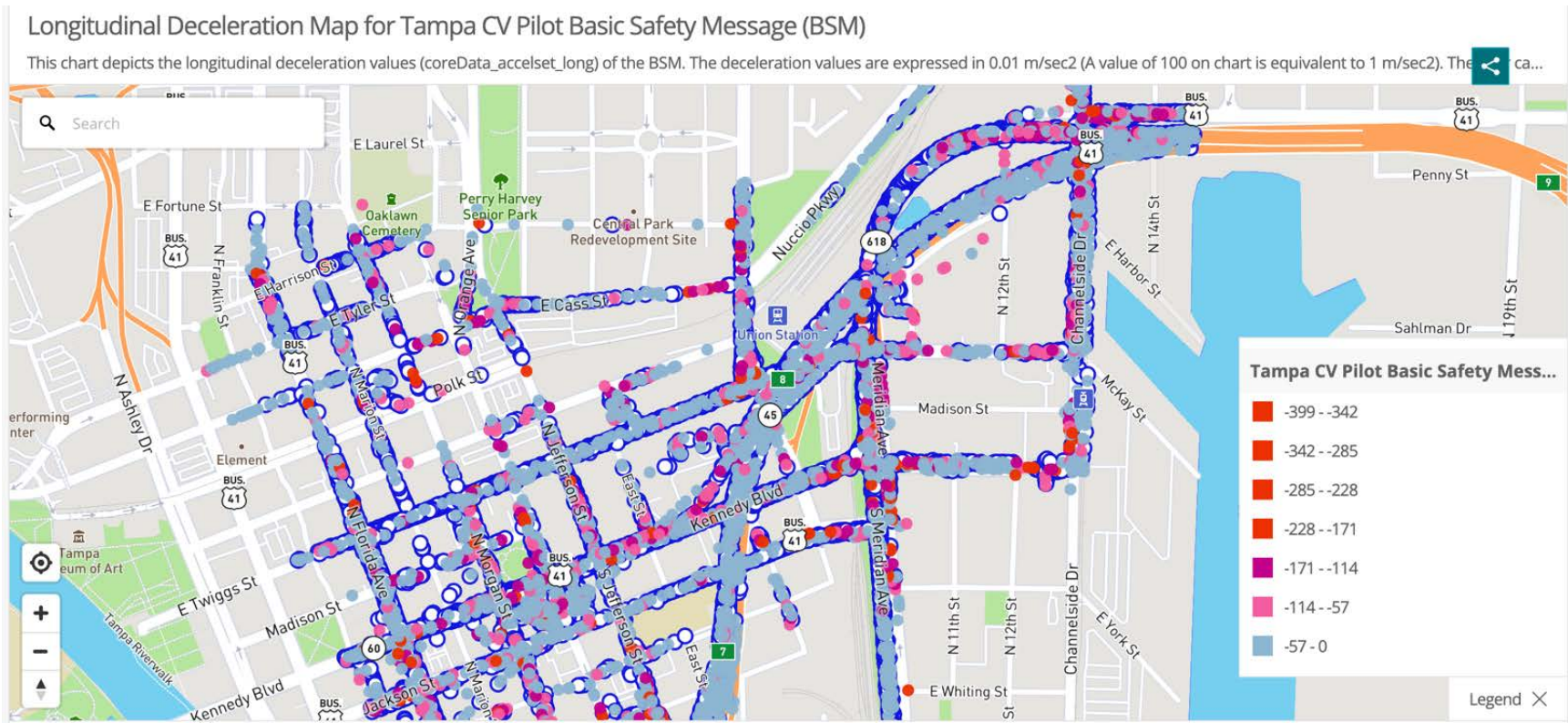


Figure 22. BSM Data Highlighting Brake Events in Tampa Connected Vehicle Pilot

National Considerations

Market Forecast

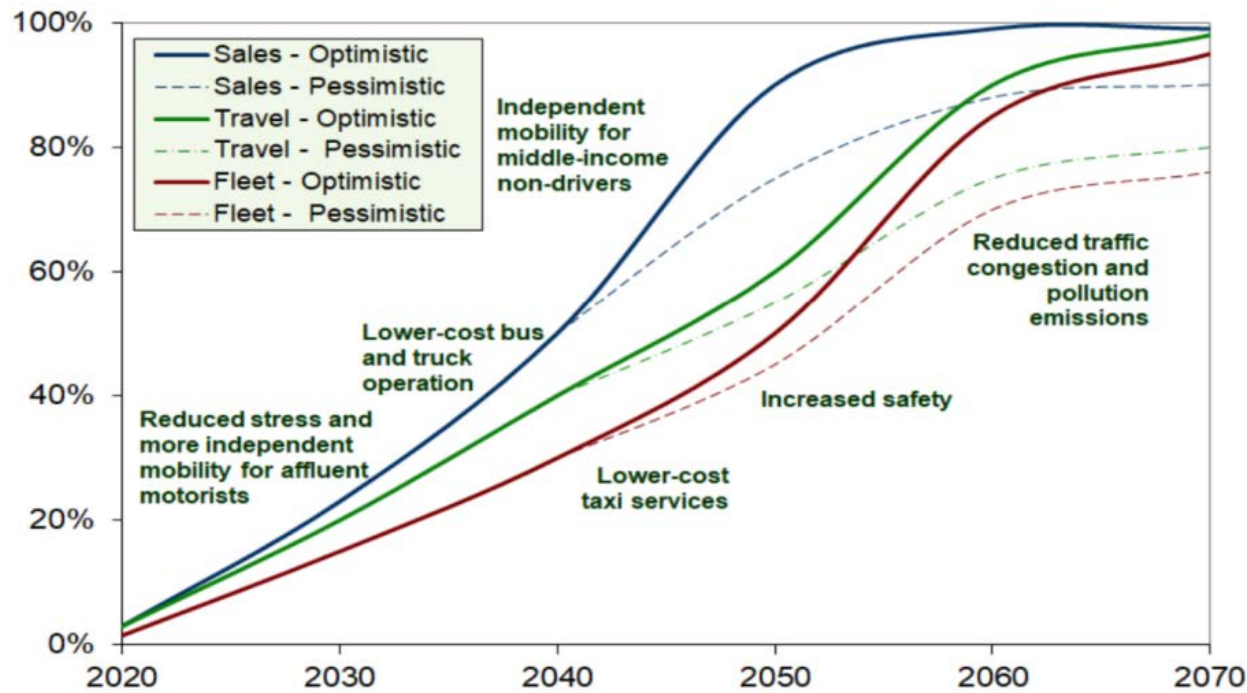
The vehicle connectivity market forecast in the United States is dynamic; however, it is expected that within 5 years most new vehicles will have some connectivity. **Table 4** includes a market forecast for DSRC technology in the automotive industry, based on announcements issued by automobile manufacturers. Currently, Ford Motor Company has approximately 14% market share in the United States and has fully committed to C-V2X (cellular) communication. Toyota and General Motors have also committed to using DSRC communications for OBUs for safety applications, though their deployment timelines have slowed until the FCC provides clarity on whether the 5.9 GHz will remain dedicated for DSRC or opened up to C-V2X.

Table 4. Market Forecast of Commitment by OEMs

Automaker Commitments	Market Share
Ford Motor Company (C-V2X)	14%
General Motors (DSRC)	17%
Toyota (DSRC)	13%

Source: AECOM

The chart created by the Victoria Transport Policy Institute (VTPI) in **Figure 23** shows predictions of benefits as autonomous vehicles make their way on our roads between now and 2070. VTPI predicts full market saturation with benefits such as increased safety and lowered costs of operating services before 2060.



Source: Litman. VTPI. November 2018. <https://www.vtpi.org/avip.pdf>

Figure 23. Autonomous Vehicle Sales, Fleet, Travel, and Benefit Projections

Connected Vehicle Communications

Market uncertainty regarding communications options affects the decisions made by the product manufacturers and the agencies that seek to operate connected vehicle systems. In general, a sound investment indicates that the solutions reach the right people, are scalable across jurisdictional boundaries, and are going to last a long time. The characteristics of DSRC and

cellular communication have been classified as technical and non-technical and are described in this section.²⁷

Technical Considerations

Technology Maturity

5G cellular technology is being tested and developed in various countries because it can increase communication bandwidth and lower latency compared to current cellular deployments. In the United States, 5G is in the early stages of deployment testing but has been marketed extensively. 5G requires deployment of a network of small cells to reach network coverage maturity.

DSRC has been available for nearly 20 years and has been tested extensively. It provides lower latency and higher communication bandwidth compared to current cellular technology. DSRC also requires a deployment of devices in a relatively dense arrangement, since the radius of communication is typically 1,000 feet (300 meters) and latency is low.

Uncertainty about Future Federal Communications Commission Action

For several years, the FCC has been considering a potential change to the communication spectrum currently dedicated for DSRC, which is 5.9 GHz band. The NHTSA issued a Notice of Proposed Rule Making (NPRM) that ran from December 26, 2018, to February 25, 2019, in which they invited the public to provide comments on how connected vehicle developments impact V2X in general, and USDOT's role in encouraging the integration of V2X. As a result, over 56 companies, jurisdictions, original equipment manufacturers (OEMs), organizations, and members of the general public responded with a range of responses. The NPRM responses indicate the complexity of the matter and the challenging position for both USDOT and the FCC with respect to rendering a final decision regarding the 5.9 GHz spectrum.

Network Operations and Maintenance Responsibility

One of the potential impacts regarding the DSRC (5.9 GHz) spectrum is whether the spectrum remains exclusively available for V2X application, or whether the spectrum is open for non-vehicle

²⁷ <https://www.regulations.gov/document?D=DOT-OST-2018-0210-0001>.

safety/mobility use. The outcome results in whether the public sector (such as agencies having roadway jurisdiction) will have control of the connected vehicle deployment or whether they will need to purchase access from a telecommunications broker. There are advantages and disadvantages for both scenarios. Sharing the spectrum between the public and private sectors is understood to be challenging because of the impact to communication speed and standards, since there is the potential for interference between the public-facing and private-facing applications.

Privacy and Data Security

Data ownership and privacy is also a concern. Data is now a commodity that can be sold, leaving the consumer potentially vulnerable if the personal data is not first anonymized. As a result, the companies and agencies that have access to the data may choose to monetize the data, or at minimum those companies and agencies become a potential point of entry for data theft. For DSRC systems, USDOT has been developing a Security Credential Management System (SCMS) to support the operation of a connected vehicle system in a safe, secure, and privacy-protective manner.²⁸ Over the years, many standards have also been developed by consortiums like Crash Avoidance Metrics Partnership (CAMP), SAE, and IEEE to ensure that safety, security, and privacy exist in messages sent between connected devices.²⁹ For cellular systems, the work of developing a full suite of standards continues, and there are existing industry standards such as IEEE802.11.³⁰

CAMP was formed in 1995 by Ford Motor Company and General Motors with the objective of improving traffic safety by accelerating the implementation of crash avoidance countermeasures. CAMP facilitates interaction with other OEMs, the Federal Highway Association, NHTSA, and local DOTs to coordinate cooperative research projects.

²⁸ <https://www.its.dot.gov/resources/scms.htm>.

²⁹ https://www.its.dot.gov/factsheets/pdf/ITSJPO_Connected_Vehicle_Standards.pdf.

³⁰ <https://futurenetworks.ieee.org/standards>.

Non-technical Considerations

Social Justice Related to Speed of Vehicle Fleet Penetration

Vehicles capable of communication with connected vehicle infrastructure will be produced at accelerating rates by OEMs, which will be a great benefit for those who purchase new vehicles. Existing vehicles that do not have any devices built in to communicate with connected vehicle infrastructure will need an after-market device installed. Such a barrier will require an incentive to ensure that all cars on our roadways have access to connected vehicle communications.

Social Justice Related to Cost of a Mobile Device

Until the vehicle market penetration of OBU devices with a built-in HMI naturally occurs, connected vehicle applications will depend on mobile phones to transmit messages to the driver. A defacto requirement for drivers to use their cellphone to receive safety messages may pose a social justice issue for some system users regarding the funding of a mobile device and cellular subscription. Or, as more vehicles are equipped at the factory cellular connections, two issues arise. The first is, will safety messages over connected vehicles cost more than some can afford? The second is, how long will it take before these vehicles become available to low-income populations?

Manufacturer Marketplace Tactics

To improve the vehicle market penetration of connected vehicle-enabled devices, vehicle manufacturers will need to make the connected vehicle-enabled devices standard equipment or provide incentives for vehicle owners.

Dependency on Communicating to Drivers via Multiple Apps

Cell phone use in vehicles is a primary cause of distracted driving, which poses a challenge for safety on the roadways. Eliminating distracted driving is a key objective for reducing crashes on the roads and is the reason for the hands-free law in Georgia. To support this initiative, the connected vehicle-enabled devices that are located inside the vehicle must be designed to minimize the potential for distracted driving.

Connected Vehicle Devices

Roadside Units

The definition of an RSU was first established by the FCC as part of the allocation of the 5.9 GHz band for ITS, and refers to a DSRC device versus roadside equipment (RSE), which has been used synonymously with RSU, but refers to a broader set of ITS equipment, such as signal controllers, and to functionality including applications. The USDOT encourages the use of the term “RSU” when referring to the DSRC roadside hardware and applications; however, interchangeable use between the RSU and RSE terminology still occurs. The purpose of the RSU is to act as a fixed point of contact within a dynamic network of communication devices, such as those embedded within vehicles, and a back-office supervisory system.

RSUs, as illustrated in **Figure 24**, reside at intersections and other roadside locations and receive and send communications from and to vehicles, pedestrians, or bicyclists. RSUs have varying levels of computational capability depending on the manufacturer and model. While DSRC and cellular communications are not inherently interoperable, some manufacturers can create secondary interoperability with computational capability inside the RSU that translates data from one communications protocol to the other.

Currently, three manufacturers of RSUs and three manufacturers of OBUs have achieved certification by OmniAir. OmniAir is a trade association that independently tests devices and provides certification that demonstrates for interoperability of connected vehicle systems. RSUs may also include equipment to execute edge computation to help limit the amount of data pulled back to command centers. Both C-V2X and DSRC protocols use RSUs like the sample in **Figure 25**.

The current manufacturers of RSU devices are listed in **Table 5**. RSUs are enclosed in a secure and waterproof enclosure and are mounted on a pole or mast arm, often at signalized intersections. The standards governing the performance of these devices dictate functional characteristics such as their transmit power, but also functionality such as store-and-repeat, where received messages are passed along to other devices in a network. This provides the flexibility for the RSU to process messages onboard or simply serve as a pass-through, enabling applications that reside on other network devices to intelligently process the incoming data. One

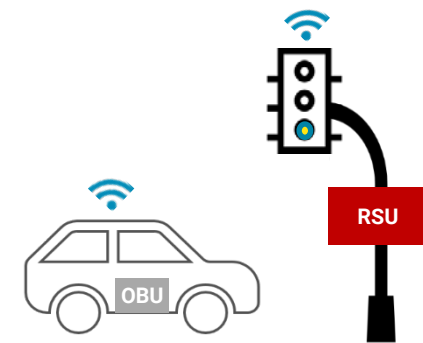


Figure 24. RSU Concept



Figure 25. Sample RSU

critical role the RSU plays is as a connection point between a transportation management and operations system, such as the Gwinnett County TCC, and the dynamic network of connected vehicles.

To date, standards and certifications for C-V2X devices comparable to those developed for DSRC have not been established in the US. There are several manufacturers; however, these systems tend to be proprietary in nature, and their ability to communicate with other devices is managed exclusively by the manufacturer. As a result, interoperability between devices is likely to be limited, and the growth of the connected vehicle system may be limited by the fact that the manufacturer has full control over the system's interoperability. Devices with dual technology, DSRC and C-V2X are being developed and hold great promise in supporting the deployment of CV systems.

Table 5. DSRC RSU and OBU Companies and Certifications

Company	Device Type	OmniAir Certified?
Cohda Wireless	OBU, RSU	No
Commsignia	OBU, RSU	Yes – OBU
DanLaw	OBU, RSU	Yes – OBU and RSU
Intersect	OBU, RSU	Yes – RSU
Lear	OBU, RSU	Yes – OBU
Siemens	OBU, RSU	Yes – RSU
Kapsch	OBU, RSU	No
TrafficCast	OBU, RSU	No

Note: All certifications can be found on the OmniAir Consortium's website; <https://omni-air.org/certified-products/>. Devices are continuously being added. See the OmniAir Consortium's website for the latest list of certified devices.

On-board Units

OBUs, as illustrated in **Figure 26**, are devices that use communications technology installed inside a vehicle. With the exception of a few automobiles that are being manufactured with built-in DSRC technology, OBUs are typically “aftermarket” devices, meaning they are stand-alone devices that must be installed into a vehicle after the vehicle has been manufactured. As vehicle manufacturers begin to include factory installed OBUs in vehicles, the OBU becomes another component included in the vehicle assembly process, along with the GPS and communications antennae.

The manufacturers of RSUs typically produce OBUs, since similar communications technology is applied to both devices.

Until vehicle communications become embedded in most of the vehicle fleet, aftermarket devices are available. Aftermarket safety device equipment can be acquired and used for fleets and individual vehicles. Depending on the level of connectivity to the vehicle (connection to the vehicle’s computer systems or independent function of the vehicle), the price and size of the device vary. **Figure 27** shows one such aftermarket OBU.

As OBUs are installed inside a vehicle, their enclosures do not need to be environmentally hardened. However, care must be taken to protect the OBU from accidental damage or theft, so they are often installed in a place that requires minor disassembly of vehicle interior panels or are enclosed inside a locked case. Additional considerations with an OBU installation are power and cable management.

The OBU must be powered by the vehicle’s electrical system, but it must also be protected from voltage spikes, which is typically addressed through an inline fuse. The OBU must also not be allowed to drain the vehicle’s power source, so the power management must also include a “key-on” detection mechanism such that when the vehicle is powered off, the OBU loses power. Cable management must be considered within the context of the type of installation – permanent or temporary. The cabling involved is for the power and antennas, and if the installation is permanent, the cables should be routed such that they are not visible and cannot be easily damaged or disconnected. A permanent antenna mount can be achieved by creating a pass-through hole in the vehicle’s roof and sealing properly.

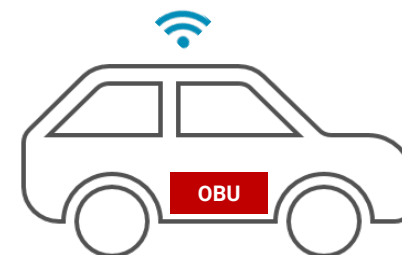


Figure 26. OBU Concept



Figure 27. Sample OBU

For a portable installation, the cables should be routed to minimize the possibility of damage or disconnection, and the antenna can be mounted on the roof of the vehicle using a magnetic mount, and the cables can pass through an open window, or through the weather sealing of a closed door, although this raises the possibility of damaging the cables over time.

Human Machine Interface

The HMI is a visual display that provides the driver with information from the connected vehicle system, which will help the driver make decisions. HMI systems are currently available as after-market products, and over time HMIs that make use of data from connected vehicles will be designed and installed by the automobile manufacturers. Other HMI systems are currently run via conventional tablets.

As the HMI systems become integrated with screens available in vehicles, they will likely be different for each manufacturer and may also vary by vehicle model, depending on how the manufacturer has researched the needs of the drivers of that vehicle model. Secondly, standards are under consideration for how to deliver data from connected vehicles to drivers. Currently, the design of the HMI varies by equipment manufacturer and software programmer and the needs of users. As one example, the THEA Connected Vehicle Pilot used rearview mirror after-market HMI devices such as the one in **Figure 28**.



Source: THEA Connected Vehicle Pilot

Figure 28. HMI in Rear-View Mirror

Edge Devices

Edge devices are a critical component for ensuring the safety of all road users in connected vehicle and autonomous vehicle systems where the speed of information transferred is critical. The speed at which information is communicated to a driver or a self-driving car can be the difference between properly managing intersection movements and causing a crash. Edge devices help manage the flow of data at the edge of a network as close to the data source as possible instead of having to run information back to a data warehouse before executing a decision. Instead of transferring information to a data warehouse or server every time new information is captured, activity can be programmed to push data at certain frequencies (hourly, daily, after peak commute times). **Figure 29** provides an example of a barebones single board computer that can be programmed, and custom built as an edge device. Some RSU manufacturers include similar devices in their products.



Source: www.raspberrypi.org/products

Figure 29. Single Board Computer Common in Edge Devices

Cost Considerations

Table 6 provides high-level cost estimates for installing hardware for a connected vehicle deployment. The estimates are based on various cost points from existing deployments that used hardware from Lear and Cohda. Because devices are constantly improving and being tested with features such as over-the-air updates, device prices are expected to decrease over time.

The RSU cost estimate includes the cost for mapping the intersection in addition to purchasing RSUs and installing them in the field.

Table 6. Connected Vehicle Hardware and Install Cost Estimates

Device	Device with Installation Cost Estimate
DSRC RSU System	\$4,000 - \$6,000 per intersection
Edge Device	\$250 - \$450 per intersection
DSRC OBU System	\$1,000 - \$5000 per unit
HMI	\$1,000 - \$3,000 per unit
C-V2X Device	\$6,000 - \$7,000 per intersection
Operations and Maintenance – DSRC devices	TBD
Operations and Maintenance – C-V2X devices*	TBD
Operations and Maintenance – HMI	TBD

* These costs are sometimes included in the C-V2X device purchase cost.

System-level Considerations

Vehicle Credentials

USDOT has developed a security system that involves a Public Key Infrastructure (PKI) system. This is called the Security Credential Management System (SCMS), and it involves each piece of equipment in the system having matching credentials. Each OBU or RSU or broadcasting/receiving device in the system needs to have credentials to participate in the system. Similar to log-in credentials for banking, emailing, and shopping websites, vehicles will need to prove they are trusted, and traffic signals will need to prove they are trusted by showing their credentials before they begin to communicate and exchange sensitive information.

Personal Data Security

The protocol standards that define the data that moves between and among vehicles does not include identifying characteristics in them. Standards under development will allow a user to select “opt-in” applications. The connected vehicle protocols that currently exist do not transfer personal data and are designed to maintain users’ privacy.

Connected Vehicle Security

In 2015 the NHTSA began developing the SCMS with input from various interested parties from public, private, and academic entities. In more recent years, USDOT has partnered with CAMP³¹ to implement SCMS proof of concepts with the goal of creating public documents for the public to use to establish a national SCMS. Much of the insight is currently being generated by the three USDOT-led connected vehicle pilot locations—New York City, Tampa, and Wyoming—which are required to implement an SCMS and have well documented their deployments.³²

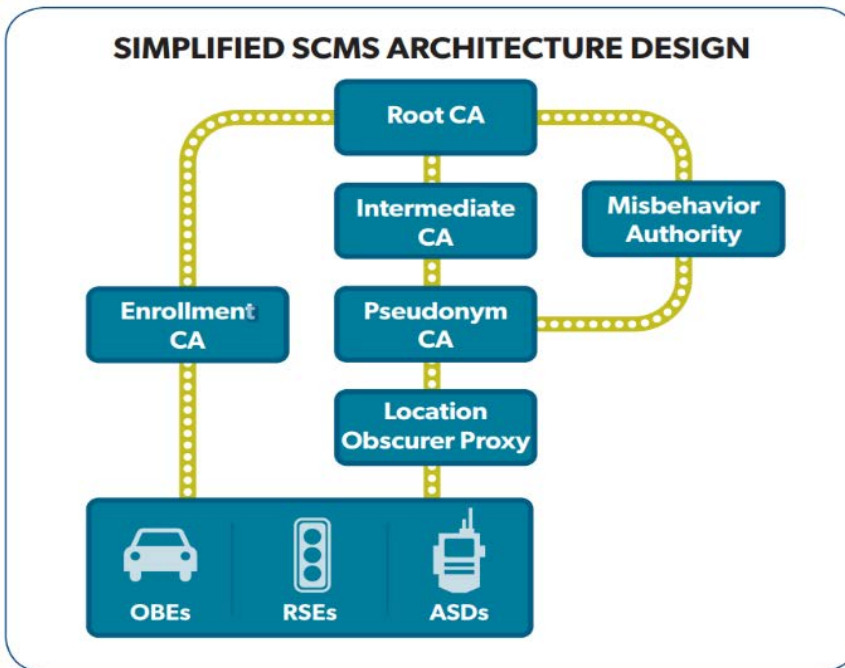
SCMS provides the security infrastructure to issue and manage security certificates, which are the basis of trust in connected vehicle communications by using PKI. Each OBU or RSU or broadcasting/receiving device in the system needs to have credentials to participate in the

³¹ <https://wiki.campllc.org/#all-updates>.

³² https://www.its.dot.gov/pilots/phase2_technical.htm.

system. OBU and RSU hardware can be loaded with a certain number of certificates, and therefore require reloading over time.

Figure 30 provides a high-level look at the architecture of an SCMS. The diagram introduces the concept of Certification Authority (CA). The CA is present in multiple parts of the process to continuously detect, identify, and remove misbehaving devices from the system.³³ **Table 7** provides an overview of the companies providing SCMS nationally and abroad.



Source: USDOT

Figure 30. SCMS Architecture as Illustrated by USDOT

³³ https://rosap.ntl.bts.gov/view/dot/36397/dot_36397_DS1.pdf?

Table 7. SCMS Companies

Company	Website
Green Hills	https://www.ghs.com/products/auto_secure_connect.html
Blackberry (Certicom)	https://blackberry.certicom.com/en/products/certicom-scms
Escrypt	https://www.escrypt.com/en/products/cycurv2x-scms
PentaSecurity	https://www.pentasecurity.com/solutions/iot-security/car-security-autocrypt/

The main goal of an SCMS is to detect, identify, and remove misbehaving devices and to protect the privacy of system users (drivers). Misbehaving devices are OBUs in vehicles that may have been tampered with or are malfunctioning. Each OBU will have a large number of certificates that it will need to load periodically (every 2 to 3 years depending on rate of use) that other OBUs or RSUs can verify as safe devices to communicate with. If a driver's OBU were to be identified as misbehaving, then the driver receives an alert to have the OBU examined by a technician.

Schematic Diagrams of Applications

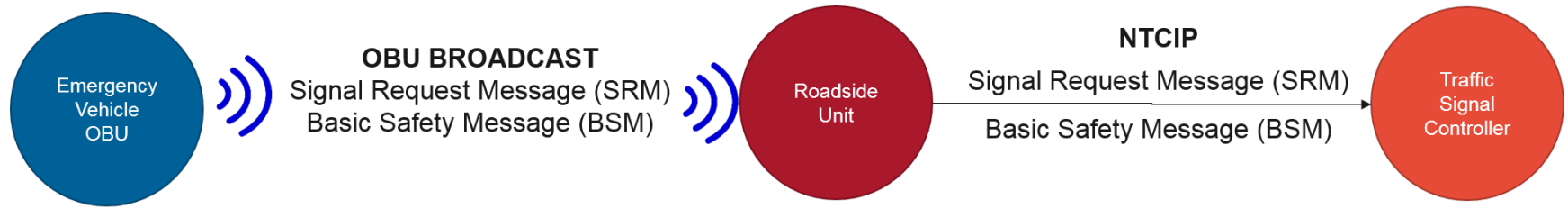
To illustrate how information is sent and received by each application, **Figure 31** through **Figure 36** were developed. A summary of the message content is also provided in the schematic diagrams.

Figure 31 and **Figure 32** provide an overview of the communications process between vehicles and roadway infrastructure for preemption and/or priority applications. The process begins with the OBU in a vehicle sending a signal request message (SRM) to the RSU. The RSU parses the message and passes it on to the traffic signal controller with the appropriate request for service. The traffic signal controller evaluates the request for service and responds based on the operational parameters that are programmed in the traffic signal controller.

A BSM is sent at the same time as the SRM. The SRM includes information about the request as well as vehicle credential information. The BSM includes information about the vehicle such as speed, travel lane, direction, and detailed car status information.³⁴

The traffic signal controller sends the appropriate command to the RSU to communicate with the OBU if a request has been granted as well as the appropriate SPaT message. **Figure 32** details the composition of SSM and SPaT messages.

³⁴ Basic Safety Message Sample Visualization. ITS JPO USDOT. <https://www.its.dot.gov/data/visualizations/element6/>.



SRM	BSM	SSM	SPaT
<ul style="list-style-type: none"> • Preemption or priority request • Optional BSM information • Vehicle ID and credentials 	<ul style="list-style-type: none"> • Lat/Long • Elevation • Speed • Heading • X/Y/Z Acceleration 	<ul style="list-style-type: none"> • Intersection ID • Signal status • Priority status • Preempt status • Transit status 	<ul style="list-style-type: none"> • Current state of the intersection • Active lane • Remaining time for current state

Figure 31. V2I Priority or Preemption

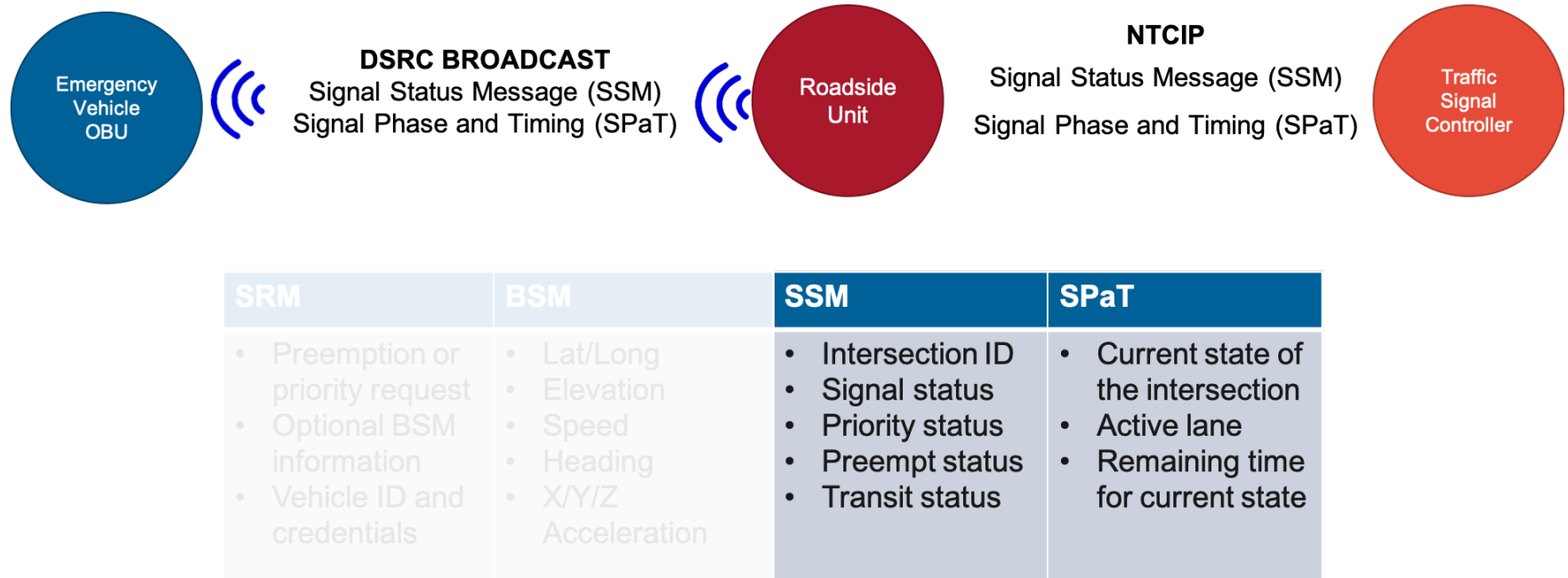


Figure 32. Infrastructure-to-Vehicle Preemption or Priority

The rail intersection blocked alert application is intended to provide information to motorists while a train occupies an at-grade crossing and blocks passage. This application is illustrated in **Figure 33**. The train detection can occur by two methods: a track relay can initially be used, and in the future a passive detection device located outside of the railroad right-of-way could be used to supplement the track relay information to improve the accuracy of tracking the train movement at a railroad crossing.

The first generation of this application may include the status of the railroad crossing (clear or blocked) delivered to a web application. Later phases will likely allow the application to mature and include communication to the driver with predictive (estimated) capabilities such as the time until the next train arrives, the time for the train to clear the railroad crossing, and the estimated duration of the railroad crossing blockage.

This application will particularly benefit emergency vehicle response times and prevent vehicles from blocking nearby intersections. An example of such an intersection can be seen on **Figure 34** where an at-grade crossing alert could help reroute an emergency vehicle to a grade-separated crossing if needed.

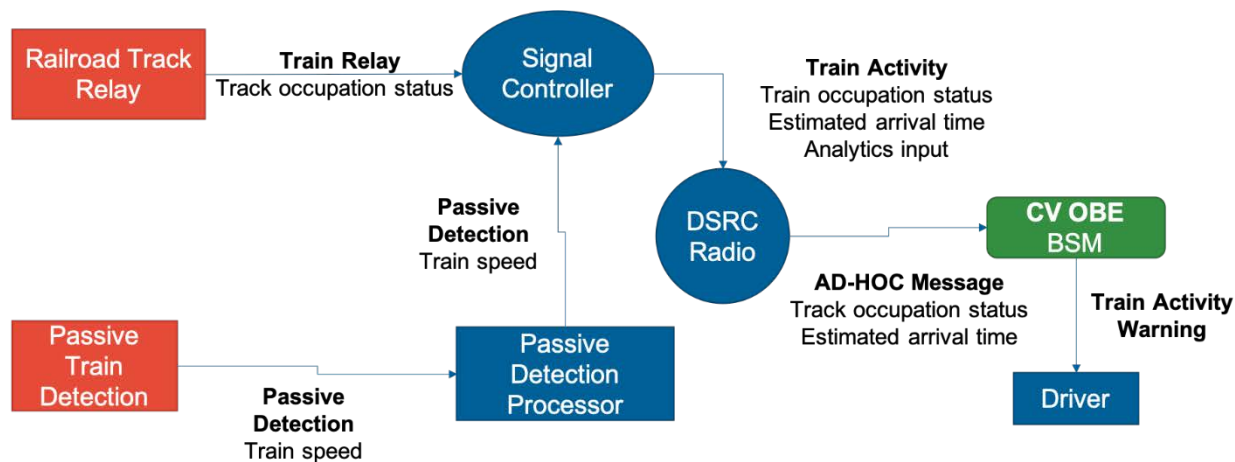


Figure 33. Railroad at At-grade Crossing Alert



Figure 34. At-grade Crossings in Downtown Duluth

Figure 35 and **Figure 36** illustrate the Mobile Accessible PPA application, which provides drivers with an alert about nearby pedestrian activity. In the near-term, an alert can be sent to nearby vehicles that a pedestrian is in the area based on when a pedestrian activated the push button to provide a safe crossing. This approach is technically simple to deploy but limited in its accuracy. For example, it is dependent on a pedestrian activating the push button and may not provide detailed insight about the direction of travel, speed, or location of the pedestrian.

To this end, a more detailed alert could be created by using passive detection and/or information from transit status messages. Passive detection such as intersection cameras, radar, etc., can provide more detailed information such as crosswalk occupancy, direction of travel, speed, and whether the crosswalk is clear of pedestrians. For situations when a pedestrian is not at a crosswalk, alerts can be crafted by parsing information about who is disembarking the bus, including the number of people, if there is a person with a disability disembarking, or if the person is removing a bicycle from the bus rack.

The diagrams serve to provide insight on what is currently possible and what could be possible. The exact functionality will be refined or improved via partnerships with vehicle and bus OEMs, combining information from cellular and DSRC sources, and leveraging insights from ITS devices at the intersection.

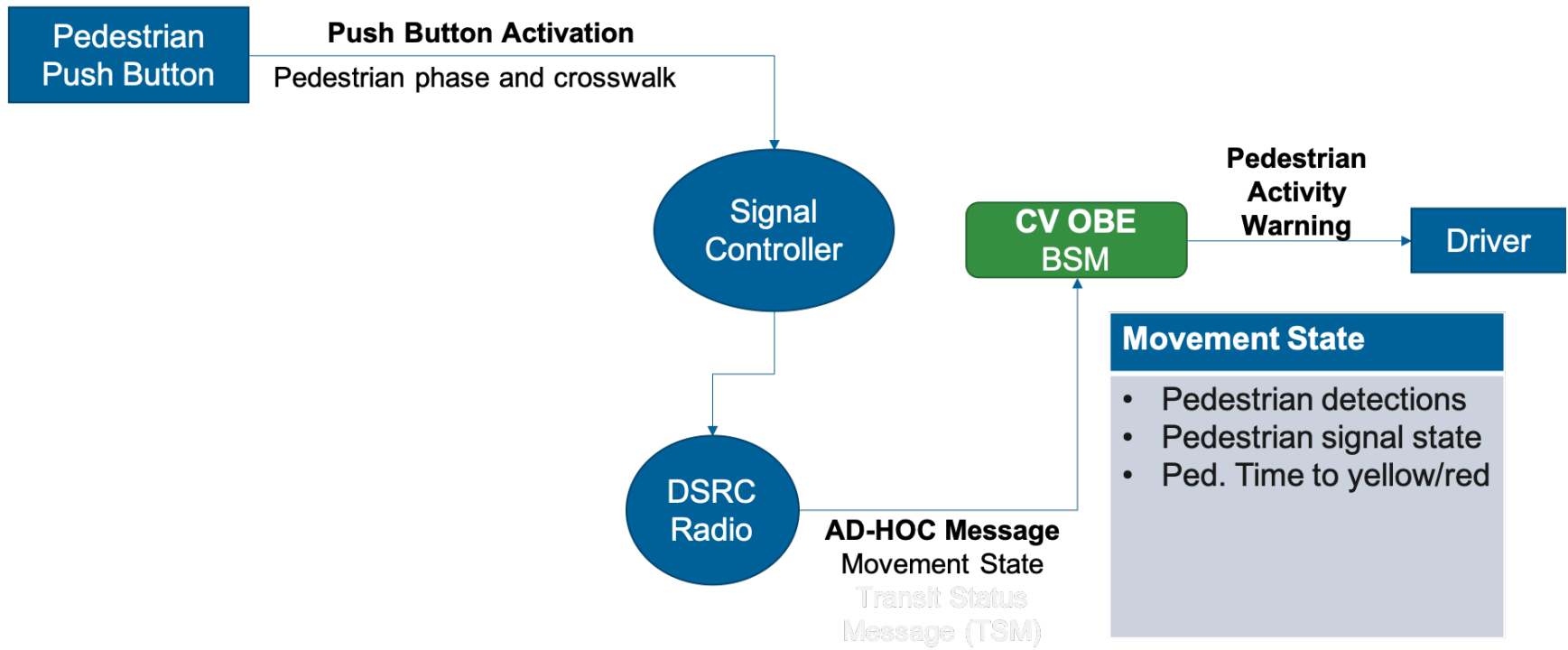


Figure 35. Pedestrian Alert – Near-term

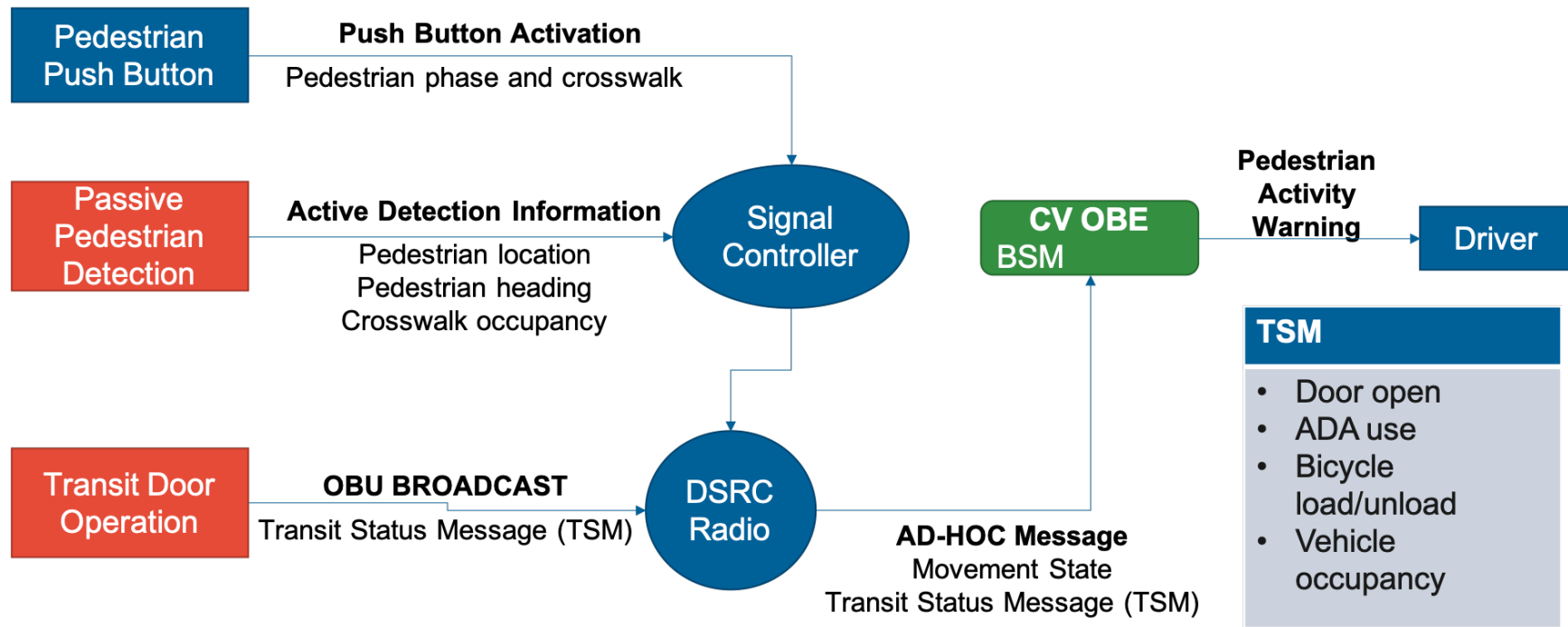


Figure 36. Pedestrian Alert – Future

CHAPTER 4 STAKEHOLDER PROCESS

Approach

To assess the mobility needs and goals of the county and how to apply connected and automated vehicle solutions, insight was gathered by interviewing local jurisdictions who have deployed connected and automated vehicle solutions. Additionally, two stakeholder meetings were conducted to share information and solicit feedback.

Interviews were held with staff from Renew Atlanta (RenewATL), Cobb County Department of Transportation (CCDOT), and the City of Marietta Fire Department. Detailed insights from each interview are provided in **Appendix A**.

RenewATL is the department at the City of Atlanta tasked with deploying connected vehicle technology. CCDOT has remained at the forefront of deploying various technologies to better manage traffic on their roadways. CCDOT works closely with local transit agency CobbLinc to improve the transit system and transit options for Cobb County residents and visitors. The City of Marietta was one of the first in the Metro Atlanta area to deploy cellular-based connected vehicle solutions including EVP. The City of Marietta Fire Department provided useful insight on how the system serves the needs of the Fire Department.

A summary of the local agency feedback is included in **Table 8**. Insight provided by each agency was found to be helpful and has been incorporated in the Smart Corridor considerations and the 5-year timeline.

Table 8. Aggregated Feedback from Local Jurisdictions

#	Question	Guiding Feedback
1	Does your agency have a smart mobility vision or problem statement(s)? If so, what is the overall vision and/or problem statement?	Most began with solving for an immediate need and are developing a process for project evaluation. For some, existing planning documents did not provide smart mobility vision.
2	Did you develop any criteria to help with narrowing down mobility technology solutions to test?	
3	What was the underlying need/focus/priority for your deployment?	Prioritization was sometimes set by a leadership council. Prioritization was sometimes dictated by which corridors were under local control.
4	Did interoperability with legacy and/or future systems concern you during the selection process?	Yes, the intention in some cases was to ease data sharing across departments and jurisdictions. Data storage and management quickly becomes a challenge. Entering data-sharing agreements can be difficult.
5	Did you already have funding secured for the solution(s)?	Yes. SPLOST programs may have a category for smart mobility. CIDs can also be supportive.
6	Describe the process for selecting the connected vehicle system?	Focus on EVP, TSP, SPaT messaging, and deployment ubiquity. Deployments relying on cell phones vs OBUs were found to be more appealing. Another appealing motivator was that it was already deployed in other Metro Atlanta communities.
7	Are there policies currently in place hindering or supporting the ability to adopt new technologies? What types of new policies do you think should be explored to prepare for or respond to these technology trends?	A project prioritization framework is needed.
8	How do you foresee the use of the existing and future technology solutions over the next five years? Do you foresee needing to expand the existing system(s) or to pursue new technologies?	Yes. Funding strategies are needed. Evaluation strategies are needed.
9	Is your agency/jurisdiction collaborating with other agencies/jurisdictions regarding smart mobility solutions?	Yes, at varied levels of engagement. A coordination mechanism is missing.
10	Did you have to upgrade communications capabilities prior to technology deployments?	Fiber upgrades were needed.

#	Question	Guiding Feedback
11	Are there any additional capabilities you wish for in the near-term? Long-term?	Network insights rather than intersection by intersection priority/preemption would be helpful for emergency vehicles.
12	Were there any unforeseen positive or negative impacts post deployment?	Training of the system for varying staff members is critical.
13	Did you establish specific KPI's ahead of the connected vehicle deployment? If so, what were they?	Not currently. Some are working on developing measures.
14	What have the measured outcomes indicated this far?	Anecdotally, improvements were noted in the EVP deployments.

Stakeholder Input

In addition to insight from agencies that have deployed connected vehicle technologies in their communities, local knowledge has been invaluable. Stakeholder meetings were held on October 26, 2018, and April 17, 2019. **Table 9** and **Figure 37** list the stakeholders present at each of the stakeholder meetings.

At the October 26, 2018, stakeholder meeting, the CVTMP team provided an overview of connected vehicle technology – the opportunities offered, what is occurring on the national stage, and how it could help move forward issues the Gwinnett County community identified through previous planning processes. The greatest amount of time was spent discussing questions from the stakeholders, which are outlined in **Table 10**, and engaging in a mapping exercise to help identify areas that connected vehicle technology could help mitigate.

Table 9. Stakeholders from Meeting on October 26, 2018

Organization Type	# of Participants	Agencies
City Staff	10	Braselton, Buford, Dacula, Duluth, Lawrenceville, Snellville, Suwanee
State DOT Staff	2	GDOT Office of Traffic Operations
CID Staff	6	Evermore, Gateway 85, Gwinnett Place, Lilburn, Sugarloaf
Fire	3	Gwinnett County
Police	2	Gwinnett County
Neighbor	1	Chamblee
Academic	1	Georgia Institute of Technology

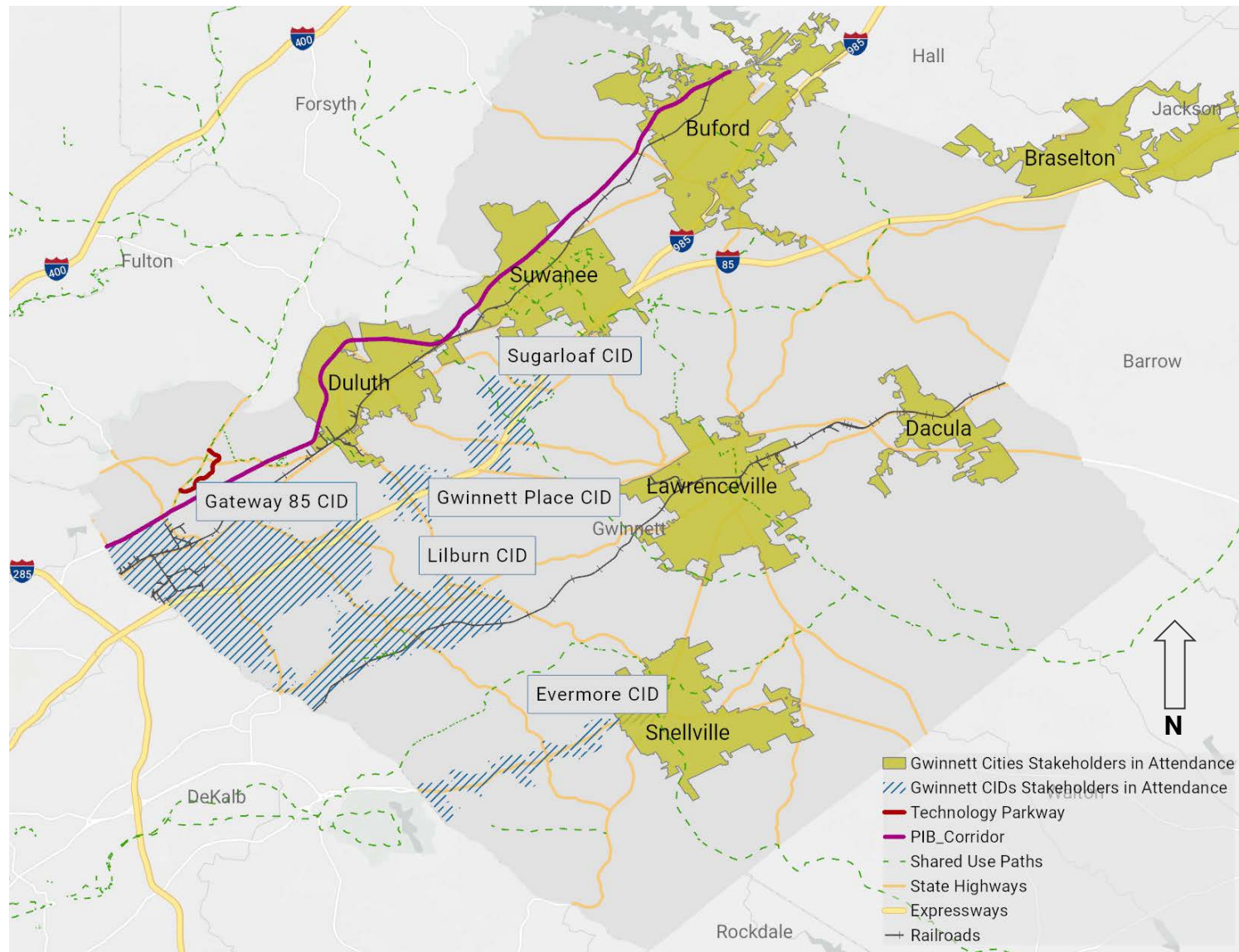


Figure 37. Spatial Representation of Stakeholder Participation

Table 10. Summary of Discussion with Stakeholders

Questions	Discussion answer
1 When will connected vehicle, solutions become readily available in all vehicles?	One automaker has started adding devices to vehicles to enable connected vehicle solutions, and more automakers are expressing intent to add devices within the next few years. However, it will be many years before the vehicle fleet has a significant number of vehicles outfitted.
2 What is the cost of Dedicated Short-Range Communications (DSRC) unit?	The current cost is a few thousand dollars for the DSRC unit. Other costs related to the DSRC unit may include a cabinet, communications, and power for the unit.
3 As we upgrade roads now, what can we do to prepare for new technology?	The most significant need while upgrading roadways is to provide a robust communications system, such as fiber-optic communications, to provide a way to move the data generated by the connected vehicle system.
4 What is the plan for retrofitting existing vehicles since on-board units (OBUs) can be costly?	The cost of an on-board unit will drop over time. There is currently no plan to require retrofit units.
5 How does V2V/V2I communications connect to 5G?	5G cellular communications would provide a much higher communications capacity, and if applied to connected vehicle applications, those applications would benefit.
6 How much more data is needed since cell phone-based data is already available?	Connected vehicle applications would provide a richer data set, in real-time and as archived data. The data would support more applications than the data currently collected by transportation systems.

Appendix B documents the issues raised by the stakeholders. The insight found in the appendix is divided into three zones as shown on **Figure 38**. Zone 1 in blue covers the southern portion of Gwinnett County south of Duluth and Lawrenceville. Zone 2 in green includes an area west of I-85 and north of Zone 1. Zone 3 in red includes most of the county east of I-85 and north of Zone 1. Crossing through zones 1 and 2 is the Smart Corridor project area with Peachtree Industrial Boulevard as the spine.

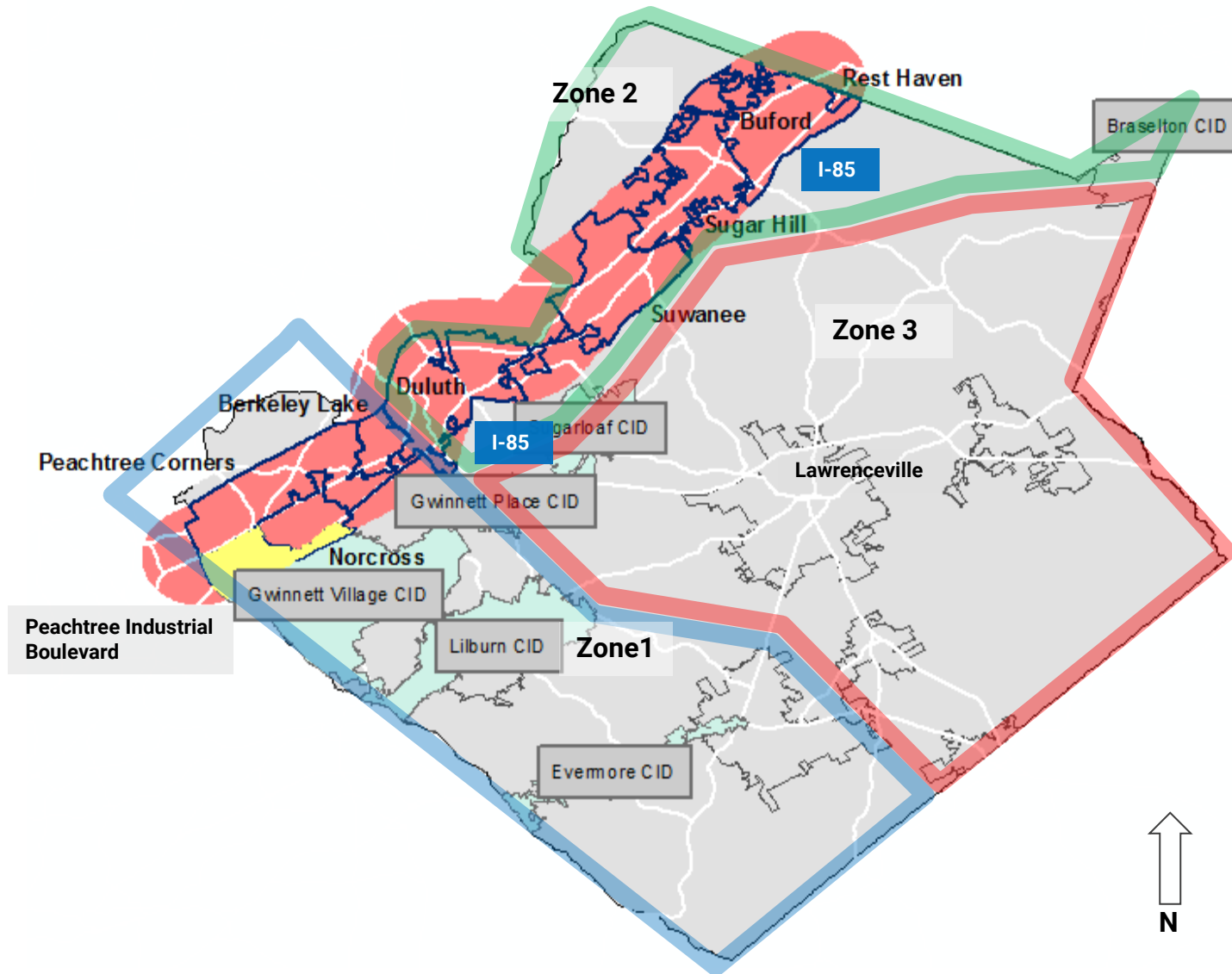


Figure 38. Map of Three Zones in Gwinnett County

Across all the zones stakeholders most frequently identified locations in need of congestion relief, emergency vehicle travel improvements, and pedestrian safety improvements. These issues are reflective of the growing development patterns identified in parts of the county. Also identified but with slightly less frequency are locations where transit buses could receive priority during times of congestion, alerts of bottlenecks, incentivized priority for freight, and improving incident response and clearance times. All the identified issues were further included in the evaluation process as discussed in **Chapter 5**.

As a result of the insight provided, the CVTMP has been tailored to address the issues raised by the stakeholders. The zones were also modified to better fit the connected vehicle deployment plan (**Chapter 6**). The stakeholder insight will need to be continuously updated as technology evolves and opportunities arise for the county.

Project Priority Based on Stakeholder Input

At the stakeholder meeting held on October 26, 2018, the stakeholders filled out small surveys so that the transportation challenges throughout Gwinnett County could be documented. The result of the survey is provided by category in **Table 11**.

Table 11. Stakeholder Meeting Transportation Challenges Summary

Focus Areas Identified by Stakeholders	Comment Frequency
Congestion relief	12
Emergency vehicles	8
Pedestrian safety	8
Transit buses	3
Bottleneck alerts	3
Freight	3
Incident response and clearance times	3

The survey results provide the CVTMP with a clear direction of priority with respect to application selection, including congestion relief, emergency vehicles, and pedestrian safety as the top areas of focus.

Project Coordination Opportunities with Agency Partners

As part of discussions with GDOT and local agencies, opportunities to coordinate with other technology projects in the Atlanta Metro area were examined. The opportunities include hardware and software deployments for a range of purposes, including network communication, school beacon management, and traffic signal operation data. These opportunities were examined to determine how Gwinnett County could leverage these assets for further deployment opportunities. A summary of the opportunities is provided in **Table 12**.

Table 12. Applications Deployed in Metro Atlanta

Device/Software	Deployed?	Description	Status/Details
Traffic Signal Software Capability for EVP and TSP (Intelight)	Summer 2019 (target)	State-wide license and capability, licensed to GDOT	Testing underway
Connected Vehicle Software Applications (Intelight MaxView CV)	Yes	State-wide license and capability, licensed to GDOT	Tested with GDOT DSRC roll out
Traffic Signal System Software (Intelight MaxView)	Yes	State-wide license and capability, licensed to GDOT	Operating in Gwinnett County and most other counties throughout the state of Georgia
State-wide Data Aggregation tool (Connected Data Platform)	Phase 2 target: fall/winter 2019	Phase 1: aggregates crash, incident, and ITS device data, owned by GDOT	State-wide data aggregation platform
Cellular-Based Applications (Applied Information, TravelSafely App + Glance)	Yes	School flashing beacon system management	Operating in Gwinnett County
Cellular-Based Applications (Applied Information, TravelSafely App + Glance)	Yes	Transit signal priority, emergency vehicle preemption	Operating in Marietta (Cobb County)
Cellular-Based Applications (Applied Information, TravelSafely App + Glance)	Yes	Pedestrian and vehicle alert applications	Operating in Marietta (Cobb County)

CHAPTER 5 EVALUATION OF APPLICATIONS

Prioritizing Applications for Gwinnett County

The stakeholder engagement process and interviews with local partners served to fine tune the selection and prioritization of connected vehicle applications. The details of how the applications will be deployed in the future are discussed in **Chapter 6**. A comprehensive list of applications that have been or are currently being tested across the nation by other agencies is provided in **Appendix C**. This section focuses on the types of applications available and the process to evaluate and prioritize application development.

In the interest of public safety, connected vehicle applications must be rigorously tested before being deployed for public consumption. DSRC systems and C-V2X systems are fundamentally different with respect to the fact that the testing should include conformance to existing protocols and messaging. DSRC-based systems use standard protocols and messaging associated with specific applications.³⁵ At this time, C-V2X-based systems are typically proprietary in nature, since standard protocols and messaging are not currently available.

For the Smart Corridor Request for Proposals, there is an opportunity to evaluate the expectations, capabilities, and delivery of DSRC and C-V2X-based systems. This opportunity may be useful to regional infrastructure and policy leaders, since both system types can provide viable applications. The Smart Corridor project will focus on a pilot deployment in one portion of Gwinnett County, with the possibility of scaling applications that are of particular benefit to the rest of Gwinnett County in future deployments.

The insights gained from all parties will help to refine a list that pushes innovation while maintaining a realistic set of expectations for capabilities and deliverability. The applications recommended in **Chapter 6** are focused on Gwinnett County's needs while understanding the significance of scalability across other communities within and outside of Gwinnett County. The remainder of this chapter focuses on application types and scalability.

³⁵ <https://local.iteris.com/cvria/html/applications/applications.html>.

Types of Applications

Stand-alone Applications

Stand-alone applications are those that apply to a unique geographical area and are not intended to be applicable to an area the size of a county or larger. The applications are appropriate to solve local issues, so the application may need to be customized or scaled to a specific intersection, roadway, or roadway network. Stand-alone applications are typically developed by aggregating input data to automatically generate the system output, preferably in a manner that allows the application to be self-contained at the edge devices and/or the vehicles that have an OBU.

Examples of stand-alone applications include:

- Incident management for freeways
- Microclimate applications (fog, etc.)
- Specific movements associated with intersection congestion mitigation

Wide Area Applications

Wide area applications are those that are appropriate for county-wide or state-wide application. The applications are sufficiently generic in nature to apply to most any location. Wide area applications aggregate input data from standard sources to generate the system output. The source of the input data may include data generated at the edge devices and/or vehicles that have an OBU; however, in some cases the data source may be located elsewhere. Examples of wide area applications include:

- Traffic signal SPaT data transmission to vehicles
- Pedestrian presence alert via push button activation to approaching vehicles
- Construction and maintenance vehicle alert to approaching vehicles

Flexibility and Scalability Considerations

The flexibility and scalability of connected vehicles is different for stand-alone and wide area applications. A stand-alone application does not require consistency across the state to provide the core functionality of the application, while a wide area application does require consistency across the state to provide the core functionality of the application. How these differences impact the development of the connected vehicle system is described below.

Stand-alone applications collect inputs and send outputs on a local, small area scale, with the primary limitation being the number of vehicles that have OBUs to send and receive data and messages. Stand-alone applications may include preemption and/or priority functions at traffic signals, if the emergency and/or transit vehicles are outfitted with equipment that is capable of triggering a call to the traffic signal for service. While a consistent approach with respect to the technology used and/or software behind the application is desirable, it is not necessary to achieve the core functionality of the application.

Wide area applications require the same protocol, message sets, and software to achieve the core functionality of the application. Although multiple systems could be employed across the state, this limits the ability of the system to provide a single point of system management and associated parameters, performance measures, and standard reports. The goal of any system as complex as a connected vehicle system is to reduce the barriers and complexity related to system operation and maintenance.

As the connected vehicle system grows in size and complexity, the need for tools that enable the operator to perform critical functions efficiently and effectively should be considered an objective. With each additional application, the stakeholders should consider whether the functionality can or should be considered as a stand-alone or wide area application.

Applicability to the State of Georgia

Connected vehicle applications with potential for wide area application should be considered eligible for state-wide use. **Figure 39** shows how Gwinnett County is one of 159 counties in the State of Georgia, and highlights that the connected vehicle system will require inter-county interoperability.

A goal of any wide area application should be interoperability. Interoperability allows any jurisdiction or agency in the State of Georgia to apply a wide area application to their connected vehicle deployment with minimal modification to the application. As wide area applications are developed, Gwinnett County will coordinate with GDOT to determine the best way for the application to be added to the connected vehicle system.

In most cases, a pilot project would be useful to demonstrate the proof of concept before the application advances to state-wide use. The Smart Corridor project will be managed and designed to achieve applicability for use throughout the State of Georgia.

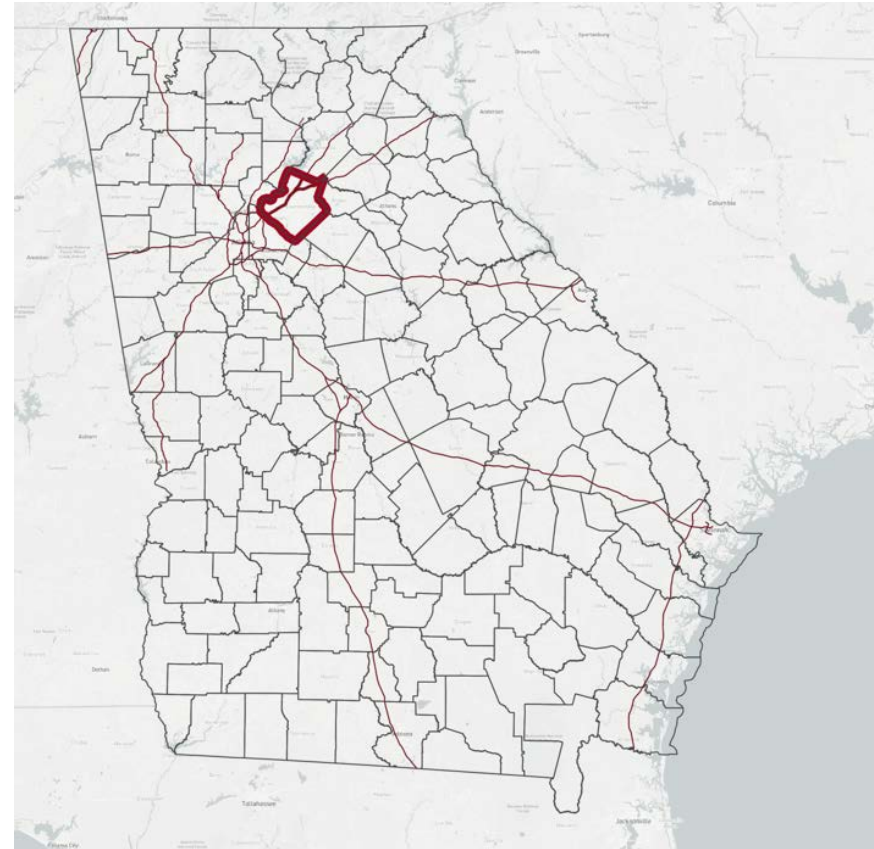


Figure 39. Gwinnett County in Context of the State of Georgia

CHAPTER 6 CONNECTED VEHICLE DEPLOYMENT PLAN

Overview

The deployment plan focuses on a 5-year approach as detailed in **Table 13**. By 2024, the expectation is that a significant number of vehicles will be manufactured with connected vehicle-enabled capability. The 5-year plan is intended to provide a period of testing connected vehicle applications as Gwinnett County expands to a county-wide deployment, anticipating that the market saturation level in private vehicles will remain relatively low until 2024.

Workflow and Timeline

The approach begins with limited connected vehicle applications as part of the Smart Corridor project, which shows how connected vehicle applications can benefit a variety of users by improving safety and mobility and enhancing traveler information. Then, Gwinnett County will coordinate with other agencies with respect to applications that have state-wide potential so that staff and financial resources are utilized efficiently. After testing and evaluating connected vehicle applications, an application can be expanded county-wide with applications that have proven benefits.

The 5-year plan is intended to provide a timeframe (2020 to 2024) during which innovation can be tested and evaluated. During this period, connected vehicle applications that apply to a range of users will be tested. Testing applications for a range of users on a small scale is desirable to demonstrate the feasibility and value of the connected vehicle application.

Table 13. 5-Year Deployment Plan

Application	Near-Term (2020)	Short-Term (2020-2022)	Long-Term (2020-2024)
	Smart Corridor project	In Coordination with ARC, GDOT	In Coordination with GDOT
1. All Solutions	<ul style="list-style-type: none"> Deploy RSUs in the Smart Corridor area Test connected vehicle data collection, analytics, and archiving 	<ul style="list-style-type: none"> State-wide; dashboard for intersection traffic signal operations (RR + EVP + TSP + FSP transition times) State-wide; manage RR + EVP + TSP + FSP conditional requirements Test connected vehicle-generated safety data alerts Cybersecurity; deploy SCMS or similar system 	<ul style="list-style-type: none"> Deploy RSUs county-wide Test county-wide connected vehicle data, analytics, and archiving Deploy mission-critical connected vehicle-generated safety data alerts
2. Signal Phase and Timing (SPaT) Information	<ul style="list-style-type: none"> Enable red light warning, phase termination/next signal phase, and green band speed applications 	<ul style="list-style-type: none"> Monitor benefits of safety applications related to fleet penetration of RSUs and cellular OBUs 	<ul style="list-style-type: none"> Monitor benefits of safety applications related to fleet penetration of DSRC/cellular OBUs
3. Emergency Vehicle Preemption (EVP)	<ul style="list-style-type: none"> Enable EVP Install OBUs on fire trucks 	<ul style="list-style-type: none"> State-wide; manage EVP conditional priority requirements 	<ul style="list-style-type: none"> Alerts for excessive transition time
4. Transit Signal Priority (TSP)	<ul style="list-style-type: none"> Enable TSP Install OBUs on transit vehicles 	<ul style="list-style-type: none"> Manage TSP conditional priority Test schedule adherence conditional priority Test bus occupancy conditional priority 	<ul style="list-style-type: none"> County-wide system development Alerts for excessive transition time
5. Freight Signal Priority (FSP)		<ul style="list-style-type: none"> Enable FSP State-wide; manage FSP conditional priority Develop commercial freight outreach program 	<ul style="list-style-type: none"> County-wide system development Alerts for excessive transition time
6. Construction and Maintenance Vehicle Alert	<ul style="list-style-type: none"> Enable alerts Install OBUs and HMIs on select GCDOT vehicles 	<ul style="list-style-type: none"> State-wide; manage alert conditional requirements 	<ul style="list-style-type: none"> County-wide system development
7. Rail Intersection Blocked Alert	<ul style="list-style-type: none"> Test railroad intersection blocked alert 	<ul style="list-style-type: none"> State-wide; evaluate railroad crossing safety applications Evaluate railroad crossing prediction accuracy 	<ul style="list-style-type: none"> County-wide system development Develop additional railroad crossing safety applications Enable predictive railroad crossing delay
8. Mobile Accessible Pedestrian Presence Alert (PPA)	<ul style="list-style-type: none"> Test alert from pedestrian push button activation at intersections 	<ul style="list-style-type: none"> Test transit and bus door open events County-wide system development Test applications for the visually impaired 	<ul style="list-style-type: none"> Test alert from pedestrian push button activation for mid-block pedestrians County-wide system development

Phase 1: Smart Corridor Project (Near-term)

The first deployment is a pilot project that is intended to demonstrate connected vehicle applications that are deployed elsewhere and to demonstrate new connected vehicle applications within the state of Georgia. The Smart Corridor project lies in the western portion of Gwinnett County, between the western county line and the I-85/I-985 corridor. It includes the cities of Norcross, Peachtree Corners, Berkeley Lake, Duluth, Suwanee, Sugar Hill, and Buford. **Figure 40** provides context on the project extents.

The connected vehicle applications identified for the Smart Corridor project will primarily benefit emergency vehicles and transit vehicles through the functions of traffic signal preemption and priority. These benefits will provide enhanced safety and mobility operations for first responders and improved on-time performance for public transportation by providing preemption and priority along a route.

Additional applications include SPaT information, Construction and Maintenance Vehicle Alert, Rail Intersection Blocked Alert, and PPA. Safety-oriented messages associated with these applications could be delivered to vehicles equipped with HMIs.

During the near-term, the intention is to deploy the applications that will be tested and evaluated, with a focus on improving their capability and verifying scalability. All but 94 signals will be outfitted with connected vehicle devices. The remaining 94 were not deemed to be critical for the success of the applications to be deployed but will need to be integrated over time.

The Smart Corridor project will include an “innovation solution” component, which is intended for the technology industry to showcase the broadest or most effective ways in which to apply connected vehicle technology. Following the Smart Corridor Request for Proposals, the contractor teams will be challenged to provide solutions that provide short-term public benefit, additional value, mobility benefits, and safety benefits. The outcome of the innovation solution is that Gwinnett County will improve the project value to the transportation users in Gwinnett County.

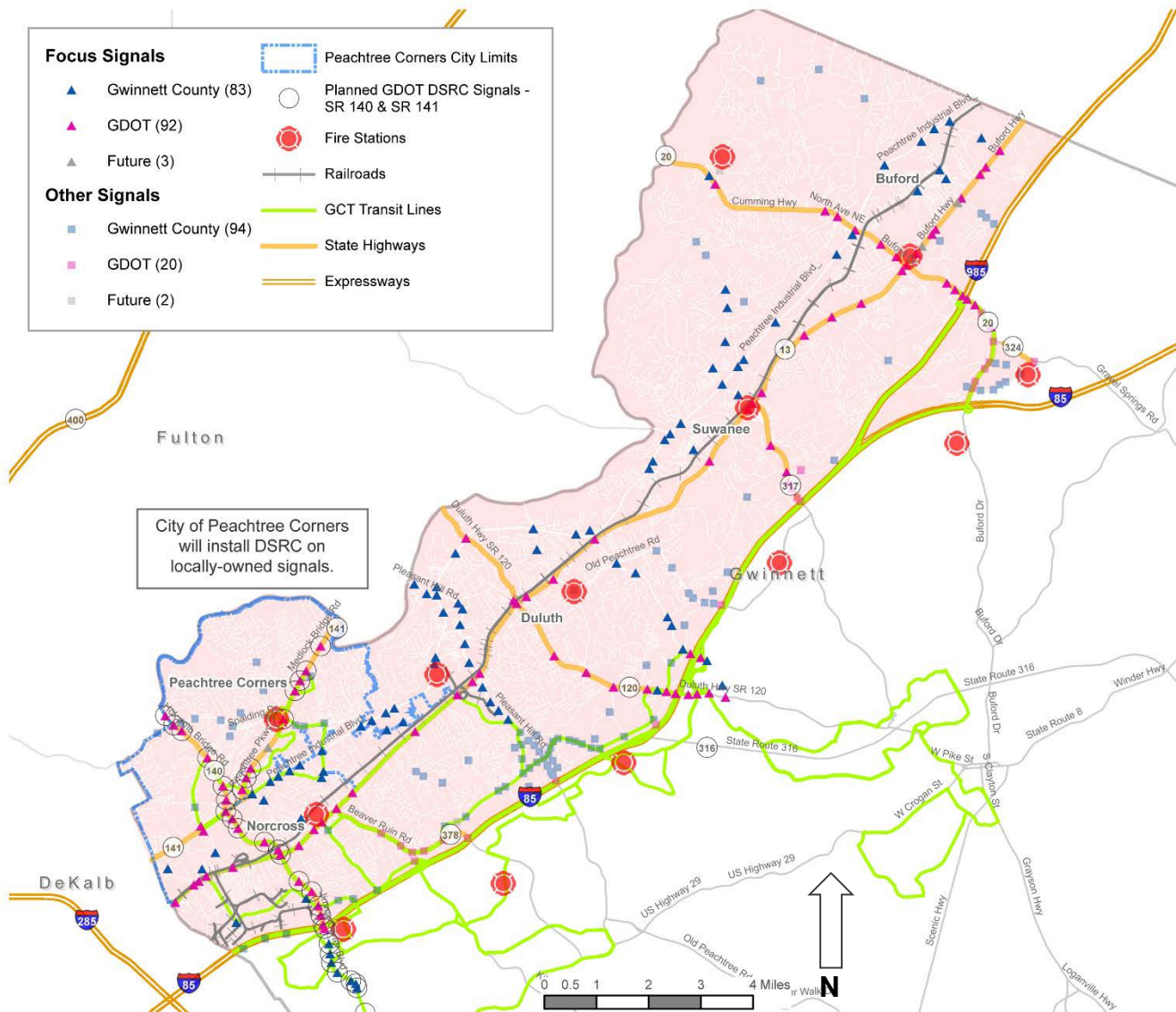


Figure 40. Smart Corridor Project Limits

The contractor will need to include sufficient software licenses for the Smart Corridor applications at all traffic signals in the Smart Corridor area. Expansion of software to traffic signals outside of the Smart Corridor may be deployed as part of a separate project during any portion of the 3-year service period. In addition, the contractor will provide a license unit cost for Smart Corridor applications per traffic signal located outside of Gwinnett County, if other agencies elect to participate during the 3-year service period.

The license per traffic signal, at a minimum, will include:

- State-wide access with login for various users with varying access levels (administration, local agency, etc.)
- The hardware on which the software is to be distributed must be free of defects
- License per traffic signal must include updates to ensure quality and accuracy of system logic and outputs.

Before completing the Smart Corridor project, Gwinnett County will want to increase the level of technical staffing to support the needs from deploying a new and evolving technology. The technical staffing level changes should occur for engineering and IT.

At minimum, one full-time engineer position would be needed to perform the following tasks:

- Monitor the activity of the Smart Corridor contractor during the 3-year service period
- Monitor the activity of the innovative solution during the 3-year service period
- Manage connected vehicle infrastructure operations, maintenance, and warranty work
- Iterate and innovate connective vehicle applications
- Provide guidance for the subsequent phases of connected vehicle deployment
- Educate others on the capabilities of the connected vehicle system
- Coordinate with other connected vehicle system operators in the Atlanta metro area and beyond

At minimum, one full-time technology manager would be needed to perform the following tasks:

- Manage and monitor the connected vehicle system and support the needs of other departments such as but not limited to GCT.
- Manage and monitor the Gwinnett County communications network with respect to the connected vehicle devices, protocols, data flows, applications, and bandwidth requirements
- Manage the network security requirements related to connected vehicle devices, including RSUs, OBUs, and HMIs
- Follow industry developments with respect to network security, connected vehicle device security, physical security, hack threats, and hack outcomes in similar environments
- Provide network security guidance for the subsequent phases of connected vehicle deployment

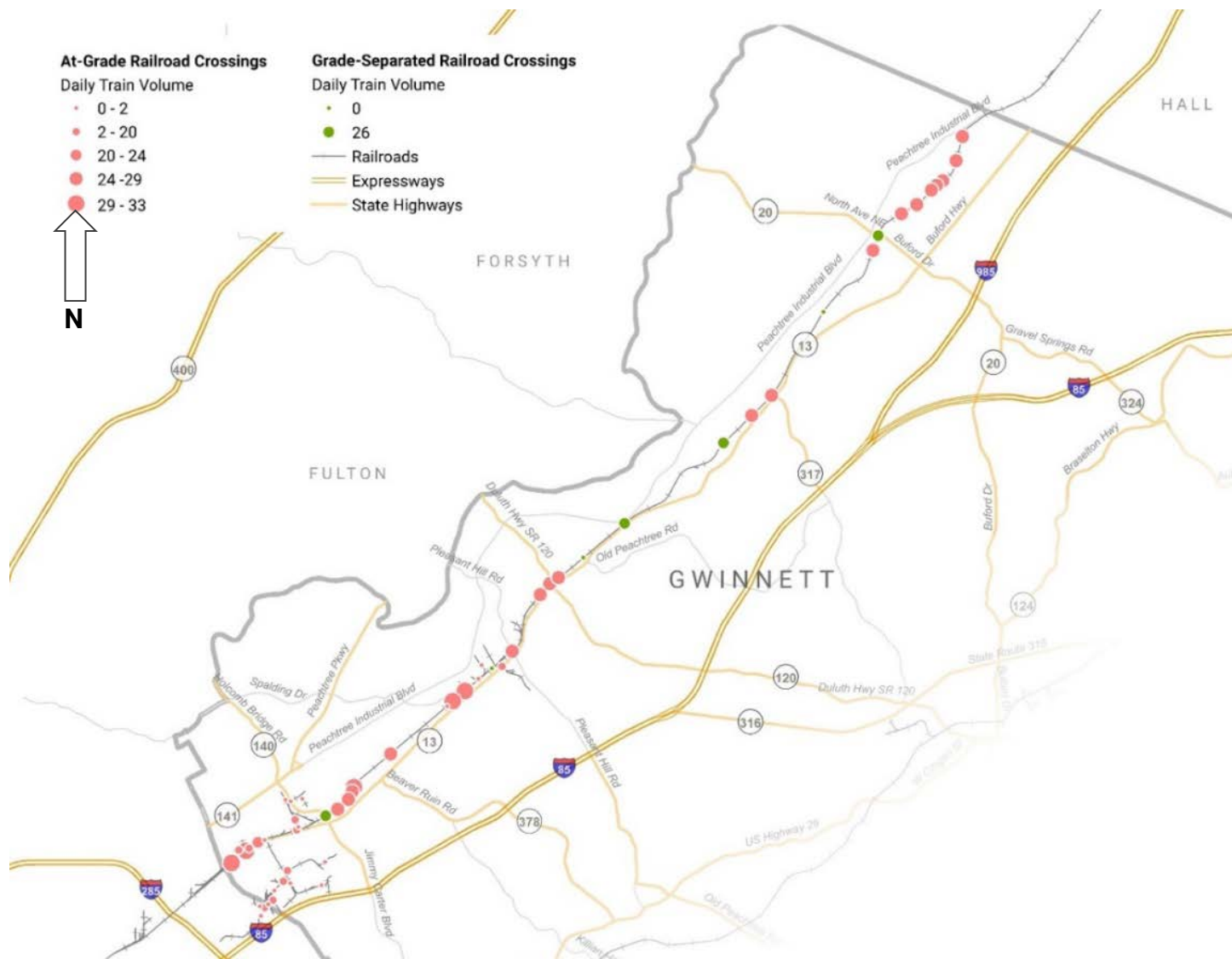
The 2017 ITS Master Plan identified the following projects, which have relevance to the success of the connected vehicle deployment:

Table 14. Short-term ITS Projects

Project Number	Project Title
ST-2	ITS Expansion on SR 13 (Buford Hwy)
ST-3	ITS Expansion on Peachtree Industrial Blvd (Phase 1)
ST-5	ITS Communications and Asset Management Program
ST-6	ITS Communications Upgrades 1
ST-7	Network Upgrades and Operational Enhancements

Figure 41 provides insight on railroad activity at highway-rail at-grade railroad crossings in the Smart Corridor area. The size of the red dot indicates a greater volume of train activity, which translates to the greater likelihood an emergency vehicle (and other vehicles) may be delayed by the train event. For example, a railroad intersection blocked alert application in the future will have the potential to reduce the time it takes to get a patient to the care they need, or to reduce the severity of the fire for the purposes of saving lives and property.

The first generation of this application may include the status of the railroad crossing (clear or blocked) delivered to a web application. In addition, initially very few vehicles will be outfitted by OEMs to accept messages regarding the status of the railroad crossing. Later phases will likely allow the application to mature and include communication to the driver with predictive (estimated) capabilities such as the time until the next train arrives, the time for the train to clear the railroad crossing, and the estimated duration of the railroad crossing blockage.



Source: GDOT OTD

Figure 41. At-grade Crossings within the Limits of the Smart Corridor

Connected Vehicle System Sample Project

Table 15 and Table 16 provide an overview of a sample project with rough estimates for a system with 20 intersections outfitted with connected vehicle technology.

Table 15. Sample Project Field Installations

Field Installation	# of Units + Install + Programming	Unit Cost	Total Cost
Roadside Unit	20	\$5,000.00	\$100,000.00
MAP Message Development	20	\$1,500.00	\$30,000.00
Edge processing	20	\$350.00	\$7,000.00
Software (units = intersections)	20	\$7,000.00	\$140,000.00
Service (units = years)	3	\$ 10,000.00	\$ 30,000.00
Cyber Security (SCMS)	20	\$ 100.00	\$ 2,000.00
	TOTAL		\$ 309,000.00

Table 16. Sample Project Vehicle Installations

Vehicle Installation	# of Units + Install + Programming	Unit Cost	Total Cost
OBU	20	\$5,000.00	\$100,000.00
HMI	20	\$3,000.00	\$60,000.00
Cybersecurity (SCMS)	20	\$100.00	\$2,000.00
	TOTAL		\$ 162,000.00

Phase 2: Short-Term (2-3 years)

Following the Smart Corridor project, Gwinnett County will have the opportunity to test and evaluate the connected vehicle applications, and to demonstrate new connected vehicle applications as they become available. Collaboration with GDOT and ARC will improve the value of the connected vehicle testing and refinement process for all agencies that seek to provide connected vehicle applications within the State of Georgia.

During this phase, the number of vehicles manufactured with connected vehicle-enabled capability will grow. Gwinnett County will experience first-hand learning about how drivers respond to messages generated by connected vehicle applications, as the market penetration of OBUs occurs over time.

New connected vehicle applications that will be evaluated during Phase 2 are as follows:

- Freight signal priority, including conditional requirements
- Transit signal conditional priority based on bus schedule adherence and bus occupancy level
- Railroad intersection blocked alert application enhancements
- Safety alerts generated by vehicle-derived data, such as hard braking events
- Pedestrian presence alerts based on transit bus door open events
- Pedestrian applications to support visually impaired users

Testing and evaluation opportunities include:

- A dashboard for evaluating the impact of preemption and priority on traffic signal operations, to apply conditional requirements that may be appropriate
- Next steps towards implementing the rail intersection blocked alerts application to drivers
- Understanding the communications network and ATMS network impacts as the number of vehicles with an OBU grows

Supportive infrastructure was identified in the 2017 *Intelligent Transportation System Master Plan* as mid-term and long-term projects. There are 11 mid-term projects identified and 6 long-term projects, some of which will be critical to support a connected vehicle system. Two such ITS expansion projects are the Peachtree Industrial Boulevard (phase 2) and the SR 120 Duluth Highway (phase 1). Additionally, DSRC and C-V2X devices will need to be deployed and programmed in coordination with local agencies.

Scaling Connected Vehicle Infrastructure County-wide

Following the Smart Corridor project deployment, much of Gwinnett County will remain in need of connected vehicle technology deployment. A recommended strategy is to identify where and when to expand the connected vehicle system. This includes:

- Coordinate with GDOT to outfit additional intersections with RSUs
- Deploy connected vehicle infrastructure in batches of 75 to 175 traffic signals per phase
- Focus on outfitting signals that serve FSP and TSP

Figure 42 illustrates how Gwinnett County can be divided into three zones. The deployment of traffic signals could be divided in a similar manner, should project funding be available in amounts that support wide-scale deployment.

If funding is available in smaller increments, then deployments can be targeted at

- Area surrounding the Mall of Georgia and Coolray Field
- Area surrounding Gwinnett Place Mall
- Major commuter corridors, such as Sugarloaf Parkway
- Downtown areas, such as Lawrenceville, Lilburn and Snellville

Deployments will need to be cognizant of Fire District boundaries

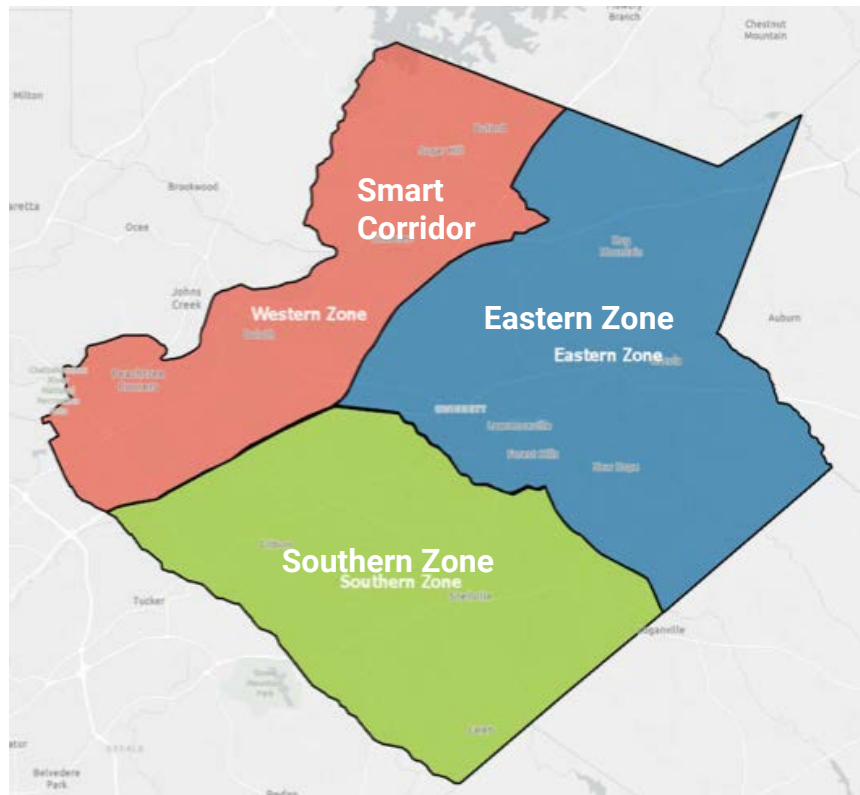


Figure 42. Map of Deployment Zones

For reference, **Table 17** provides selected assets related to the connected vehicle applications by deployment zone. This data will be helpful as the connected vehicle projects are developed and will be further verified by coordinating with GDOT and Gwinnett County Transit if information changes over time.

Table 17. Gwinnett County Selected Assets by Zone

	Western Zone	Eastern Zone	Southern Zone	Total
Total Traffic Signals	269	249	231	740
Smart Corridor Traffic Signals	76	2	0	78
GDOT Traffic Signals	102	121	83	306
Local Traffic Signals	162	115	147	424
Future Traffic Signals	5	4	1	10
Fire Stations	7	13	12	32
Fiber Hubs	15	10	9	34
Traffic Signals near Transit Stops (900 feet)	90	63	66	219
Traffic Signals along Transit Routes (900 feet)	117	99	94	310

Phase 3: Long-Term (4-5 years)

By 2024, a significant number of new vehicles will be manufactured with connected vehicle capabilities. The applications that are appropriate and ready for county-wide deployment will be deployed, including an expansion of the connected vehicle system components, including connected vehicle devices and fiber communications.

While all connected vehicle applications may not yet be fully mature, Gwinnett County will continue to select and prioritize applications based on the results of the testing and evaluation phase. The anticipated safety and mobility benefits, number of users, cost, staffing, and amount of hardware and software will be considered for making decisions regarding county-wide deployment.

Collaboration with GDOT and ARC will remain critical as technology and connected vehicle applications change. For instance, some applications may be better served by applications that can be displayed via an HMI installed in a vehicle, and some applications may be adequately served by a mobile device.

The mission-critical nature of providing first-line safety applications requires the connected vehicle system to be robust, redundant, and secure to the extent practical. To reduce pressure on the network communications system, applications that can be served at the “edge,” such as by a local intersection, will be deployed first. Applications that require external triggers to be sent to the intersection through the network communications system will be considered supplementary.

As with any technology-oriented plan, there is a significant likelihood that the plan will become obsolete before the horizon year occurs. As a result, the recommendations for long-term will be considered advisory in nature. As Gwinnett County experiences the Smart Corridor project, the applications and communications approach will be reviewed to take advantage of the most beneficial methods of delivering connected vehicle benefits.

APPENDIX A INTERVIEW GUIDING QUESTIONS REGARDING RECENT SMART MOBILITY DEPLOYMENTS

Questions for Municipalities

1. Does your agency have a smart mobility vision or problem statement(s)? If so, what is the overall vision and/or problem statement?
2. Did you develop any criteria to help with narrowing down mobility technology solutions to test?
3. What was the underlying need/focus/priority for your deployment?
4. Did interoperability with legacy and/or future systems concern you during the selection process?
5. Did you already have funding secured for the solution(s)?
6. Describe the process for selecting the connected vehicle system?
7. Are there policies currently in place hindering or supporting the ability to adopt new technologies? What types of new policies do you think should be explored to prepare for or respond to these technology trends?
8. How do you foresee the use of the existing and future technology solutions over the next five years? Do you foresee needing to expand the existing system(s) or to pursue new technologies?
9. Is your agency/jurisdiction collaborating with other agencies/jurisdictions regarding smart mobility solutions?
10. Did you have to upgrade communications capabilities prior to technology deployments?
11. Are there any additional capabilities you wish for in the near-term? Long-term?
12. Where there any unforeseen positive or negative impacts post deployment?
13. How many vehicles in your fleet are outfitted to receive signal pre-emption?
14. Did you establish specific KPI's ahead of the connected vehicle deployment? If so, what were they?
15. What have the measured outcomes indicated this far?

Insight from the City of Atlanta

Subject	Insight
Vision/Project Selection Process	<ul style="list-style-type: none"> Needs based. Prioritized roads under City control, underserved communities, areas in need of complete streets projects. City Council and Public Engagement directed projects Updating process to work closer with planning department using the Atlanta Transportation Plan (ATP) as a foundation for adding technical rigor
Funding	<ul style="list-style-type: none"> All local dollars. April will be year 3 of 5 of SPLOST. Funding strategy for project delivery could be a full-time job Too often money is left on the table
Interoperability	<ul style="list-style-type: none"> A consultant was hired to upgrade all city fiber. Goal is to move all City departments to the same network. Growing from 5 miles of fiber to 50 miles of 144/288 fiber when all projects are built. Would connect 100 of 950 traffic signals. AIM has new leadership and is currently working on an IT master plan Concerned about maintenance of fiber system
Data Sharing	<ul style="list-style-type: none"> Has been a challenge navigating data storage needs, solidifying data agreements GDOT via TTS has been successful in providing analytics of car movements to CoA At this time, companies do a better job of managing data than the City
Transit	<ul style="list-style-type: none"> Glance has been deployed at 5 intersections along Campbellton Rd MARTA needs to add receivers to buses – currently delayed Chose Glance over Opticom because of multi-solution option Glance provides
Standards	<ul style="list-style-type: none"> CV standards need to be set. Similar to how GDOT set up Cabinet standards; company agnostic, performance-based, product must do x, y, z.
Traffic Signal Operations Software	<ul style="list-style-type: none"> For North Avenue, the Surtrac adaptive system was installed, but is currently turned off. Surtrac was used instead of Intelight because SPaT module was not available at the time. Surtrac will be moving from North Ave to DeKalb Ave when corridor is reconfigured Not ideal in a grid setting
Collaboration	<ul style="list-style-type: none"> This is a great need internally at the City of Atlanta for project delivery This is also a great need regionally to develop many necessary standards crucial for interoperability

Insight from Marietta Fire Department

Subject	Insight
Vision/Project Selection Process	<ul style="list-style-type: none"> • Opportunity based decision making • Deployment was traffic solution driven with the added benefit of EVP
Funding	<ul style="list-style-type: none"> • City funded • Test bed for Glance
Findings	<ul style="list-style-type: none"> • Travel time is being reduced by not having to slow down as much at intersections • Reduced secondary crashes • There has been a culture shift since switching from Opticom • There was an issue of triggering signal preemption at a nearby signal when turning into a fire department. Company was responsive to fix the issue.
Data/KPIs	<ul style="list-style-type: none"> • Fire Department has not analyzed any of the perceived benefits
Future	<ul style="list-style-type: none"> • Would like to have a system that predicts a route from station to call location and clears the entire route • Would like to see notifications inside the car stating the type of emergency vehicle approaching, what side it's approaching from, and when it is arriving • For notifying the public, would like a better solution than the current mobile app

Insight from Cobb County Department of Transportation

Subject	Insight
Vision/Project Selection Process	<ul style="list-style-type: none"> • Comprehensive Transportation Plan is the most mature vision. • Device selection process was opportunity based. Interoperability with neighbors was key.
Funding	<ul style="list-style-type: none"> • SPLOST funds often used to match federal. CIDs help with cost-sharing • Most cost concerns for County are operational
Interoperability	<ul style="list-style-type: none"> • Key driver for TSP project
Data-Sharing	<ul style="list-style-type: none"> • For CV, the plan is to provide data access to TTS with local data and have them make it available to others with goal of improving safety and reducing congestion • Have an agreement with Smyrna for SCATs system • Smart city data platform will focus on incident-based congestion - what is needed to arrive at and clear an incident and, for ambulance, arriving to the hospital quickly
Transit	<ul style="list-style-type: none"> • Testing on the table TSP – working to set up business rules to match how we track on-time performance (0-5 mins) and passenger load
Future	<ul style="list-style-type: none"> • Anything that helps to reduce crashes • Last-mile improvements • Looking forward to creating data streams of mobility options and putting them all on one platform

APPENDIX B STAKEHOLDER INSIGHTS BY ZONE

Stakeholders

Name	Title	Organization
Jennifer Scott	City Manager	City of Braselton
Dan Branch	Public Safety Director	City of Buford
Rebecca Keefer	Consultant / Special Projects Manager	City of Chamblee
Joey Murphy	City Administrator	City of Dacula
Brittini Nix	City Planner	City of Dacula
Jimmy Wilbanks	Mayor	City of Dacula
Margie Pozin	City Engineer	City of Duluth
Bill Aiken	Planning and Development Director	City of Duluth
Judy Jordan Johnson	Mayor	City of Lawrenceville
Eric Van Otteren	Economic Development	City of Snellville
Marty Allen	City Manager	City of Suwanee
Jim Brooks	Executive Director	Evermore CID
Masha Anderson Bomar	Executive Director	Gateway 85 CID
Matt Gore	Project Manager	Gateway 85 CID
Sam Harris	Traffic Engineer	Georgia Department of Transportation
Laura Olle	Intern	Georgia Department of Transportation
Jesse Jones	GCPD Assistant Chief	Gwinnett County Police Department
Butch Ayers	GCPD Chief of Police	Gwinnett County Police Department
Stoney Polite	Chief of Logistics	Gwinnett County Fire Department
Russell Knick	Fire Chief	Gwinnett County Fire Department
Ronnie Ezell	FF/LT	Gwinnett County Fire Department
Karen Winger	Transit Division Director	Gwinnett County Department of Transportation
Alex Hofelich	Division Director for Traffic Engineering	Gwinnett County Department of Transportation

Name	Title	Organization
Tom Sever	Deputy Director for Traffic Engineering, Operations, and Maintenance	Gwinnett County Department of Transportation
Vince Edwards	Section Manager – Infrastructure Analysis	Gwinnett County Department of Transportation
Ken Keena	Engineer IV	Gwinnett County Department of Transportation
Joe Allen	Executive Director	Gwinnett Place CID
Emory Morsberger	Executive Director	Lilburn CID
Alyssa Davis	Executive Director	Sugarloaf CID

Map of Gwinnett County in Three Area Zones

This map was later updated to better represent the county and stakeholder's input.

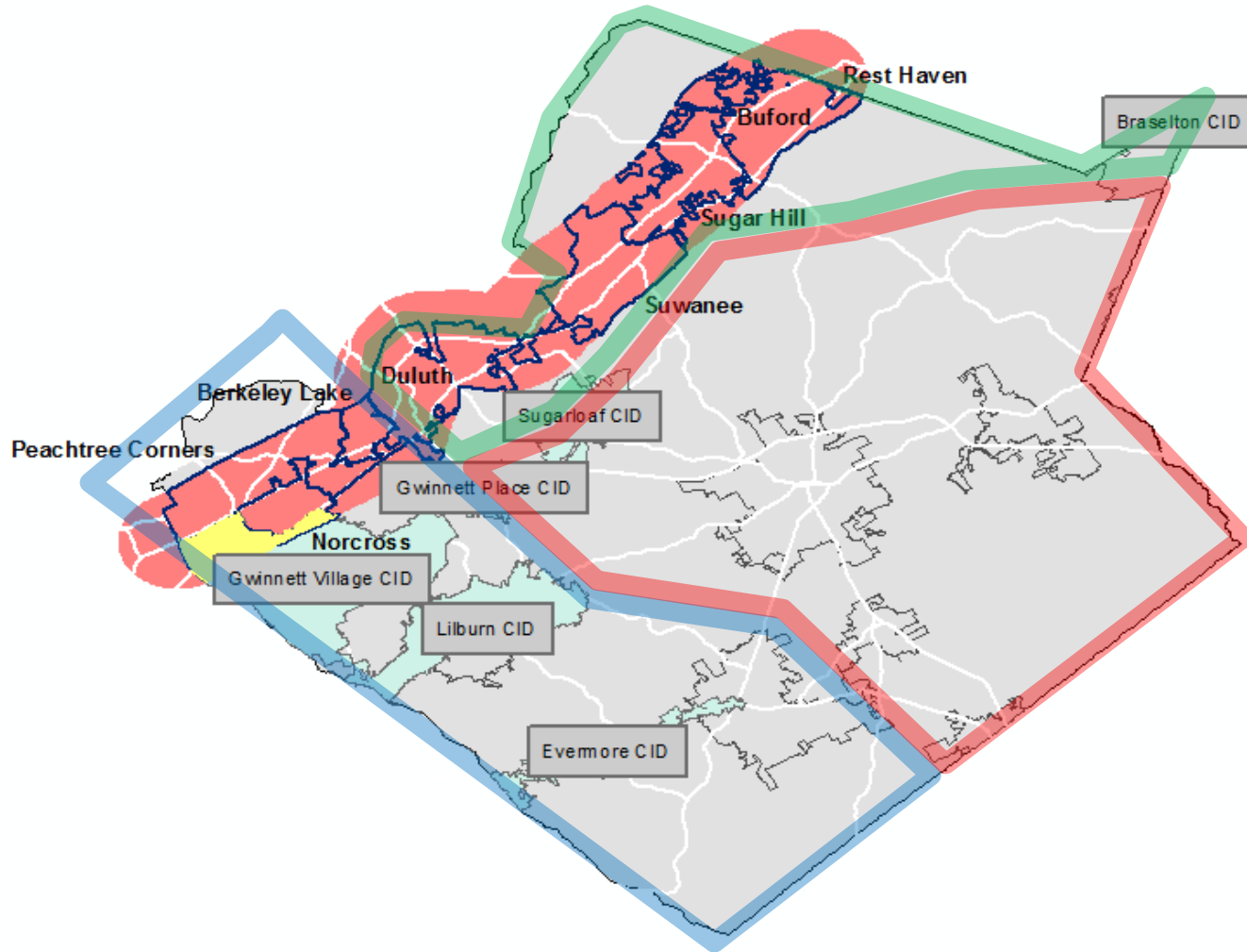


Table 18. Zone 1

Location	Goal/Action	Reason	Priority
<u>Jimmy Carter Blvd @ Buford Hwy</u>	Enhance/create electronic wayfinding for freight carriers and consider preference/preemption for freight	Freight can move more efficiently through the area and vehicular traffic will be less impacted by freight	High
Various	Consider adding technology to pedestrian signals (RRFB/PHB, etc.) to warn drivers that they are nearing an activated signal for a crossing ahead	Pedestrians have an additional layer of protection at pedestrian crossings	Medium
Everywhere	V2V – Driver awareness of approaching emergency vehicles	Drivers to clear route for emergency vehicles. Driver distraction and vehicle noise limitation have reduced the effectiveness of emergency sirens on police and fire vehicles	High
Everywhere	V2I – Emergency vehicle – traffic light preemption	Quick emergency response to incidents	High
Everywhere	Alert authorities of traffic flow issue or driver/vehicle initiated a notice of accident, etc.	Quick response to the situation to mitigate and get traffic moving again.	Medium
<u>Parkview High School and Trickum Middle School</u>	Reset nearby lights to allow better flow in and out		
<u>US-29 and Jimmy Carter Blvd</u>	Worsening backups during rush hour	Reduce bottlenecks	
<u>US-29 @ Rockbridge Rd NW</u>	Worsening backups during rush hour	Reduce bottlenecks	
<u>Jimmy Carter Blvd @ Lawrenceville Hwy</u>	Rush hour drivers traveling in the turn lane and switching into through lane at the light	Delineators or plastic curbs to stop turn lane abuse	
Jimmy Carter Blvd, Beaver Ruin Rd, Indian Trail Rd	Instrument signals with pedestrian detection	Make walking safer	Medium
Zone 1	Instrument JCB between McDonough Dr. and Buford Hwy, as well as Buford Hwy	Trucks can have signal prioritization	High

Location	Goal/Action	Reason	Priority
<u>Brook Hollow Parkway</u>	Expedite transit and future BRT		High
Zone 1	Reduce traffic congestion on US 78	Improvements to US 78 at 285	High
<u>Snellville Town Center. 124, 78, Wisteria Dr</u>	Town Center Development	Begin construction fall 2019	High
<u>Scenic HWY 124 from 78 To Web Gin</u>	Traffic and emergency vehicle		Medium
<u>Hwy 78 east to west</u>	Emergency vehicles		Low
Everywhere	Identify "hard-driving" so it can be addressed and reduce wear and tear on vehicles	Identify specific vehicles and drivers that are in need of retraining	Medium
County-wide	Ensure that Public Safety is able to view cameras throughout the county because we often get bad information about where the incident is located	So we can respond promptly to the correct location	Medium
County-wide	Traffic congestion – trying to get emergency response trucks around all congestion	We can get to emergency scenes faster	High
<u>Mall of GA Blvd west of fire station 24</u>	Improve the ability of station 24 to get through traffic Heading towards Buford Dr	Station 24 can respond promptly to emergencies in that direction	Medium
Particularly in areas with large buildings like malls, schools, where it may be harder to "radio out" from inside	Improve portable radio communication/eliminate dead spots	So we always have good radio communication during emergency incidents	High

Table 19. Zone 2

Location	Goal/Action	Reason	Priority
Braselton	Connect traffic signals to Gwinnett System		Low
Braselton	Improve pedestrian safety	Crossing SR 211 is safer	High
Duluth	Know how many trains will clog up the at-grade crossings and for how long as multiple trains in a row tend to clog up all crossings and it takes a long time to recover. Ideally, road users have access to this info long before I approach the crossings		
<u>SR 120 WB heading into Duluth</u>	Relieve congestion. Can traffic be diverted This is RR related		
<u>PIB and SR 120</u>	Alleviate bottleneck @ PIB and SR 120. Widening project assumed to help	Traffic congestion decrease. Level of Service Increase	
<u>Pleasant Hill Rd at Satellite Blvd</u>	Intersection needs mobility and safety enhancements	Intersection needs to be improved to better move vehicle and move make more pedestrian friendly	High
Satellite Blvd – Old Norcross to Old Norcross NW	Move employees entering/exiting office buildings during AM/PM peak into office parks	Backups do not occur on roadways new office buildings crossings.	Medium
<u>Entering Gwinnett Place Dr</u>	Adjust Traffic signalization during special events or accidents clog Steve Reynolds, Pleasant Hill, and Satellite Blvd	Drivers alerted to alternative or signals adjusted until “event” has passed	Medium
Pleasant Hill At Major intersections from <u>Pleasant Hill @ Club</u> to <u>Pleasant Hill @ Old Norcross</u>	Pedestrian crossings between intersections and not at crosswalks. Due to larger blocks	Not cross. Mid-block.	High
<u>Venture Pkwy/Dr at Day Dr</u>	Improve safety at the intersection	Project underway	Medium
<u>Steve Reynolds Blvd at I-85</u>	Backups to enter and exit interstate	Relieve backups on Steve Reynolds in AM	Medium

Location	Goal/Action	Reason	Priority
<u>Pleasant Hill at I-85</u>	Trucks blocking lanes	Remove vehicles from blocking DDI and allow easier flow of vehicles	High
Peachtree Corners – St. 4			
Norcross – 1, 11, 23, 25, 3, 22, 6, 28, 19			
Lilburn, Duluth, Snellville, Loganville	Reduce travel time	Better respond to emergencies	High
<u>5885 Live Oak Pkwy – Fire Station 11</u>	Reduce travel time to emergencies	Mitigate more quickly	
<u>Snellville – Fire Station 12 – 2815 Lenora Church Rd</u>	Reduce travel time through heavy travel time	Fire responds in a timely manner. EMS in emergencies	High
<u>Sugarloaf Pkwy @ Satellite Blvd</u>	Figure out how to coordinate pedestrian and vehicle movements during big events	We can help pedestrians move more efficiently and safely (and can help cars look out for pedestrians)	High
Buford Hwy @ Buford Drive Buford Hwy @ Hamilton Mill Rd Hamilton Mill Rd @ South Coon Rd Buford Dr @ Gravel Springs Rd	Heavy congestion at all four intersections during peak traffic hours	Communication which would or could alert drivers to seek an alternate route	High
<u>Buford Hwy @ George Pierce Park</u>	During sporting events, traffic backs up inside the park enormously	Have more dynamic signalization. 90% of the time not a problem but when it's a problem, it is significant	Medium
<u>Town Center Ave @ Buford Hwy</u>	Pedestrian safety, existing HAWK needs to be replaced	Ped safety	High
<u>PIB and Suwanee Dam Drive</u>	Peak hour congestion		High
<u>PIB @ McGinnis Ferry</u>	Peak congestion relief		Medium
<u>Lawrenceville-Suwanee + Satellite Blvd</u>	Peak congestion		Medium

Location	Goal/Action	Reason	Priority
<u>SR20 @ Old Peachtree Rd NE</u>	SR20 increased traffic due to development	Find ways to use technology to make traffic flow smoothly	
All areas	Use the technology to be able to determine a vehicles exact location	Find crash sites faster	
<u>Horizon Dr @ Lawrenceville-Suwanee</u>	Peak hour congestion		High

Table 20. Zone 3

Location	Goal/Action	Reason	Priority
<u>Dacula Rd @ Winder Hwy</u>	need for better driver decision-making to choose between SR 316 and US 29 routes; Dacula at Fence is a key point on the US 29 corridor		
<u>Duluth Hwy @ University Pkwy</u>		this intersection has significant left turn crashes	
<u>SR 316 at Harbins Rd</u>	history of fatal crashes		
<u>Duluth HWY at Professional Drive, Lawrenceville, GA 30046</u>	these locations need transit signal priority, due to significant bus delays		
<u>Sugarloaf Mills Park/Ride</u>	perhaps provide motorists with I-85 traffic conditions and parking space availability		
<u>Near Braselton</u>		this area near Braselton is impacted when there is a crash on SR 316, and impacts traffic around Dacula as well (Dacula is growing quickly)	
<u>US-29 @ Jimmy Carter Blvd</u>	this area has significant congestion 3-5 PM, particularly when there is a crash on US-29		
<u>Fire Station #3</u>	it takes a significant amount of time for the fire truck to leave the station, due to congestion on the two-lane roadway. The nearest signals that could be used to flush the roadway congestion would be at Lucerne and Killian		

APPENDIX C APPLICATIONS BEING TESTED NATIONWIDE

Near-term Applications (1-3 years)

Curve Speed Warning

Description: An application where alerts are provided to the driver who is approaching a curve at a speed that may be too high for safe travel through that curve. The curve speed warning system is a cooperative vehicle and infrastructure system that assists drivers in avoiding crashes. The application provides a warning to the driver that the vehicle's current speed may be too high to safely traverse one or more upcoming curves. Alerts are classified by the location of the vehicle within the curve and the vehicle speed at the time of the alert.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Deployment: New York (testing), Florida (testing), Michigan (planning), and Minnesota (researching)

Emergency Vehicle Preemption (PREEMPT)

Description: An application that provides signal preemption to emergency vehicles and accommodates multiple emergency requests.

The EVP application is a very high level of priority for emergency first responder vehicles. Historically, priority for emergency vehicles has been provided by special traffic signal timing strategies called preemption. The goal of EVP is to facilitate safe and efficient movement through intersections. As such, clearing queues and holding conflicting phases can facilitate emergency vehicle movement. For congested conditions, it may take additional time to clear a standing queue, so the ability to provide information in a timely manner is important. In addition, transitioning back to normal traffic signal operations after providing EVP is an important consideration since the control objectives are significantly different.

Potential Benefits: Mobility benefits for driver on non-arterial road

Deployment: Maricopa County, Arizona (deployment), Pennsylvania (planning), and Virginia (planning)

Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)

Description: An application that provides input to responder vehicle routing, staging, and secondary dispatch decisions.

The Incident Scene Pre-Arrival Staging Guidance for Emergency Responders application will provide situational awareness to and coordination among emergency responders - upon dispatch, while en route to establish incident scene work zones, upon initial arrival and staging of assets, and afterward if circumstances require additional dispatch and staging. The application collects a variety of data from emergency, traffic, and maintenance centers. The application includes a vehicle and equipment staging function that supplies the en-route responders with additional information about the scene of an incident that they can use to determine where to stage personnel and equipment prior to their arrival on-scene. The application also includes a dynamic routing function that provides emergency responders with real-time navigation instructions to travel from their base to the incident scene, accounting for traffic conditions, road closures, and snowplow reports if needed. In addition, the application includes an emergency responder status reporting function that continuously monitors the location of the en-route responder vehicles as well as the vehicles already on-scene. The function develops and maintains the current position of the responder's vehicles and provides updates for estimated time of arrival to other applications.

Intelligent Traffic Signal System (I-SIG)

Description: An overarching system optimization application accommodating signal priority, preemption, and pedestrian movement requirements.

The Intelligent Traffic Signal System (I-SIG) application uses both vehicle location and movement information from connected vehicles as well as infrastructure measurement of non-equipped vehicles to improve the operations of traffic signal control systems. The application utilizes the vehicle information to adjust signal timing for an intersection or group of intersections to improve traffic flow, including allowing vehicle flow through the intersection. The application serves as an overarching system optimization application, accommodating other mobility applications such as TSP, FSP, EVP, and Pedestrian Mobility to maximize overall arterial network performance. The application may consider additional inputs such as environmental situation information or the interface (i.e., traffic flow) between arterial signals and ramp meters.

Potential Benefits: Mobility benefits for driver on non-arterial road

Deployment: Maricopa County, Arizona (deployment), Florida (testing), New York (testing), and Virginia (planning)

Mobile Accessible Pedestrian Signal System (PED-SIG)

Description: An application that allows for an automated call from the smart phone of a visually impaired pedestrian to the traffic signal, as well as audio cues to safely navigate the crosswalk.

Potential Benefits: Mobility benefits for drivers and pedestrians on non-arterial road

Deployment: Maricopa County, Arizona (deployment), Florida (testing), and New York (testing)

Multimodal Intelligent Traffic Signal System (MMITSS)

Description: The MMITSS application bundle seeks to develop a comprehensive traffic signal system that services all modes of transportation. MMITSS is composed of the following applications:

- Intelligent Traffic Signal System (I-SIG)
- Transit Signal Priority (TSP)
- Freight Signal Priority (FSP)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)

Potential Benefits: Mobility benefits for agencies on arterial and non-arterial road

Deployment: Maricopa County, Arizona (deployment), California (deployment), Colorado (planning), Pennsylvania (planning), and Utah (testing)

Pedestrian in Signalized Crosswalk Warning (Transit)

Description: An application that warns transit bus operators when pedestrians within the crosswalk of a signalized intersection are in the intended path of the bus. This application utilizes RSE to warn bus drivers of a pedestrian's presence using pedestrian detection equipment set up to recognize pedestrians in delineated crosswalks.

Potential Benefits: Safety benefits for driver on non-arterial road

Deployment: Florida (testing), New York (testing), Minnesota (planning), and Texas (planning)

Red Light Violation Warning

Description: An application that broadcasts SPaT information and other data to connected vehicles, to provide a warning to the driver if they may violate an upcoming red light, based on the driver's approach speed and distance to the intersection. The application in the vehicle cross references the vehicle's speed and acceleration profile, along with the signal timing and geometry information, to determine whether it appears likely that the vehicle will enter the intersection in violation of a traffic signal. If the violation seems likely to occur, a warning can be provided to the driver.

Potential Benefits: Safety benefits for driver on non-arterial road

Deployment: Michigan (testing) and Virginia (planning)

Reduced Speed/Work Zone Warning

Description: An application that utilizes RSE to broadcast alerts to drivers warning them to reduce speed, change lanes, or come to a stop within work zones.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Deployment: Maricopa County, Arizona (deployment), New York (planning), and Virginia (planning)

Transit Signal Priority (TSP) and Freight Signal Priority (FSP)

Description: An application that provides signal priority to transit at intersections and along arterial corridors as well as signal priority to freight vehicles along an arterial corridor near a freight facility.

The TSP application uses transit V2I communications to allow a transit vehicle to request a priority at one or a series of intersection. The application includes feedback to the transit driver indicating whether the signal priority has been granted or not. This application can contribute to improved operating performance of the transit vehicles by reducing the time spent stopped at a red light.

Potential Benefits: Mobility benefits for driver on non-arterial road

Deployment: Maricopa County, Arizona (deployment), Colorado (planning), Florida (planning), Michigan, (testing), Minnesota (planning), Pennsylvania (planning), Tennessee (planning), Utah (deployment), and Virginia (planning)

Short-term Applications (3-5 years)

Advanced Traveler Information System

Description: The Advanced Traveler Information System application provides for the collection, aggregation, and dissemination of a range of transportation information. The collection of information includes traffic, transit, road weather, work zone, and connected vehicle-related data. All the sources of data are aggregated into data environments that can be used to drive data portals, allowing dissemination of the spectrum of transportation information to travelers via mobile devices, in-vehicle displays, web portals, 511 systems, and roadside signage.

Potential Benefits: Environmental benefits for driver on arterial and non-arterial road

Deployment: Tennessee (planning) and Virginia (planning)

Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)

Description: An application that warns on-scene workers of vehicles with trajectories or speeds that pose a high risk to their safety. It also warns drivers passing an incident zone if they need to slow down, stop, or change lanes.

The Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE) application employs communications technologies to provide warnings and alerts relating to incident zone operations. One aspect of the application is an in-vehicle messaging system that provides drivers with merging and speed guidance around an incident. Another aspect is providing in-vehicle incident scene alerts to drivers, both for the protection of the drivers and incident zone personnel. A third aspect is an infrastructure-based warning system for on-scene workers when a vehicle approaching or in the incident zone is being operated outside of safe parameters for the conditions. Additional information such as arriving and staging of additional responders is provided to assist in staging decisions and response to the incident.

Potential Benefits: Mobility and safety benefits for driver on arterial and non-arterial road

Deployment: Tennessee (planning) and Virginia (planning)

Vehicle Turning Right in Front of Bus Warning (Transit)

Description: An application that warns transit bus operators of the presence of vehicles attempting to go around the bus to make a right turn as the bus departs from a bus stop.

The Vehicle Turning Right in Front of a Transit Vehicle (VTRFTV) application determines the movement of vehicles near a transit vehicle stopped at a transit stop and provides an indication to the transit vehicle operator that a nearby vehicle is pulling in front of the transit vehicle to make a right turn. This application will help the transit vehicle determine whether the area in front of it will not be occupied as it begins to pull away from a transit stop.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Deployment: Florida (planning) and New York (planning)

Work Zone Traveler Information

Description: An application that monitors and aggregates work zone traffic data.

Potential Benefits: Agency data benefits for agencies on arterial and non-arterial road

Deployment: Pennsylvania (planning) and Virginia (planning)

Long-term Applications (5+ years)

Eco-traffic Signal Timing

Description: An application that uses data collected wirelessly from vehicles (and other sources) to optimize the performance of traffic signals, thus reducing fuel consumption and emissions.

The Eco-Traffic Signal Timing application is similar to current adaptive traffic signal control systems; however, the application's objective is explicitly to optimize traffic signals for the environment rather than the current adaptive systems' objective, which is to enhance the intersection level of service or throughput, which might improve the intersection's environmental performance. The Eco-Traffic Signal Timing application processes real-time and historical connected vehicle data at signalized intersections to reduce fuel consumption and overall emissions at the intersection, along a corridor, or for a region. The application evaluates traffic and environmental parameters at each intersection in real time and adapts so that the traffic network is optimized using available green time to serve the actual traffic demands while minimizing the environmental impact.

Potential Benefits: Environmental benefits for driver on non-arterial road

Freight Advanced Traveler Information Systems (FRATIS)

Description: The FRATIS application bundle seeks to provide freight-specific route guidance and optimize drayage operations so that load movements are coordinated between freight facilities to reduce empty-load trips. FRATIS is composed of the following applications:

- Freight Specific Dynamic Travel Planning and Performance)
- Drayage Optimization (DR-OPT)

Potential Benefits: Mobility benefits for agencies on arterial and non-arterial road

Freight Drayage Optimization

Description: An application that optimizes truck/load movements between freight facilities, balancing early and late arrivals.

The Freight Drayage Optimization application covers the information exchanges between all intermodal parties to provide current drayage truck load matching and container availability and appointment scheduling at railroad and steamship line terminals. The application includes a link from drivers and freight management systems dispatchers to an intermodal terminal reservation system and integrates an appointment function with Terminal Queue Status and Load Matching. The application set provides information to the dispatcher and driver concerning the availability status for pickup of a container at an intermodal terminal. The application bundle also provides drivers and dispatchers with both intermodal terminal queue length, and estimated time from the back of the queue to the gate.

Potential Benefits: Mobility benefits for driver on arterial and non-arterial road

Freight-Specific Dynamic Travel Planning and Performance

Description: An application that enhances traveler information systems to address specific freight needs. Provides information such as wait times at ports, road closures, work zones, and route restrictions.

The Freight-Specific Dynamic Travel Planning application provides both pre-trip and en route travel planning, routing, and commercial vehicle-related traveler information, which includes information such as truck parking locations and current status. The information will be based on data collected from the commercial fleet as well as general traffic data collection capabilities. The information, both real time and static, can be provided directly to fleet managers, to mobile devices used by commercial vehicle operators, or directly to in-vehicle systems as commercial vehicles approach roadway exits with key facilities such as parking. The application can also provide oversize/overweight permit information to commercial managers.

Potential Benefits: Mobility benefits for driver on arterial and non-arterial road

In-Vehicle Signage

Description: The In-Vehicle Signage application augments regulatory, warning, and informational signs and signals by providing information directly to drivers through in-vehicle devices. The information provided includes static sign information (e.g., stop, curve warning, guide signs, service signs, and directional signs) and dynamic information (e.g., current signal states including highway intersection and highway-rail intersection status and local conditions warnings identified by local environmental sensors). This application also includes the capability for maintenance and construction and emergency vehicles to transmit sign information to vehicles in the vicinity so that in-vehicle signing can be used without fixed infrastructure in work zones and around incidents.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Intermittent Bus Lanes (IBL)

Description: The Intermittent Bus Lane (IBL) application provides dedicated bus lanes during peak demand times to enhance transit operations mobility. IBL consists of a lane that can change its status from regular lane (accessible for all vehicles) to bus lane, for the time strictly necessary for a bus or set of buses to pass. The status of the IBL is communicated to drivers using roadside message signs and through in-vehicle signage. The creation and removal of dedicated bus lanes is managed through coordination between traffic and transit centers.

Potential Benefits: Mobility benefits for agencies on arterial and non-arterial road

Pedestrian in Signalized Crosswalk Warning

Description: A V2I system that assists drivers in avoiding crashes involving pedestrians at signalized intersections. The application provides a warning to the vehicle driver when, based on their movement and location of the pedestrian and crosswalk, a potential conflict exists.

Potential Benefits: Safety benefits for drivers and pedestrians on non-arterial road

Pedestrian Mobility

Description: The Pedestrian Mobility application will integrate traffic and pedestrian information from roadside or intersection detectors and new forms of data from wirelessly connected, pedestrian (or bicyclist) carried mobile devices (nomadic devices) to request dynamic pedestrian signals or to inform pedestrians when to cross and how to remain aligned with the crosswalk based on real-time SPaT and MAP information. In some cases, priority will be given to pedestrians, such as persons with disabilities who need additional crossing time, or in special conditions (e.g., weather) where pedestrians may warrant priority or additional crossing time. This application will enable a "pedestrian call" to be routed to the traffic controller from a nomadic device of a registered person with disabilities after confirming the direction and orientation of the roadway that this pedestrian is intending to cross. The application also provides warnings to the personal information device user of possible infringement of the crossing by approaching vehicles.

Potential Benefits: Mobility benefits for drivers and pedestrians on non-arterial road

Railroad Crossing Violation Warning (RCVW)

Description: The Railroad Crossing Violation Warning (RCVW) application will alert and/or warn drivers who are approaching an at-grade railroad crossing if they are on a crash-imminent trajectory to collide with a crossing or approaching train. This will be achieved through the integration of both vehicle-based and infrastructure-based technologies. The RSE sends to the vehicle detailed geometric information about the intersection, as well as information about whether a train is approaching or blocking the intersection. The geometric information could be obtained from an RSE at the intersection or obtained from an RSE at some earlier point in the vehicle's trip. The information about the approach or presence of a train is obtained from the infrastructure via a connection between the rail infrastructure and the RSE. The information received from the RSE at the intersection could also be augmented with road surface information or other weather-related data. A more advanced version of the application could provide train arrival information or information about the amount of time the Highway Rail Intersection will be blocked by the train.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Reduced Speed Zone Warning (RSZW)

Description: The Reduced Speed Zone Warning/Lane Closure (RSZW/LC) application provides connected vehicles that are approaching a reduced speed zone with information on the zone's posted speed limit and/or whether the configuration of the roadway is altered (e.g., lane closures, lane shifts). Reduced speed zones include (but are not be limited to) construction/work zones, school zones, pedestrian crossing areas, and incorporated zones (e.g., rural towns). The RSZW/LC application inside the connected vehicle uses the revised speed limit along with any applicable changed roadside configuration information to determine whether to provide an alert or warning to the driver. Additionally, to provide warnings to non-equipped vehicles, infrastructure equipment measures the speed of the approaching vehicles, and if greater than the reduced speed zone posted speed limit, will provide warning signage. The application will provide an alert to drivers in advance when aggressive braking is required to reduce to the posted speed limit.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Restricted Lane Warning

Description: The Restricted Lane Warning application provides the connected vehicle with restriction information about the travel lanes, such as if the lane is restricted to high occupancy vehicles, transit, or public safety vehicles only or has defined eco-lane criteria. A connected vehicle can use this information to determine whether the vehicle is in a lane that has lane restrictions.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Road Weather Information and Routing Support for Emergency Responders

Description: The Road Weather Information and Routing Support for Emergency Responders application provides the capability of collecting road weather data from connected vehicles and other sources and using that data to develop short-term warnings or advisories that can be provided to individual emergency response vehicles or to emergency response dispatchers. The information may come from vehicles operated by the general public and commercial entities (including passenger cars and trucks) or specialty vehicles and public fleet vehicles (such as snowplows, maintenance trucks, and other agency pool vehicles). The raw data will be processed

in a controlling center to generate road segment-based data outputs. The processing will also include a road weather vehicle alerts algorithm to generate short time horizon alerts that will be pushed to user systems and available to emergency response dispatchers. The short time horizon alerts that are pushed to emergency vehicle drivers and dispatchers will include information on high winds, standing water, and flooding of roadways. This information will be acquired from other fixed and remote observation systems and will be provided with as much geographic precision as possible. In addition, the information collected can be combined with observations and forecasts from other sources to provide medium (next 2 to 12 hours) or long-term (more than 12 hours) advisories through a variety of interfaces, including web-based and connected vehicle-based interfaces.

Potential Benefits: Safety weather warnings for agencies on arterial and non-arterial road

Road Weather Information for Freight Carriers

Description: The Road Weather Information for Freight Carriers application is a special case of the Road Weather Advisories and Warnings for Motorists application focuses on Freight Carrier users. This application provides the capability of collecting road weather data from connected vehicles and using that data to develop short-term warnings or advisories that can be provided to individual commercial vehicles or to commercial vehicle dispatchers. The information may come from vehicles operated by the general public and commercial entities (including passenger cars and trucks) or specialty vehicles and public fleet vehicles (such as snowplows, maintenance trucks, and other agency pool vehicles). The raw data will be processed in a controlling center to generate road segment-based data outputs. The processing will also include a road weather commercial vehicle alerts algorithm to generate short time horizon alerts that will be pushed to user systems and available to commercial vehicle dispatchers. In addition, the information collected can be combined with observations and forecasts from other sources to provide medium (next 2 to 12 hours) or long-term (more than 12 hours) advisories through a variety of interfaces including web-based and connected vehicle-based interfaces.

Potential Benefits: Safety weather warnings for driver on arterial and non-arterial road

Road Weather Information for Maintenance and Fleet Management Systems

Description: The Road Weather Information for Maintenance and Fleet Management Systems Application can be viewed as a stand-alone application and as an adjunct to the Enhanced-MDSS. Vehicle data is collected both from vehicles used during winter maintenance and from other maintenance vehicles and equipment used year-round. The data collected is road weather data as well as specialized maintenance information such as status of vehicle systems, material distribution rate, and materials remaining. The data collected can be used by maintenance or fleet dispatchers to monitor the status of the maintenance operations, or the data can be used as an input to the Enhanced-MDSS application.

Potential Benefits: Safety weather warnings for agencies on arterial and non-arterial road

Transit Pedestrian Indication

Description: The Transit Pedestrian Indication application provides vehicle-to-device communications to inform pedestrians at a station or stop about the presence of a transit vehicle. In addition, this application informs the transit vehicle operator about the presence of pedestrians nearby and those waiting for the bus. It helps prevent collisions between transit vehicles and pedestrians.

Potential Benefits: Mobility benefits for driver on non-arterial road

Transit Stop Request

Description: The Transit Stop Request application allows a transit passenger to send a stop request to an approaching transit vehicle. This application allows a transit vehicle to know that a passenger has requested a transit stop from an infrastructure device.

Potential Benefits: Mobility benefits for pedestrian on non-arterial road

Transit Vehicle at Station/Stop Warnings

Description: The Transit Vehicle at Station/Stop Warnings application informs nearby vehicles of the presence of a transit vehicle at a station or stop. The application also indicates the intention of the transit vehicle when pulling into or out of a station/stop.

Potential Benefits: Mobility and safety benefits for driver on non-arterial road

Warnings about Hazards in a Work Zone (WHWZ)

Description: The Warnings about Hazards in a Work Zone (WHWZ) application provides warnings to maintenance personnel within a work zone about potential hazards within the work zone. This application enables vehicles or the infrastructure to provide warnings to workers in a work zone when a vehicle is moving in a manner that appears to create an unsafe condition (e.g., moving at high speed or entering the work zone).

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

Warnings about Upcoming Work Zones (WUWZ)

Description: The Warnings about Upcoming Work Zone (WUWZ) application provides information about the conditions that exist in a work zone to vehicles that are approaching the work zone. This application provides approaching vehicles with information about work zone activities that may result in unsafe conditions to the vehicle, such as obstructions in the vehicle's travel lane, lane closures, lane shifts, speed reductions, or vehicles entering/exiting the work zone.

Potential Benefits: Safety benefits for driver on arterial and non-arterial road

APPENDIX D CVTMP PRESENTATION

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

- 1. **Award No.**
69A3552341004- SMARTFY22N1P1G21
- 2. **Effective Date**
See No. 17 Below
- 3. **Assistance Listings No.**
20.941
- 4. **Award To**
Gwinnett County Board of Commissioners
- 5. **Sponsoring Office**
U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
1200 New Jersey Avenue, SE
Washington, DC 20590

Unique Entity Id:
CH7PF EADFRK3

- 6. **Period of Performance**
10/01/23 to 04/01/25
- 7. **Total Amount**
Federal Share: \$1,053,400
Recipient Share: \$0
Other Federal Funds: \$0
Other Funds: \$0
Total: \$1,053,400
- 8. **Type of Agreement**
Grant
- 9. **Authority**
Section 25005 of the Infrastructure Investment and Jobs Act (Pub. L. 117-58, November 15, 2021; also referred to as the "Bipartisan Infrastructure Law" or "BIL")
- 10. **Procurement Request No.**
69A3552341004
- 11. **Federal Funds Obligated**
\$1,053,400
- 12. **Submit Payment Requests To**
See article 19.
- 13. **Payment Office**
See article 19.

14. **Accounting and Appropriations Data** 69A3552341004

15. **Description of Project** Prototype safety technologies along Gwinnett County's Singleton Road Corridor, including passive pedestrian detection and Transit Signal Priority.

RECIPIENT

16. **Signature of Person Authorized to Sign**

Buffy Alexzulia 9.22.2023
Signature Date
Name: **Buffy Alexzulia**
Title: Director, Financial Services

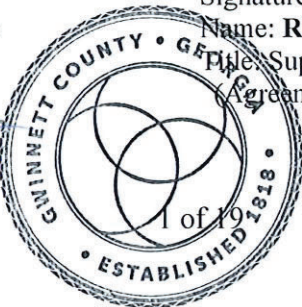
17. **OFFICE OF THE ASSISTANT SECRETARY FOR RESEARCH AND TECHNOLOGY Signature of Agreement Officer**

ROXANNE D LEDESMA
Signature
Name: **Roxanne Ledesma**
Title: Supervisory Grant Management Specialist (Agreement Officer)

Digitally signed by ROXANNE D LEDESMA
Date: 2023.09.25 15:59:22 -04'00'

Attest: Dina M King
County Clerk

Approved as to form:
Alison B. Calkins
Sr. Assistant County Attorney



U.S. DEPARTMENT OF TRANSPORTATION

**GRANT AGREEMENT UNDER THE
FISCAL YEAR 2023 STRENGTHENING MOBILITY AND REVOLUTIONIZING
TRANSPORTATION (SMART) GRANTS PROGRAM**

This agreement is between the [United States Department of Transportation (the “USDOT”)] and the Gwinnett County Board of Commissioners (the “Recipient”).

This agreement reflects the selection of the Recipient to receive a Strengthening Mobility and Revolutionizing Transportation (SMART) Grant for the Singleton Road Corridor Technology Improvements

The parties therefore agree to the following:

**ARTICLE 1
GENERAL TERMS AND CONDITIONS**

- (1) In this agreement, “General Terms and Conditions” means the content of the document titled “General Terms and Conditions Under the Fiscal Year Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program,” dated June 20, 2023, which is available at <https://www.transportation.gov/grants/smart/grants-management>. Articles 7–30 are in the General Terms and Conditions. The General Terms and Conditions are part of this agreement.
- (2) The Recipient states that it has knowledge of the General Terms and Conditions. Recipient also states that it is required to comply with all applicable Federal laws and regulations including, but not limited to, the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (2 CFR part 200); National Environmental Policy Act (NEPA) (42 U.S.C. § 4321 et seq.); and Build America, Buy America Act (BIL, div. G §§ 70901-27).
- (3) The Recipient acknowledges that the General Terms and Conditions impose obligations on the Recipient and that the Recipient’s non-compliance with the General Terms and Conditions may result in remedial action, termination of the SMART Grant, disallowing costs incurred for the Project, requiring the Recipient to refund to the USDOT the SMART Grant, and reporting the non-compliance in the Federal-government-wide integrity and performance system.

**ARTICLE 2
APPLICATION, PROJECT, AND AWARD**

a. Application.

Application Title: Singleton Road Corridor Technology Improvements

Application Date: November 18, 2022

b. Award Amount.

SMART Grant Amount: \$1,053,400

c. Award Dates.

Period of Performance End Date: 04/01/2025

d. Budget Period

Budget Period End Date: 04/01/2025

FEDERAL AWARD IDENTIFICATION NUMBER.

The Federal Award Identification Number is listed on page 1, line 1.

**ARTICLE 3
SUMMARY PROJECT INFORMATION**

a. Summary of Project’s Statement of Work.

Prototype safety technologies along Gwinnett County’s Singleton Road Corridor, including passive pedestrian detection and Transit Signal Priority.

b. Project’s Estimated Schedule.

Milestone	Schedule Date
Evaluation & Data Management Plan (NLT 3mo after start)	01/01/2024
Draft Implementation Report (NLT 1 yr after start)	10/01/2024
Final Implementation Report (by the end of the POP)	04/01/2025

Project’s Estimated Costs.

(1) Eligible Project Costs

Eligible Project Costs	
SMART Grant Amount:	\$1,053,400
Other Federal Funds:	\$0
State Funds:	\$0
Local Funds:	\$0
In-Kind Match:	\$0
Other Funds:	\$0
Total Eligible Project Cost:	\$1,053,400

(2) Supplemental Estimated Budget

Cost Element	Federal Share	Non-Federal Share	Total Budget Amount
Direct Labor	\$0	\$0	\$0
Fringe Benefits	\$0	\$0	\$0
Travel	\$0	\$0	\$0
Equipment	\$200,000.00	\$0	\$200,000.00
Supplies	\$15,000.00	\$0	\$15,000.00
Contractual/Consultant	\$401,000.00	\$0	\$401,000.00
Construction	\$300,000.00	\$0	\$300,000.00
Other	\$137,400.00	\$0	\$137,400.00
Indirect Costs	\$0	\$0	\$0

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

Total Budget	\$1,053,400	\$0	\$1,053,400
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(3) Cost Classification Table -Implementation Grants Only

Utilize the descriptions from the SF-424c to determine what cost goes in each row.

Cost Classification	Total Costs	Non-SMART Previously Incurred Costs	Eligible Costs
Administrative and legal expenses			
Land, structures, rights-of-way, appraisals, etc.			
Relocation expenses and payments			
Architectural and engineering fees			
Other architectural and engineering fees			
Project inspection fees			
Site work			
Demolition and removal			
Construction			
Equipment			
Miscellaneous			
Contingency			
Project Total			

**ARTICLE 4
RECIPIENT INFORMATION**

a. Recipient's Unique Entity Identifier.

CH7PFEADFRK3

b. Recipient Contact(s).

Jerry Oberholtzer
Manager of Transportation Planning
75 Langley Drive,
Lawrenceville, GA 30046
770-822-7452
jerry.oberholtzer@gwinnettcountry.com

c. Recipient Key Personnel.

Name	Title or Position
Jerry Oberholtzer	Manager of Transportation Planning

d. USDOT Project Contact(s).

Roxanne Ledesma
Strengthening Mobility and Revolutionizing Transportation Grants Program Manager
U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology 1200 New Jersey Avenue,
S.E.
Washington, DC 20590
(202) 774-8003
Roxanne.Ledesma@dot.gov

ARTICLE 5
USDOT ADMINISTRATIVE INFORMATION

5.1 Office for Subaward and Contract Authorization.

- (a) USDOT Office for Subaward and Contract Authorization: Office of the Assistant Secretary for Research and Technology SUBAWARDS AND CONTRACTS APPROVAL

Note: See 2 CFR § 200.331, Subrecipient and contractor determinations, for definitions of subrecipient (who is awarded a subaward) versus contractor (who is awarded a contract).

Note: Recipients with a procurement system deemed approved and accepted by the Government or by the AO are exempt from the requirements of this clause. See 2 CFR 200.317 through 200.327.

- (b) Unless described in the application and funded in the approved award, the Recipient must obtain prior written approval from the AO for the subaward, transfer, or contracting out of any work under this award above the Simplified Acquisition Threshold. This provision does not apply to the acquisition of supplies, material, equipment, or general support services. Approval of each subaward or contract is contingent upon the Recipient's submittal of a written fair and reasonable price determination, and approval by the AO for each proposed contractor/sub-recipient. Consent to enter into subawards or contracts will be issued through written notification from the AO or a formal amendment to the Agreement.
- (c) The following subawards and contracts are currently approved under the Agreement by the AO. This list does not include supplies, material, equipment, or general support services which are exempt from the pre-approval requirements of this clause.

(Fill in at award or by amendment)

5.2 Reimbursement Requests

- (a) The Recipient may request reimbursement of costs incurred in the performance of this agreement if those costs do not exceed the funds available under section 2.2 and are allowable under the applicable cost provisions of 2 C.F.R. Part 200, Subpart E. The Recipient shall not request reimbursement more frequently than monthly.
- (b) The Recipient shall use the DELPHI eInvoicing System to submit requests for reimbursement to the payment office. When requesting reimbursement of costs incurred or credit for cost share incurred, the Recipient shall electronically submit supporting cost detail with the SF 271 (Outlay Report and Request for Reimbursement for Construction Programs) to clearly document all costs incurred.

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

- (c) The Recipient's supporting cost detail shall include a detailed breakout of all costs incurred, including direct labor, indirect costs, other direct costs, travel, etc., and the Recipient shall identify the Federal share and the Recipient's share of costs. If the Recipient does not provide sufficient detail in a request for reimbursement, the AO may withhold processing that request until the Recipient provides sufficient detail.
- (d) The USDOT shall not reimburse costs unless the Agreement Officer's Representative (the "AOR") reviews and approves the costs to ensure that progress on this agreement is sufficient to substantiate payment.
- (e) The USDOT may waive the requirement in section 19.7(a) that the Recipient use the DELPHI eInvoicing System. The Recipient may obtain waiver request forms on the DELPHI eInvoicing website (<http://www.dot.gov/cfo/delphi-einvoicing-system.html>) or by contacting the AO. A Recipient who seeks a waiver shall explain why they are unable to use or access the Internet to register and enter payment requests and send a waiver request to

Director of the Office of Financial Management
US Department of Transportation,
Office of Financial Management B-30, Room W93-431
1200 New Jersey Avenue SE
Washington DC 20590-0001

or

DOTElectronicInvoicing@dot.gov.

- (f) To seek reimbursement from DOT, the Recipient shall submit documentary evidence of all expenditures associated with the Grant Project (those to be covered by the local and/or state contribution, as well as those covered by the Federal contribution) on a monthly basis. All reimbursement requests to DOT shall include sufficient documentation to justify reimbursement of the Recipient, including invoices and proof of payment of the invoice. In seeking reimbursements, grant recipients must provide invoices or other evidence of the expenditure, details about the expenditure and how it relates to the grant project, and evidence of payment.

The requirements set forth in these terms and conditions supersede previous financial invoicing requirements for Recipients.

ARTICLE 6
SPECIAL GRANT TERMS

- 6.1** SMART funds must be expended by the budget period end date in section 10.3 of the Terms and Conditions.
- 6.2** The Recipient should demonstrate compliance with civil rights obligations and nondiscrimination laws, including Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act of 1990 (ADA), Section 504 of the Rehabilitation Act, and implementing regulations. This should include a current Title VI plan, completed Community Participation Plan, and a plan to address any legacy infrastructure or facilities that are not compliant with ADA standards. The Department's and the applicable Operating Administrations' Offices of Civil Rights may work with awarded grant recipients to ensure full compliance with Federal civil rights requirements.
- 6.3** There are no other special grant requirements for this award.

**ATTACHMENT A
PERFORMANCE MEASUREMENT INFORMATION**

Baseline Measurement Date: Due 90 days after award

Baseline Report Date: Due 90 days after award

Table 1: Performance Measure Table

Measure	Category and Description	Measurement Frequency
Safety and Reliability	Qualitative Project Benefits: Qualitative description of the anticipated impacts of at-scale implementation on emergency response and the safety of systems for pedestrians, bicyclists, and the broader traveling public	End of period of performance
Resiliency	Qualitative Project Benefits: Qualitative description of the anticipated impacts of at-scale implementation on the reliability and resiliency of the transportation system including cybersecurity and climate change	End of period of performance
Equity and Access	Qualitative Project Benefits: Qualitative description of the anticipated impacts of at-scale implementation on connecting or expanding access to jobs, education, and essential services for underserved or disadvantaged populations	End of period of performance
Climate	Qualitative Project Benefits: Qualitative description of the anticipated impacts of at-scale implementation on congestion, air pollution, emissions, and energy efficiency	End of period of performance
Partnerships	Qualitative Project Benefits: Qualitative description of the anticipated impacts of	End of period of performance

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

Measure	Category and Description	Measurement Frequency
	at-scale implementation on the economic competitiveness and private sector investments or partnerships including technical and financial commitments	
Integration	Qualitative Project Benefits: Qualitative description of the anticipated impacts of at-scale implementation on the integration of systems and the connectivity of infrastructure, connected vehicles, pedestrians, bicyclists, and the broader traveling public	End of period of performance
Costs	Project Costs: Quantification of the cost of the proof-of-concept or prototype carried out using the grant (Stage 1)	End of period of performance
Costs	Project Costs: Quantification of the anticipated cost of at-scale implementation (Stage 2)	End of period of performance
Lessons Learned and Recommendations	Lessons Learned and Recommendations: Description of lessons learned and recommendations for future deployment strategies	End of period of performance

**ATTACHMENT B
CHANGES FROM APPLICATION**

INSTRUCTIONS FOR COMPLETING ATTACHMENT B: Describe all material differences between the scope, schedule, and budget described in the application and the scope, schedule, and budget described in Article 3. The purpose of this attachment B is to document the differences clearly and accurately in scope, schedule, and budget to establish the parties' knowledge and acceptance of those differences. See section 10.1.

Scope: No Change.

Schedule: No Change.

Budget: No Change.

The table below provides a summary comparison of the project budget.

Fund Source	Application		Section 3.3	
	\$	%	\$	%
Previously Incurred Costs (Non-Eligible Project Costs)	\$0	0	\$0	0
Federal Funds	\$0	0	\$0	0
Non-Federal Funds	\$0	0	\$0	0
Total Previously Incurred Costs	\$0	0	\$0	0
Future Eligible Project Costs	\$0	0	\$0	0
SMART Funds	\$1,053,400	100	\$1,053,400	100
Other Federal Funds	\$0	0	\$0	0
Non-Federal Funds	\$0	0	\$0	0
Total Future Eligible Project Costs	\$1,053,400	100	\$1,053,400	100
Total Project Costs	\$1,053,400	100	\$1,053,400	100

**ATTACHMENT C
CLIMATE CHANGE AND ENVIRONMENTAL JUSTICE IMPACTS**

1. Consideration of Climate Change and Environmental Justice Impacts.

The Recipient states that rows marked in the following table are accurate:

<input type="checkbox"/>	The Project directly supports a Local/Regional/State Climate Action Plan that results in lower greenhouse gas emissions. <i>(Identify the plan in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project directly supports a Local/Regional/State Equitable Development Plan that results in lower greenhouse gas emissions. <i>(Identify the plan in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project directly supports a Local/Regional/State Energy Baseline Study that results in lower greenhouse gas emissions. <i>(Identify the plan in the supporting narrative below.)</i>
<input checked="" type="checkbox"/>	The Recipient or a project partner used environmental justice tools, such as the EJSCREEN, to minimize adverse impacts of the Project on environmental justice communities. <i>(Identify the tool(s) in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project supports a modal shift in freight or passenger movement to reduce emissions or reduce induced travel demand. <i>(Describe that shift in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project utilizes demand management strategies to reduce congestion, induced travel demand, and greenhouse gas emissions. <i>(Describe those strategies in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project incorporates electrification infrastructure, zero-emission vehicle infrastructure, or both. <i>(Describe the incorporated infrastructure in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project supports the installation of electric vehicle charging stations. <i>(Describe that support in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project promotes energy efficiency. <i>(Describe how in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project serves the renewable energy supply chain. <i>(Describe how in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project improves disaster preparedness and resiliency <i>(Describe how in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project avoids adverse environmental impacts to air or water quality, wetlands, and endangered species, such as through reduction in Clean Air Act criteria pollutants and greenhouse gases, improved stormwater management, or improved habitat connectivity. <i>(Describe how in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project repairs existing dilapidated or idle infrastructure that is currently causing environmental harm. <i>(Describe that infrastructure in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project supports or incorporates the construction of energy- and location-efficient buildings. <i>(Describe how in the supporting narrative below.)</i>

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

<input type="checkbox"/>	The Project includes recycling of materials, use of materials known to reduce or reverse carbon emissions, or both. <i>(Describe the materials in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient has taken other actions to consider climate change and environmental justice impacts of the Project, as described in the supporting narrative below.
<input type="checkbox"/>	The Recipient has not yet taken actions to consider climate change and environmental justice impacts of the Project but, before beginning construction of the Project, will take relevant actions described in Attachment A. <i>(Identify the relevant actions from Attachment A in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient has not taken actions to consider climate change and environmental justice impacts of the Project and will not take those actions under this award.

2. **Supporting Narrative.**

[Recipient - Insert supporting text in last page, as described in the table above.]

**ATTACHMENT D
RACIAL EQUITY AND BARRIERS TO OPPORTUNITY**

1. Efforts to Improve Racial Equity and Reduce Barriers to Opportunity.

The Recipient states that rows marked with “X” in the following table are accurate:

<input type="checkbox"/>	A racial equity impact analysis has been completed for the Project. <i>(Identify a report on that analysis or, if no report was produced, describe the analysis and its results in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient or a project partner has adopted an equity and inclusion program/plan or has otherwise instituted equity-focused policies related to project procurement, material sourcing, construction, inspection, hiring, or other activities designed to ensure racial equity in the overall delivery and implementation of the Project. <i>(Identify the relevant programs, plans, or policies in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project includes physical-barrier-mitigating land bridges, caps, lids, linear parks, and multimodal mobility investments that either redress past barriers to opportunity or that proactively create new connections and opportunities for underserved communities that are underserved by transportation. <i>(Identify the relevant investments in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project includes new or improved walking, biking, and rolling access for individuals with disabilities, especially access that reverses the disproportional impacts of crashes on people of color and mitigates neighborhood bifurcation. <i>(Identify the new or improved access in the supporting narrative below.)</i>
<input type="checkbox"/>	The Project includes new or improved freight access to underserved communities to increase access to goods and job opportunities for those underserved communities. <i>(Identify the new or improved access in the supporting narrative below.)</i>
<input checked="" type="checkbox"/>	The Recipient has taken other actions related to the Project to improve racial equity and reduce barriers to opportunity, as described in the supporting narrative below.
<input type="checkbox"/>	The Recipient has not yet taken actions related to the Project to improve racial equity and reduce barriers to opportunity but, before beginning construction of the project, will take relevant actions described in Attachment A. <i>(Identify the relevant actions from Attachment A in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient has not taken actions related to the Project to improve racial equity and reduce barriers to opportunity and will not take those actions under this award.

2. Supporting Narrative.

[Recipient- Insert supporting text in last page, as described in the table above.]

**ATTACHMENT E
LABOR AND WORKFORCE**

1. Efforts to Support Good-Paying Jobs and Strong Labor Standards. Successful projects will also support the creation of good-paying jobs with the free and fair choice to join a union.

As outlined in the Notice of Funding Opportunity, applicants are evaluated and selected based on criteria including the extent to which applicants identify the necessary planning and engagement activities that, as projects are fully implemented during Stage 2, will ensure high-quality job creation by supporting good-paying jobs with a free and fair choice to join a union, incorporating strong labor standards (e.g., wages and benefits at or above prevailing, use of project labor agreements, registered apprenticeship programs, pre-apprenticeships tied to 16 registered apprenticeships, etc.), and/or providing workforce opportunities for historically underrepresented groups (e.g., workforce development program, etc.). The table below enables The Recipient to demonstrate how this criteria is addressed.

The Recipient states that rows marked with “X” in the following table are accurate:

<input type="checkbox"/>	The Recipient demonstrate, to the full extent possible consistent with the law, an effort to create good-paying jobs with the free and fair choice to join a union and incorporation of high labor standards. <i>(Identify the relevant agreements and describe the scope of activities they cover in the supporting narrative below.)</i>
<input checked="" type="checkbox"/>	The Recipient or a project partner has adopted the use of local and economic hiring preferences in the overall delivery and implementation of the Project. <i>(Describe the relevant provisions in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient or a project partner has adopted the use of registered apprenticeships in the overall delivery and implementation of the Project. <i>(Describe the use of registered apprenticeship in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient or a project partner will provide training and placement programs for underrepresented workers in the overall delivery and implementation of the Project. <i>(Describe the training programs in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient or a project partner will support free and fair choice to join a union in the overall delivery and implementation of the Project by investing in workforce development services offered by labor-management training partnerships or setting expectations for contractors to develop labor-management training programs. <i>(Describe the workforce development services offered by labor-management training partnerships in the supporting narrative below.)</i>

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

<input type="checkbox"/>	<p>The Recipient or a project partner will provide supportive services and cash assistance to address systemic barriers to employment to be able to participate and thrive in training and employment, including childcare, emergency cash assistance for items such as tools, work clothing, application fees and other costs of apprenticeship or required pre-employment training, transportation and travel to training and work sites, and services aimed at helping to retain underrepresented groups like mentoring, support groups, and peer networking. <i>(Describe the supportive services and/or cash assistance provided to trainees and employees in the supporting narrative below.)</i></p>
<input type="checkbox"/>	<p>The Recipient or a project partner has documented agreements or ordinances in place to hire from certain workforce programs that serve underrepresented groups. <i>(Identify the relevant agreements and describe the scope of activities they cover in the supporting narrative below.)</i></p>
<input type="checkbox"/>	<p>The Recipient or a project partner participates in a State/Regional/Local comprehensive plan to promote equal opportunity, including removing barriers to hire and preventing harassment on work sites, and that plan demonstrates action to create an inclusive environment with a commitment to equal opportunity, including:</p> <ul style="list-style-type: none"> a. affirmative efforts to remove barriers to equal employment opportunity above and beyond complying with Federal law; b. proactive partnerships with the U.S. Department of Labor’s Office of Federal Contract Compliance Programs to promote compliance with EO 11246 Equal Employment Opportunity requirements and meet the requirements as outlined in the Notice of Funding Opportunity to make good faith efforts to meet the goals of 6.9 percent of construction project hours being performed by women and goals that vary based on geography for construction work hours and for work being performed by people of color; c. no discriminatory use of criminal background screens and affirmative steps to recruit and include those with former justice involvement, in accordance with the Fair Chance Act and equal opportunity requirements; d. efforts to prevent harassment based on race, color, religion, sex, sexual orientation, gender identity, and national origin; e. training on anti-harassment and third-party reporting procedures covering employees and contractors; and f. maintaining robust anti-retaliation measures covering employees and contractors. <p><i>(Describe the equal opportunity plan in the supporting narrative below.)</i></p>
<input type="checkbox"/>	<p>The Recipient has taken other actions related to the Project to create good-paying jobs with the free and fair choice to join a union and incorporate strong labor standards. <i>(Describe those actions in the supporting narrative below.)</i></p>

STRENGTHENING MOBILITY AND REVOLUTIONIZING TRANSPORTATION (SMART) GRANTS PROGRAM

<input type="checkbox"/>	The Recipient has not yet taken actions related to the Project to create good-paying jobs with the free and fair choice to join a union and incorporate strong labor standards but, before beginning construction of the project, will take relevant actions described in schedule B. <i>(Identify the relevant actions from schedule B in the supporting narrative below.)</i>
<input type="checkbox"/>	The Recipient has not taken actions related to the Project to improving good-paying jobs and strong labor standards and will not take those actions under this award.

a. Supporting Narrative.

[Recipient- Insert supporting text in last page, as described in the table above.]

**ATTACHMENT F
CRITICAL INFRASTRUCTURE SECURITY AND RESILIENCE**

1. Efforts to strengthen the Security and Resilience of Critical Infrastructure against both Physical and Cyber Threats.

The Recipient states that rows marked with “X” in the following table are accurate:

<input checked="" type="checkbox"/>	The Recipient demonstrates, prior to the signing of this agreement, effort to consider and address physical and cyber security risks relevant to the transportation mode and type and scale of the activities.
<input checked="" type="checkbox"/>	The Recipient appropriately considered and addressed physical and cyber security and resilience in the planning, design and oversight of the project, as determined by the Department and the Department of Homeland Security.
<input checked="" type="checkbox"/>	The Recipient complies with 2 CFR 200.216 and the prohibition on certain telecommunications and video surveillance services or equipment.
<input type="checkbox"/>	For projects in floodplains: The Recipient appropriately considered whether the project was upgraded consistent with the Federal Flood Risk Management Standard, to the extent consistent with current law, in Executive Order 14030, Climate-Related Financial Risk (86 FR 27967), and Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Solicit and Considering Stakeholder Input (80 FR 6425).

2. Supporting Narrative.

[Recipient- Insert supporting text in last page as described in the table above.]

SUPPORTING TEXT FOR CLIMATE CHANGE AND ENVIRONMENTAL JUSTICE IMPACTS

The Singleton Road Corridor extends through three census tracts (504.19; 504.21; 504.22) and is at the center of a 26-census tract cluster of historically disadvantaged communities. The DOT's Transportation Disadvantaged Census Tracts tool specifically indicates that all subject tracts exceed the threshold in Transportation, Economic, Equity, and Environmental indicators.

As the project is primarily a technology-based solution, adverse impacts on these environmental justice communities are not expected.

SUPPORTING TEXT FOR RACIAL EQUITY AND BARRIERS TO OPPORTUNITY

Gwinnett County has taken the following actions to demonstrate its commitment to improving racial equity and reducing barriers to opportunity:

Hiring of an Equity and Inclusion Officer:

Gwinnett County is currently in the process of hiring an Equity and Inclusion Officer (EIO) to champion and oversee the development, implementation, and monitoring of the Gwinnett County Equity and Inclusion Action Plan. The EIO will lead high-profile projects that directly impact core operations, collaborate with elected officials and county leadership, and deliver sustainable solutions that support the goal of achieving equitable and inclusive outcomes and culture. The EIO will also develop policies, practices, and programs that create a climate of equity and inclusion throughout the county, and provide guidance and support to county departments in developing strategies that promote equity and inclusion in all areas of county operations, such as hiring practices, training and development, service delivery, and community engagement. (source:

<https://www.governmentjobs.com/careers/gwinnett/jobs/4028672/equity-and-inclusion-officer>)

Inclusion of "Equity" as a stated core value of Gwinnett County:

Gwinnett County is a diverse community, and inclusion of "Equity" as a core value demonstrates that the county is committed to creating a welcoming and inclusive environment that promotes "fairness and respect for all". The county believes that equity is essential for creating a community that upholds a vision of being a "preferred community where everyone thrives!". (source:

<https://www.gwinnettcountry.com/web/gwinnett/departments/boardofcommissioners/missionvisionvalues>)

The adoption of the Gwinnett Place Mall Equitable Redevelopment Plan:

Gwinnett County, as a demonstration of its commitment to enhancing racial equity and dismantling barriers to opportunity, will implement a comprehensive set of guidelines for the redevelopment of the predominantly vacant Gwinnett Place Mall site, which occupies a significant location within a region renowned nationwide for its diverse and vibrant character. These guidelines will be designed to uplift all Gwinnett residents by fostering community engagement throughout the planning process, embracing an inclusive approach that harmonizes economic opportunities, and proactively addressing and mitigating potential risks faced by vulnerable communities in the vicinity. (source:

<https://www.gwinnettcountry.com/web/gwinnett/departments/planningdevelopment/economicdevelopment/gwinnettplacemallerp>)

SUPPORTING TEXT FOR LABOR AND WORKFORCE

Gwinnett County actively employs the Georgia Department of Transportation's (GDOT) Disadvantaged Business Enterprise (DBE) Program for federally funded projects, prioritizing the engagement of workforce programs that cater to underrepresented groups.

Furthermore, Gwinnett County firmly adheres to GDOT's Standard Federal Equal Employment Opportunity Construction Contract Specification (Executive Order 11246) (43 FR14895) for federally funded projects.

In addition to these efforts, Gwinnett County stands firmly committed to full compliance with the Federal Highway Administration's FHWA-1273 guidelines for federally funded projects, ensuring strict adherence to anti-discrimination policies, affirmative action, and equal opportunity requirements outlined therein.

Moreover, the county diligently maintains compliance with Appendix A, titled "Notice to Contractors, Compliance with Title VI of the Civil Rights Act of 1964 for Federal Aid Contracts," for all federally funded transportation and infrastructure projects.

SUPPORTING TEXT FOR CRITICAL INFRASTRUCTURE SECURITY AND RESILIENCE

Gwinnett County operates its transportation technology infrastructure on an air-gapped fiber-optic network, physically separated from the internet. New technologies implemented as a part of this project will be incorporated into this network while maintaining the existing air-gap status.

All procurement of software, hardware, and services will abide by the Gwinnett County Information Technology Security Requirements for Purchases Policy (ITS-SST-006) to ensure compliance with the County's security needs.

U.S. DEPARTMENT OF TRANSPORTATION

GENERAL TERMS AND CONDITIONS UNDER THE
FISCAL YEAR 2022 STRENGTHENING MOBILITY AND REVOLUTIONIZING
TRANSPORTATION (SMART) GRANT PROGRAM:

Revision date: June 20, 2023

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GENERAL TERMS AND CONDITIONS

The Infrastructure Investment and Jobs Act (Pub. L. 117–58, November 15, 2021; also referred to as the “Bipartisan Infrastructure Law” or “BIL”) established the Strengthening Mobility and Revolutionizing Transportation (SMART) Discretionary Grant Program (BIL Section 25005) and appropriated additional funds to the United States Department of Transportation (the “USDOT”) under Division J, Title VIII of BIL to implement the program. The funding will be implemented, as appropriate and consistent with law, in alignment with the priorities in Executive Order 14052, Implementation of the Infrastructure Investment and Jobs Act (86 FR 64355). The funds are available to conduct demonstration projects focused on advanced smart city or community technologies and systems in a variety of communities to improve transportation efficiency and safety. The program funds projects that are focused on using technology interventions to solve real-world challenges and build data and technology capacity and expertise in the public sector.

The USDOT published a Notice of Funding Opportunity (the “NOFO”) to solicit applications for Federal financial assistance in Fiscal Year 2022 for the Strengthening Mobility and Revolutionizing Transportation (SMART) (87 FR 58187).

These general terms and conditions are incorporated by reference in a project-specific grant agreement under the fiscal year 2022 SMART Grants Program. Articles 1–6 are in the project-specific portion of the agreement. The term “Recipient” is defined in the project-specific portion of the agreement. Attachments A through D are project-specific attachments.

ARTICLE 7
PURPOSE

7.1 **Purpose.** The purpose of this award is to is to conduct demonstration projects focused on advanced smart city or community technologies and systems in a variety of communities to improve transportation efficiency and safety. The program funds projects that are focused on using technology interventions to solve real-world challenges and build data and technology capacity and expertise in the public sector. The parties will accomplish that purpose by achieving the following objectives:

- (a) timely completing the Project; and
- (b) ensuring that this award does not substitute for non-Federal investment in the Project, except as proposed in the Grant Application, as modified by section 3.3 and Attachment B.

ARTICLE 8 USDOT ROLE

8.1 Division of USDOT Responsibilities.

The Office of the Secretary of Transportation is ultimately responsible for the USDOT's administration of the SMART Grant Program.

USDOT Program Contacts.

U.S. Department of Transportation
Office of the Assistant Secretary for Research and Technology
1200 New Jersey Avenue, SE
Washington, DC 20590
SMART@dot.gov

**ARTICLE 9
RECIPIENT ROLE**

- 9.1 **Statements on the Project.** The Recipient states that:
- (a) all material statements of fact in the Grant Application were accurate when that application was submitted; and
 - (b) Attachment B documents all material changes in the information contained in that application.
- 9.2 **Statements on Authority and Capacity.** The Recipient states that:
- (a) it has the authority to receive Federal financial assistance under this agreement;
 - (b) it has the legal authority to complete the Project;
 - (c) it has the capacity, including institutional, managerial, and financial capacity, to comply with its obligations under this agreement;
 - (d) not less than the difference between the “Total Eligible Project Cost” and the “SMART Grant Amount” listed in section 3.3 are committed to fund the Project;
 - (e) the individual executing this agreement on behalf of the Recipient has authority to enter this agreement and make the statements in this article 9 and in section 24.7 on behalf of the Recipient.
- 9.3 **USDOT Reliance.** The Recipient acknowledges that:
- (a) the USDOT relied on statements of fact in the Grant Application to select the Project to receive this award;
 - (b) the USDOT relied on statements of fact in both the Grant Application and this agreement to determine that the Recipient and the Project are eligible under the terms of the NOFO;
 - (c) the USDOT relied on statements of fact in both the Grant Application and this agreement to establish the terms of this agreement; and
 - (d) the USDOT’s selection of the Project to receive this award prevented awards under the NOFO to other eligible applicants.
- 9.4 **Project Delivery.**
- (a) The Recipient shall complete the Project under the terms of this agreement.

- (b) The Recipient shall ensure that the Project is financed, constructed, operated, and maintained in accordance with all applicable Federal laws, regulations, and policies.
- (c) The Recipient shall provide any certifications or assurances deemed necessary by the USDOT in ensuring the Recipient's compliance with all applicable laws, regulations, and policies.
- (d) The Recipient shall provide access to records as provided at 2 CFR 200.337.

9.5 Rights and Powers Affecting the Project.

- (a) The Recipient shall not take or permit any action that deprives it of any rights or powers necessary to the Recipient's performance under this agreement without written approval of the USDOT.
- (b) The Recipient shall act, in a manner acceptable to the USDOT, promptly to acquire, extinguish, or modify any outstanding rights or claims of right of others that would interfere with the Recipient's performance under this agreement.
- (c) The Recipient shall ensure that the funds provided by DOT are not misappropriated or misdirected to any other account, need, project, line-item, or the like.

9.6 Notification of Changes to Key Personnel. The Recipient shall notify all USDOT representatives who are identified in Section 4.4 in writing within 30 calendar days of any change in key personnel who are identified in Section 4.3.

ARTICLE 10
AWARD AMOUNT, OBLIGATION, AND TIME PERIODS

10.1 **Federal Award Amount** The USDOT hereby awards a SMART Grant to the Recipient in the amount listed in Section 2.2 as the SMART Grant Amount.

10.2 **Federal Obligations.**

This agreement obligates for the period of performance listed in section 2.3 of the grant agreement.

10.3 **Budget Period**

The budget period for this award begins on the date of this agreement and ends on the budget period end date that is listed in section 2.4, which shall be no later than 2 years from the date of grant execution. In this agreement, “budget period” is used as defined at 2 C.F.R. 200.1.

10.4 **Period of Performance.**

- (a) The period of performance for this award begins on the effective date of award listed in page 1 item 2 and ends on the period of performance end date that is listed in Section 2.3.
- (b) In this agreement, “period of performance” is used as defined at 2 C.F.R. 200.1.

ARTICLE 11
STATEMENT OF WORK, SCHEDULE, AND BUDGET CHANGES

- 11.1 **Notification Requirement.** The Recipient shall notify all USDOT representatives who are identified in section 4.4 in writing within 30 calendar days of any change in circumstances or commitments that adversely affect the Recipient's plan to complete the Project. In that notification, the Recipient shall describe the change and what actions the Recipient has taken or plans to take to ensure completion of the Project. This notification requirement under this section 11.1 is separate from any requirements under this article 11 that the Recipient request amendment of this agreement.
- 11.2 **Statement of Work Changes.** If the Project's activities differ from the statement of work that is described in section 3.1 and Attachment B, then the Recipient shall request an amendment of this agreement to update section 3.1.
- 11.3 **Schedule Changes.** If one or more of the following conditions are satisfied, then the Recipient shall request an amendment of this agreement to update the relevant dates:
- (a) a substantial completion date for the Project or a component of the Project is listed in section 3.2 and the Recipient's estimate for that milestone changes to a date that is more than six months after the date listed in section 3.2; or
 - (b) a schedule change would require the period of performance to continue after the period of performance end date listed in section 2.3.

For other schedule changes, the Recipient shall request an amendment of this agreement unless the USDOT has consented, in writing consistent with applicable requirements, to the change.

- 11.4 **Budget Changes.**
- (a) The Recipient acknowledges that if the cost of completing the Project increases:
 - (1) that increase does not affect the Recipient's obligation under this agreement to complete the Project; and
 - (2) the USDOT will not increase the amount of this award to address any funding shortfall.
 - (b) The Recipient shall request an amendment of this agreement to update section 3.3 and Attachment B if, in comparing the Project's budget to the amounts listed in section 3.3:
 - (1) the "Non-Federal Funds" amount decreases; or
 - (2) the "Total Eligible Project Cost" amount decreases.

- (c) For budget changes that are not identified in section 11.4(b), the Recipient shall request an amendment of this agreement to update section 3.3 and Attachment B unless the USDOT has consented, in writing consistent with applicable requirements, to the change.
- (d) If the actual eligible project costs are less than the “Total Eligible Project Cost” that is listed in section 3.3, then the Recipient may propose to the USDOT, in writing consistent with applicable requirements, specific additional activities that are within the scope of this award, as defined in sections 7.1 and 3.1, and that the Recipient could complete with the difference between the “Total Eligible Project Cost” that is listed in section 3.3 and the actual eligible project costs.
- (e) If the actual eligible project costs are less than the “Total Eligible Project Cost” that is listed in section 3.3 and either the Recipient does not make a proposal under section 11.4(d) or the USDOT does not accept the Recipient’s proposal under section 11.4(d), then:
 - (1) in a request under section 11.4(b), the Recipient shall reduce the Federal Share by the difference between the “Total Eligible Project Cost” that is listed in section 3.3 and the actual eligible project costs; and
 - (2) if that amendment reduces this award and the USDOT had reimbursed costs exceeding the revised award, the Recipient shall request to add additional project work that is within the scope of this project.

In this agreement, “**Federal Share**” means the sum of the “SMART Action Plan or Implementation Grant Amount” and the “Other Federal Funds” amounts that are listed in section 3.3.

- (a) The Recipient acknowledges that amounts that are required to be refunded under section 11.4(e)(2) constitute a debt to the Federal Government that the USDOT may collect under 2 C.F.R. 200.346 and the Federal Claims Collection Standards (31 C.F.R. parts 900–999).
- (b) The Recipient shall ensure compliance with Federal regulations requiring conduct of a Federally approved audit of any expenditure of funds of \$750,000 or more in a year in Federal awards.

11.5 USDOT Acceptance of Changes. The USDOT may accept or reject amendments requested under this article 11, and in doing so may elect to consider only the interests of the SMART grant program and the USDOT. The Recipient acknowledges that requesting an amendment under this article 11 does not amend, modify, or supplement this agreement unless the USDOT accepts that amendment request and the parties modify this agreement under section 21.1.

ARTICLE 12
GENERAL REPORTING TERMS

12.1 **Report Submission.** The Recipient shall send all reports required by this agreement to smartreports@dot.gov.

12.2 **Paperwork Reduction Act Notice.**

Under 5 C.F.R. 1320.6, the Recipient is not required to respond to a collection of information that does not display a currently valid control number issued by the Office of Management and Budget (the “OMB”). Collections of information conducted under this agreement are approved under OMB Control No. 2105-0520.

ARTICLE 13
PROGRESS AND FINANCIAL REPORTING

- 13.1 **Quarterly Program Performance Reports.** The recipient shall submit to USDOT Quarterly Project Progress Reports in the format and with the content described in Exhibit-C. Due dates for reporting periods are 3/31, 6/30, 9/30, or 12/31, regardless of budget period start dates. Recipients shall submit quarterly reports no later than 30 days after the end of the reporting period. Annual reports are due no later than 90 days after the end of the reporting period.
- 13.2 **Quarterly Financial Status.** Recipient shall submit a Federal Financial Report using SF-425 in accordance with specified due dates.

ARTICLE 14 PERFORMANCE REPORTING

14.1 Evaluation and Data Management Plan

The Recipient shall submit to the USDOT, not later than 90 days after receiving the grant award, a report that provides an overview of how the project will be evaluated and how the data collected will be managed and stored including

- (a) an overview of how the proof-of-concept or prototype will be evaluated and how the data collected will be managed and stored;
- (b) a description of the anticipated impact areas (i.e. goals) of the project if implemented at scale and the methods that will be used to estimate the anticipated benefits and costs associated with implementation;
- (c) robust performance metrics and measurable targets based on the project goals to inform whether the proof-of-concept or prototype meets expectations and whether full implementation would meet program goals; and
- (d) the baseline data for each performance measure that is identified in the Performance Measure Table in Attachment A, accurate as of the Baseline Measurement Date that is identified in Attachment A and a detailed description of the data sources, assumptions, variability, and estimated levels of precision for each performance measure that is identified in the Performance Measure Table in Attachment A.

14.2 Implementation Report

The Recipient shall submit to the USDOT, not later than 1 year after receiving the grant award, a report that describes, consistent with section 25005(f) of BIL:

- (a) the deployment and operational costs of the project, as compared to the benefits and savings from the project;
- (b) the means by which the project has met the original expectation, as projected in the SMART grant application, including data describing the means by which the project met the specific goals for the project;
- (c) lessons learned and recommendations for future deployment strategies to optimize transportation efficiency and multimodal system performance; and
- (d) a description of the requirements for a successful at-scale deployment, an assessment of the feasibility of at-scale implementation, and an analysis of the success, challenges, and validity of the initial approach.

(e) the performance measurement data for each performance measure that is identified in the Performance Measure Table in Attachment A.

14.3 Performance Reporting Survival.

The data collection and reporting requirements in this article 14 survive the termination of this agreement which is three years post period of performance.

14.4 Program Evaluation.

As a condition of grant award, the recipient may be required to participate in an evaluation undertaken by USDOT, or another agency or partner. The evaluation may take different forms such as an implementation assessment across grant recipients, an impact and/or outcomes analysis of all or selected sites within or across grant recipients, or a benefit/cost analysis or assessment of return on investment. The Department may require applicants to collect data elements to aid the evaluation. As a part of the evaluation, as a condition of award, grant recipients must agree to: (1) make records available to the evaluation contractor or USDOT staff; (2) provide access to program records, and any other relevant documents to calculate costs and benefits; (3) in the case of an impact analysis, facilitate the access to relevant information as requested; and (4) follow evaluation procedures as specified by the evaluation contractor or USDOT staff.

ARTICLE 15
NONCOMPLIANCE AND REMEDIES

15.1 Noncompliance Determinations.

- (a) If the USDOT determines that the Recipient may have failed to comply with the United States Constitution, Federal law, or the terms and conditions of this agreement, the USDOT may notify the Recipient of a proposed determination of noncompliance. For the notice to be effective, it must be written and the USDOT must include an explanation of the nature of the noncompliance, describe a remedy, state whether that remedy is proposed or effective at an already determined date, and describe the process through and form in which the Recipient may respond to the notice.
- (b) If the USDOT notifies the Recipient of a proposed determination of noncompliance under section 15.1(a), the Recipient may, not later than 7 calendar days after the notice, respond to that notice in the form and through the process described in that notice. In its response, the Recipient may:
 - (1) accept the remedy;
 - (2) acknowledge the noncompliance, but propose an alternative remedy; or
 - (3) dispute the noncompliance.

To dispute the noncompliance, the Recipient must include in its response documentation or other information supporting the Recipient's compliance.

- (c) The USDOT may make a final determination of noncompliance only:
 - (1) after considering the Recipient's response under section 15.1(b); or
 - (2) if the Recipient fails to respond under section 15.1(b), after the time for that response has passed.
- (d) To make a final determination of noncompliance, the USDOT must provide a notice to the Recipient that states the bases for that determination.

15.2 Remedies.

- (a) If the USDOT makes a final determination of noncompliance under section 15.1(d), the USDOT may impose a remedy, including:
 - (1) additional conditions on the award;
 - (2) any remedy permitted under 2 C.F.R. 200.339–200.340, including withholding of payments; disallowance of previously reimbursed costs,

requiring refunds from the Recipient to USDOT; suspension or termination of the award; or suspension and disbarment under 2 C.F.R. part 180; or

(3) any other remedy legally available.

- (b) To impose a remedy, the USDOT must provide a written notice to the Recipient that describes the remedy, but the USDOT may make the remedy effective before the Recipient receives that notice.
- (c) If the USDOT determines that it is in the public interest, the USDOT may impose a remedy, including all remedies described in section 15.2(a), before making a final determination of noncompliance under section 15.1(d). If it does so, then the notice provided under section 15.1(d) must also state whether the remedy imposed will continue, be rescinded, or modified.
- (d) In imposing a remedy under this section 15.2 or making a public interest determination under section 15.2(c), the USDOT may elect to consider the interests of only the USDOT.
- (e) The Recipient acknowledges that amounts that the USDOT requires the Recipient to refund to the USDOT due to a remedy under this section 15.2 constitute a debt to the Federal Government that the USDOT may collect under 2 C.F.R. 200.346 and the Federal Claims Collection Standards (31 C.F.R. parts 900–999).

15.3 **Other Oversight Entities.**

Nothing in this article 15 limits any party's authority to report activity under this agreement to the United States Department of Transportation Inspector General or other appropriate oversight entities.

ARTICLE 16
AGREEMENT TERMINATION

16.1 USDOT Termination.

- (a) The USDOT may terminate this agreement and all of its obligations under this agreement if any of the following occurs:
 - (1) the Recipient fails to obtain or provide any non-SMART Grant contribution (all eligible project costs other than the SMART Grant Amount, as described in section 3.2 table (a) of the grant agreement) or alternatives approved by the USDOT as provided in this agreement and consistent with article 3;
 - (2) a construction start date for the Project or Strategy is listed in section 3.2 and the Recipient fails to meet that milestone by six months after the date listed in section 3.2;
 - (3) a substantial completion date for the Project or Strategy is listed in section 3.2 and the Recipient fails to meet that milestone by six months after the date listed in section 3.2;
 - (4) the Recipient fails to comply with the terms and conditions of this agreement, including a material failure to comply with the schedule in section 3.2 even if it is beyond the reasonable control of the Recipient; or,
 - (5) the USDOT determines that termination of this agreement is in the public interest.
 - (6) the Recipient fails to expend the funds within 2 years after the date on which the government executes the grant agreement, which is the date funds are provided for the project.
- (b) In terminating this agreement under this section, the USDOT may elect to consider only the interests of the USDOT.
- (c) This section 16.1 does not limit the USDOT's ability to terminate this agreement as a remedy under section 15.2.
- (d) The Recipient may request that the USDOT terminate the agreement under this section 16.1.

16.2 Closeout Termination.

- (a) This agreement terminates on Project Closeout.
- (b) In this agreement, "**Project Closeout**" means the date that the USDOT notifies the Recipient that the award is closed out. Under 2 C.F.R. 200.344, Project

Closeout should occur no later than one year after the end of the period of performance.

- 16.3 **Post-Termination Adjustments.** The Recipient acknowledges that under 2 C.F.R. 200.345–200.346, termination of the agreement does not extinguish the USDOT’s authority to disallow costs, including costs that USDOT reimbursed before termination, and recover funds from the Recipient.
- 16.4 **Non-Terminating Events.**
- (a) The end of the period of performance described under section 10.4 does not terminate this agreement or the Recipient’s obligations under this agreement.
 - (b) The liquidation of funds under section 20.1 does not terminate this agreement or the Recipient’s obligations under this agreement.
- 16.5 **Other Remedies.** The termination authority under this article 16 supplements and does not limit the USDOT’s remedial authority under article 15 or 2 C.F.R. part 200, including 2 C.F.R. 200.339–200.340.

ARTICLE 17
MONITORING, FINANCIAL MANAGEMENT, CONTROLS, AND RECORDS

17.1 Recipient Monitoring and Record Retention.

- (a) The Recipient shall monitor activities under this award, including activities under subawards and contracts, to ensure:
 - (1) that those activities comply with this agreement; and
 - (2) that funds provided under this award are not expended on costs that are not allowable under this award or not allocable to this award.
- (b) If the Recipient makes a subaward under this award, the Recipient shall monitor the activities of the subrecipient in compliance with 2 C.F.R. 200.332(d).
- (c) The Recipient shall retain records relevant to the award as required under 2 C.F.R. 200.334.

17.2 Financial Records and Audits.

- (a) The Recipient shall keep all project accounts and records that fully disclose the amount and disposition by the Recipient of the award funds, the total cost of the Project, and the amount or nature of that portion of the cost of the Project supplied by other sources, and any other financial records related to the project.
- (b) The Recipient shall keep accounts and records described under section 17.2(a) in accordance with a financial management system that meets the requirements of 2 C.F.R. 200.301–200.303, 2 C.F.R. part 200, subpart F, and title 23, United States Code, and will facilitate an effective audit in accordance with 31 U.S.C. 7501–7506.
- (c) The Recipient shall separately identify expenditures under the fiscal year 2022 SMART. A grants program in financial records required for audits under 31 U.S.C. 7501–7506. Specifically, the Recipient shall:
 - (1) list expenditures under that program separately on the schedule of expenditures of Federal awards required under 2 C.F.R. part 200, subpart F, including “FY 2022” in the program name; and
 - (2) list expenditures under that program on a separate row under Part II, Item 1 (“Federal Awards Expended During Fiscal Period”) of Form SF-SAC, including “FY 2022” in column c (“Additional Award Identification”).

17.3 Internal Controls. The Recipient shall establish and maintain internal controls as required under 2 C.F.R. 200.303.

17.4 **USDOT Record Access.** The USDOT may access Recipient records related to this award under 2 C.F.R. 200.337.

ARTICLE 18 CONTRACTING AND SUBAWARDS

For domestic sourcing compliance purposes and to ensure proper procurement, recipients shall coordinate with the SMART Program office to identify if their project is considered an Infrastructure project. If USDOT determines that a project is a "project for infrastructure," the recipient will comply with Build America Buy America requirements. If USDOT determines that a project is not a "project for infrastructure," the recipient will comply with Buy American Act requirements. The Recipient may participate in planning activities before project identification, as long as it does not include the purchasing of physical materials or a commitment to do so.

18.1 **Build America, Buy America.**

This award term implements § 70914(a) of the Build America, Buy America Act, Pub. L. No. 117-58, div. G, tit. IX, subtit. A, 135 Stat. 429, 1294 (2021) and Office of Management and Budget (OMB) Memorandum M-22-11, "Initial Implementation Guidance on Application of Buy America Preference in Federal Financial Assistance Programs for Infrastructure."

For BABA compliance purposes and to ensure proper procurement, recipients shall coordinate with the SMART Program office to identify if their project is considered an Infrastructure project. If USDOT determines that a project is a "project for infrastructure," the recipient will comply with Build America Buy America requirements. If USDOT determines that a project is not a "project for infrastructure," the recipient will comply with Buy American Act requirements. The Recipient may participate in planning activities before project identification, as long as it does not include the purchasing of physical materials or a commitment to do so.

Requirement to Use Iron, Steel, Manufactured Products, and Construction Materials Produced in the United States.

The Recipient shall not use funds provided under this award for a project for infrastructure unless:

- (a) all iron and steel used in the project are produced in the United States—this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- (b) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product; and

- (c) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

Inapplicability.

The domestic content procurement preference in this award term only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project but are not an integral part of the structure or permanently affixed to the infrastructure project.

Waivers.

When necessary, the Recipient may apply for, and the USDOT may grant, a waiver from the domestic content procurement preference in this award term.

A request to waive the application of the domestic content procurement preference must be in writing. The USDOT will provide instructions on the waiver process and on the format, contents, and supporting materials required for any waiver request. Waiver requests are subject to public comment periods of no less than 15 days and must be reviewed by the Office of Management and Budget (OMB) Made in America Office.

When the USDOT has made a determination that one of the following exceptions applies, the awarding official may waive the application of the domestic content procurement preference in any case in which the USDOT determines that:

- (a) applying the domestic content procurement preference would be inconsistent with the public interest;
- (b) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (c) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.

There may be instances where an award qualifies, in whole or in part, for an existing waiver described at <https://www.transportation.gov/office-policy/transportation-policy/made-in-america>.

Definitions

“Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:

- non-ferrous metals;
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- glass (including optic glass);
- lumber; or
- drywall.

“Domestic content procurement preference” means all iron and steel used in the project are produced in the United States; the manufactured products used in the project are produced in the United States; or the construction materials used in the project are produced in the United States.

“Primarily iron or steel” means that the cost of the iron and steel content in the article, material, or supply exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components. The origin of the elements of the iron or steel is not relevant to the determination of whether it is domestic or foreign.

“Project” means the construction, alteration, maintenance, or repair of infrastructure in the United States.

- (a) Construction materials used in the Project are subject to the domestic preference requirement at § 70914 of the Build America, Buy America Act, Pub. L. No. 117-58, div. G, tit. IX, subtit. A, 135 Stat. 429, 1294 (2021), as implemented by OMB, USDOT, and FHWA. The Recipient acknowledges that this agreement is neither a waiver of § 70914(a) nor a finding under § 70914(b).
- (b) Under 2 C.F.R. 200.322, as appropriate and to the extent consistent with law, the Recipient should, to the greatest extent practicable under this award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. The Recipient shall include the requirements of 2 C.F.R. 200.322 in all subawards including all contracts and purchase orders for work or products under this award.

18.2 Buy American Act

The Recipient shall apply, comply with, and implement all provisions of the Buy American Act, 41 U.S.C. §§ 8301-8305.

For the purpose of Article 18 of this agreement, the Project is deemed a public work of the Federal Government under 41 U.S.C. § 8301.

Article 18 implements 41 U.S.C. §§ 8301-8305, the Buy American Act, by providing a preference for domestic construction material.

The Recipient shall not use foreign construction materials in performing this agreement, except that:

- (a) the Recipient may use a commercially available off-the-shelf item under 41 U.S.C. § 1907 regardless of its components if the item is manufactured in the United States;
- (b) the Recipient may use information technology that is a commercial item;
- (c) the Recipient may use foreign construction materials that are listed at 48 C.F.R. 25.104; and
- (d) the Recipient may use foreign construction materials if the USDOT has authorized their use under subsection (d) of Article 18.

If the Recipient uses foreign construction material in violation of Article 18, the USDOT may disallow and deny reimbursement of costs incurred by the Recipient and take other remedial actions under article 15 and 2 C.F.R. 200.339.

The USDOT may authorize the Recipient to use foreign construction material, by modifying this agreement under section 21.1, if the USDOT determines that:

- (a) applying the Buy American statute to the construction material would be impracticable or inconsistent with the public interest;
- (b) the construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality; or
- (c) the cost of domestic construction material is unreasonable. To determine if a cost is unreasonable, the USDOT will follow processes described in 48 C.F.R. 25.106.

The Recipient may request that the USDOT authorize the Recipient to use foreign construction material under subsection (d) of Article 18. If the Recipient makes a request under this subsection (e), the Recipient shall provide adequate information for the USDOT to evaluate the request, including:

- (a) a description of the foreign and domestic construction materials;
- (b) unit of measure;
- (c) quantity;

- (d) price, including all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued);
- (e) time of delivery or availability;
- (f) location of the construction project;
- (g) name and address of the proposed supplier;
- (h) a detailed justification of the reason for use of foreign construction materials identifying the specific basis for an exception under subsection (d) of this term;
- (i) if the Recipient requests authorization under subsection (d)(3) of Article 18, a reasonable survey of the market and a full price comparison measuring the relative costs of the available domestic and foreign construction materials; and
- (j) if the Recipient submits the request after contract award, an explanation why the Recipient could not have, before contract award:
 - (1) reasonably foreseen the need for the determination and
 - (2) requested the determination.

The Recipient acknowledges that:

- (a) this agreement is not a Government procurement contract;
- (b) acquisitions of supplies, services, or construction materials by the Recipient under this agreement are not acquisitions by the Government; and
- (c) the Free Trade Agreement exceptions to the Buy American Act as provided by 48 C.F.R. Part 25, Subpart 25.4 are inapplicable to this agreement.

In Article 18, the following definitions apply: “commercially available off-the-shelf (COTS) item”

- (a) means any item of supply (including construction material) that is:
 - (1) a commercial item as defined by 48 C.F.R. § 2.101;
 - (2) sold in substantial quantities in the commercial marketplace; and
 - (3) offered to the Government, under an agreement, without modification, in the same form in which it is sold in the commercial marketplace; and
- (b) does not include bulk cargo, as defined in 46 U.S.C. § 40102(4), such as agricultural products and petroleum products. “construction material” means an article, material, or supply brought to the construction site by the Recipient for incorporation into the building or work. The term also includes an item brought to

the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site.

“cost of components” means—

- (a) For components purchased by the Recipient, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or
- (b) For components manufactured by the Recipient, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the construction material.

“domestic construction material” means—

- (a) For construction material that does not consist wholly or predominantly of iron or steel or a combination of both—
 - (1) An unmanufactured construction material mined or produced in the United States; or
 - (2) A construction material manufactured in the United States, if:
 - (i) the cost of its components mined, produced, or manufactured in the United States exceeds 60 percent of the cost of all its components, except that the percentage will be 65 percent for items delivered in calendar years 2024 through 2028 and 75 percent for items delivered in calendar year 2029 or later. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic; or
 - (ii) the construction material is a COTS item manufactured in the United States; or
- (b) For construction material that consists wholly or predominantly of iron or steel or a combination of both, a construction material manufactured in the United States if the cost of foreign iron and steel constitutes less than 5 percent of the cost of all the components used in such construction material. The cost of foreign iron and steel includes but is not limited to the cost of foreign iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the construction material and a good faith estimate of the cost of

all foreign iron or steel components excluding COTS fasteners. Iron or steel components of unknown origin are treated as foreign. If the construction material contains multiple components, the cost of all the materials used in such construction material is calculated in accordance with the definition of “cost of components” in this term.

“foreign construction material” means a construction material other than a domestic construction material.

“predominantly of iron or steel or a combination of both” means that the cost of the iron and steel content exceeds 50 percent of the total cost of all its components. The cost of iron and steel is the cost of the iron or steel mill products (such as bar, billet, slab, wire, plate, or sheet), castings, or forgings utilized in the manufacture of the product and a good faith estimate of the cost of iron or steel components excluding COTS fasteners.

“United States” means the 50 States, the District of Columbia, and outlying areas.

- 18.3 **Small and Disadvantaged Business Requirements.** The Recipient shall expend all funds under this award in compliance with the requirements at 2 C.F.R. 200.321 (“Contracting with small and minority businesses, women’s business enterprises, and labor surplus area firms”).
- 18.4 **Engineering and Design Services.** The Recipient shall award each contract or sub-contract for program management, construction management, planning studies, feasibility studies, architectural services, preliminary engineering, design, engineering, surveying, mapping, or related services with respect to the project in the same manner that a contract for architectural and engineering services is negotiated under 2 CFR 200.320 or an equivalent qualifications-based requirement prescribed for or by the Recipient.
- 18.5 **Foreign Market Restrictions.** The Recipient shall not allow funds provided under this award to be used to fund the use of any product or service of a foreign country during the period in which such foreign country is listed by the United States Trade Representative as denying fair and equitable market opportunities for products and suppliers of the United States in procurement and construction.
- 18.6 **Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.** The Recipient acknowledges that Section 889 of Pub. L. No. 115-232, 2 C.F.R. 200.216 and 2 C.F.R. 200.471 prohibit the Recipient and all subrecipients from procuring or obtaining certain telecommunications and video surveillance services or equipment under this award.
- 18.7 **Recipient Responsibilities for Subawards.** If the Recipient makes a subaward under this award, the Recipient shall comply with the requirements on pass-through entities under 2 C.F.R. parts 200 and 1201, including 2 C.F.R. 200.331–200.333.

ARTICLE 19
COSTS, PAYMENTS, AND UNEXPENDED FUNDS

- 19.1 **Limitation of Federal Award Amount.** Under this award, the USDOT shall not provide funding greater than the amount obligated on the SMART Grant cover page, Item 11, Federal Funds Obligated. The Recipient acknowledges that USDOT is not liable for payments exceeding that amount, and the Recipient shall not request reimbursement of costs exceeding that amount.
- 19.2 **Projects Costs.** This award is subject to the cost principles at 2 C.F.R. part 200 subpart E, including provisions on determining allocable costs and determining allowable costs.
- 19.3 **Timing of Project Costs.**
- (a) The Recipient shall not charge to this award costs that are incurred after the period of performance.
 - (b) The Recipient shall not charge to this award costs that were incurred before the effective date of award of this agreement,
- 19.4 **Recipient Recovery of Federal Funds.** The Recipient shall make all reasonable efforts, including initiating litigation, if necessary, to recover Federal funds if the USDOT determines, after consultation with the Recipient, that those funds have been spent fraudulently, wastefully, or in violation of Federal laws, or misused in any manner under this award. The Recipient shall not enter a settlement or other final position, in court or otherwise, involving the recovery of funds under the award unless approved in advance in writing by the USDOT.
- 19.5 **Unexpended Federal Funds.** Any Federal funds that are awarded at section 10.1 but not expended on allocable, allowable costs remain the property of the United States.
- 19.6 **Timing of Payments to the Recipient.**
- (a) When reimbursement is used, the Recipient shall not request reimbursement of a cost before the Recipient has entered an obligation for that cost.
 - (b) Pursuant to 2 CFR 200.305, advance payments to Recipient must be limited to the minimum amounts needed and be timed to be in accordance with the actual, immediate cash requirements of the Recipient in carrying out the purpose of the approved program or project. The timing and amount of advance payments must be as close as is administratively feasible to the actual disbursements by the Recipient for direct program or project costs and the proportionate share of any allowable indirect costs. The Recipient must make timely payment to contractors in accordance with the contract provisions.
- 19.7 **Payment Method.**

- (a) If the USDOT Payment System identified in section 5.2 is “DELPHI eInvoicing,” then the Recipient shall use the DELPHI eInvoicing System to request reimbursement or advance payment under this award unless the USDOT agreement officer provides written approval for the Recipient to use a different request and payment method.
- (b) The USDOT may deny a payment request that is not submitted using the method identified in section 5.2.

19.8 Information Supporting Expenditures.

- (a) If the USDOT Payment System identified in section 5.2 is “DELPHI eInvoicing,” then when requesting reimbursement of costs incurred or credit for cost share incurred, the Recipient shall electronically submit the SF 270 (Request for Advance or Reimbursement), shall identify the Federal share and the Recipient’s share of costs, and shall submit supporting cost detail to clearly document all costs incurred. As supporting cost detail, the Recipient shall include a detailed breakout of all costs incurred, including direct labor, indirect costs, other direct costs, and travel.
- (b) If the Recipient submits a request for reimbursement that the USDOT determines does not include or is not supported by sufficient detail, the USDOT may deny the request or withhold processing the request until the Recipient provides sufficient detail.

19.9 Reimbursement Frequency. If the USDOT Payment System identified in section 5.2 is “DELPHI eInvoicing,” then the Recipient shall not request reimbursement more frequently than monthly.

ARTICLE 20
LIQUIDATION, ADJUSTMENTS, AND FUNDS AVAILABILITY

20.1 Liquidation of Recipient Obligations.

- (a) The Recipient shall liquidate all obligations of award funds under this agreement not later than the earlier of (1) 120 days after the end of the period of performance or (2) 2 years after the date on which the grant is provided.
- (b) Liquidation of obligations and adjustment of costs under this agreement follow the requirements of 2 C.F.R. 200.344–200.346.

ARTICLE 21
AGREEMENT MODIFICATIONS

21.1 **Bilateral Modifications.** The parties may amend, modify, or supplement this agreement by mutual agreement in writing signed by the USDOT and the Recipient. Either party may request to amend, modify, or supplement this agreement by written notice to the other party.

21.2 **Unilateral Contact Modifications.**

(a) The USDOT may update the contacts who are listed in sections 4.4 by written notice to all of the Recipient contacts who are listed in section 4.3.

21.3 **USDOT Unilateral Modifications.**

(a) The USDOT may unilaterally modify this agreement to comply with Federal law, including the Program Statute.

(b) To unilaterally modify this agreement under this section 21.3(a), the USDOT must provide a notice to the Recipient that includes a description of the modification and state the date that the modification is effective.

21.4 **Other Modifications.** The parties shall not amend, modify, or supplement this agreement except as permitted under sections 21.1, 21.2, or 21.3. If an amendment, modification, or supplement is not permitted under section 21.1, not permitted under section 21.2, and not permitted under section 21.3, it is void.

ARTICLE 22
CLIMATE CHANGE AND ENVIRONMENTAL JUSTICE

- 22.1 **Climate Change and Environmental Justice.** Consistent with Executive Order 14008, “Tackling the Climate Crisis at Home and Abroad” (Jan. 27, 2021), Attachment C documents the consideration of climate change and environmental justice impacts of the Project.

ARTICLE 23
RACIAL EQUITY AND BARRIERS TO OPPORTUNITY

- 23.1 **Racial Equity and Barriers to Opportunity.** Consistent with Executive Order 13985, “Advancing Racial Equity and Support for Underserved Communities Through the Federal Government” (Jan. 20, 2021), Attachment D documents activities related to the Project to improve racial equity and reduce barriers to opportunity.

ARTICLE 24
FEDERAL FINANCIAL ASSISTANCE, ADMINISTRATIVE, AND NATIONAL
POLICY REQUIREMENTS

- 24.1 **Uniform Administrative Requirements for Federal Awards.** The Recipient shall comply with the obligations on non-Federal entities under 2 C.F.R. parts 200 and 1201.
- 24.2 **Federal Law and Public Policy Requirements.**
- (a) The Recipient shall ensure that Federal funding is expended in full accordance with the United States Constitution, Federal law, and statutory and public policy requirements: including but not limited to, those protecting free speech, religious liberty, public welfare, the environment, and prohibiting discrimination.
 - (b) The failure of this agreement to expressly identify Federal law applicable to the Recipient or activities under this agreement does not make that law inapplicable.
- 24.3 **Federal Freedom of Information Act.**
- (a) The USDOT is subject to the Freedom of Information Act, 5 U.S.C. 552.
 - (b) The Recipient acknowledges that the Technical Application and materials submitted to the USDOT by the Recipient related to this agreement may become USDOT records subject to public release under 5 U.S.C. 552.
- 24.4 **History of Performance.** Under 2 C.F.R 200.206, any Federal awarding agency may consider the Recipient's performance under this agreement when evaluating the risks of making a future Federal financial assistance award to the Recipient.
- 24.5 **Whistleblower Protection.**
- (a) The Recipient acknowledges that it is a "grantee" within the scope of 41 U.S.C. 4712, which prohibits the Recipient from taking certain actions against an employee for certain disclosures of information that the employee reasonably believes are evidence of gross mismanagement of this award, gross waste of Federal funds, or a violation of Federal law related this this award.
 - (b) The Recipient shall inform its employees in writing of the rights and remedies provided under 41 U.S.C. 4712, in the predominant native language of the workforce.
- 24.6 **External Award Terms and Obligations.**
- (a) In addition to this document and the contents described in article 29, this agreement includes the following additional terms as integral parts:

- (1) Appendix A to 2 C.F.R. part 25: System for Award Management and Universal Identifier Requirements;
- (2) Appendix A to 2 C.F.R. part 170: Reporting Subawards and Executive Compensation;
- (3) 2 C.F.R. 175.15(b): Trafficking in Persons; and
- (4) Appendix XII to 2 C.F.R. part 200: Award Term and Condition for Recipient Integrity and Performance Matters.

(b) The Recipient shall comply with:

- (1) 49 C.F.R. part 20: New Restrictions on Lobbying;
- (2) 49 C.F.R. part 21: Nondiscrimination in Federally-Assisted Programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964;
- (3) 49 C.F.R. part 27: Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance; and
- (4) Subpart B of 49 C.F.R. part 32: Governmentwide Requirements for Drug-free Workplace (Financial Assistance).

24.7 Incorporated Certifications. The Recipient makes the statements in the following certifications, which are incorporated by reference:

- (a) Appendix A to 49 CFR part 20 (Certification Regarding Lobbying).

ARTICLE 25
ASSIGNMENT

- 25.1 **Assignment Prohibited.** The Recipient shall not transfer to any other entity any discretion granted under this agreement, any right to satisfy a condition under this agreement, any remedy under this agreement, or any obligation imposed under this agreement.

ARTICLE 26
WAIVER

26.1 Waivers.

- (a) A waiver granted by USDOT under this agreement will not be effective unless it is in writing and signed by an authorized representative of USDOT.
- (b) A waiver granted by USDOT under this agreement on one occasion will not operate as a waiver on other occasions.
- (c) If USDOT fails to require strict performance of a provision of this agreement, fails to exercise a remedy for a breach of this agreement, or fails to reject a payment during a breach of this agreement, that failure does not constitute a waiver of that provision or breach.

ARTICLE 27
ADDITIONAL TERMS AND CONDITIONS

27.1 **Disclaimer of Federal Liability.** The USDOT shall not be responsible or liable for any damage to property or any injury to persons that may arise from, or be incident to, performance or compliance with this agreement.

27.2 **Environmental Review**

(a) In this section, “Environmental Review Entity” means:

- (1) if the Project is located in a State that has assumed responsibilities for environmental review activities under 23 U.S.C. 326 or 23 U.S.C. 327 and the Project is within the scope of the assumed responsibilities, the State; and
- (2) for all other cases, an operating agency within the Department of Transportation will be identified to conduct NEPA evaluations.

(b) Except as authorized under section 27.3(c), the Recipient shall not begin final design; acquire real property, construction materials, or equipment; begin construction; or take other actions that represent an irretrievable commitment of resources for the Project unless and until:

- (1) the Environmental Review Entity complies with the National Environmental Policy Act, 42 U.S.C. 4321 to 4370m-12, and any other applicable environmental laws and regulations; and
- (2) if the Environmental Review Entity is not the Recipient, the Environmental Review Entity provides the Recipient with written notice that the environmental review process is complete.

(c) If the Recipient is using procedures for early acquisition of real property under 23 C.F.R. 710.501 or hardship and protective acquisitions of real property 23 C.F.R. 710.503, the Recipient shall comply with 23 C.F.R. 771.113(d)(1).

(d) The Recipient acknowledges that:

- (1) the Environmental Review Entity’s actions under section 27.3(a) depend on the Recipient conducting necessary environmental analyses and submitting necessary documents to the Environmental Review Entity; and
- (2) applicable environmental statutes and regulation may require the Recipient to prepare and submit documents to other Federal, State, and local agencies.

(e) Consistent with 23 C.F.R. 771.105(a), to the extent practicable and consistent with Federal law, the Recipient shall coordinate all environmental investigations, reviews, and consultations as a single process.

- (f) The activities described in this agreement may inform environmental decision-making processes, but the parties do not intend this agreement to document the alternatives under consideration under those processes. If a build alternative is selected that does not align information in this agreement, then:
 - (1) the parties may amend this agreement under section 21.1 for consistency with the selected build alternative; or
 - (2) if the USDOT determines that the condition at section 16.1(a)(5) is satisfied, the USDOT may terminate this agreement under section 16.1(a)(5).
- (g) The Recipient shall complete any mitigation activities described in the environmental document or documents for the Project, including the terms and conditions contained in the required permits and authorizations for the Project.
- (h) The Recipient may not expend any of the funds provided in this Agreement or incur expenses under this Agreement on final design, construction, or other activities that represent an irretrievable commitment of resources unless and until it complies with the National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (“NEPA”), Section 106 of the National Historic Preservation Act (16 U.S.C. § 470f) (“NHPA”), and any other applicable environmental laws and regulations, and DOT has provided the Recipient with a written notice that the environmental review process is complete. At that time, DOT may authorize the distribution and expenditure of funds. The Recipient may not obligate or expend any funds (federal, state or private) for final design, construction, or other activities that represent an irretrievable commitment of resources for the Project, or commence any part of final design, construction, or other activities that represent an irretrievable commitment of resources for the Project or any component of the Project, without receiving such written confirmation from DOT. The Recipient may participate in planning activities, as long as it doesn’t constitute an irretrievable commitment to a specific course of action. Depending on the outcome of the environmental review process, DOT may rescind this Agreement or may pursue any other permissible remedy under 2 C.F.R. § 200.338-200.342.

27.3 Railroad Coordination.

- (a) If the agreement includes one or more milestones identified as a “Railroad Coordination Agreement,” then for each of those milestones, the Recipient shall enter a standard written railroad coordination agreement, consistent with 23 C.F.R. 646.216(d), no later than the deadline date identified for that milestone, with the identified railroad for work and operation within that railroad’s right-of-way.

27.4 Relocation and Real Property Acquisition.

- (a) The Recipient shall comply with the land acquisition policies in 49 C.F.R. part 24 subpart B and shall pay or reimburse property owners for necessary expenses as specified in that subpart.

- (b) The Recipient shall provide a relocation assistance program offering the services described in 49 C.F.R. part 24 subpart C and shall provide reasonable relocation payments and assistance to displaced persons as required in 49 C.F.R. part 24 subparts D–E.
- (c) The Recipient shall make available to displaced persons, within a reasonable period of time prior to displacement, comparable replacement dwellings in accordance with 49 C.F.R. part 24 subpart E.

27.5 Equipment Disposition.

- (a) In accordance with 2 C.F.R. 200.313 and 1201.313, if the Recipient or a subrecipient acquires equipment under this award, then when that equipment is no longer needed for the Project that entity shall request disposition instructions from the FHWA.
- (b) In accordance with 2 C.F.R. 200.443(d), the distribution of the proceeds from the disposition of equipment must be made in accordance with 2 C.F.R. 200.313–200.316 and 2 C.F.R. 1201.313.
- (c) The Recipient shall ensure compliance with this section 27.6 for all tiers of subawards under this award.

ARTICLE 28
MANDATORY AWARD INFORMATION

28.1 Information Contained in a Federal Award. For 2 C.F.R. 200.211:

- (a) the “Federal Award Date” is the date of this agreement, as defined under section 30.2;
- (b) the “Assistance Listings Number” is 20.941 and the “Assistance Listings Title” is “Strengthening Mobility and Revolutionizing Transportation (SMART) Grants Program”; and
- (c) this award is not for research and development.

**ARTICLE 29
CONSTRUCTION AND DEFINITIONS**

29.1 **Attachments.** This agreement includes the following attachments as integral parts:

Attachment A Performance Measurement Information
Attachment B Changes from Application
Attachment C Climate Change and Environmental Justice Impacts
Attachment D Racial Equity and Barriers to Opportunity
Attachment E Labor and Workforce
Attachment F Critical Infrastructure Security and Resilience

29.2 **Exhibits.** The following exhibits, which are in the document titled “Exhibits to Grant Agreements Under the Fiscal Year 2022 SMART Grant Program”, available at <https://www.transportation.gov/grants/SMART>, are part of this agreement

Exhibit A Applicable Federal Laws and Regulations
Exhibit B Additional Standard Terms
Exhibit C Quarterly Reports and Recertifications: Format and Content
Exhibit D Certification for Contracts, Grants, Loans, And Cooperative Agreements
Exhibit E FAA Regulations
Exhibit F Communications Technology
Exhibit G Equipping or Retrofitting Motor Vehicles
Exhibit H Eligible Cost
Exhibit I Data Collection Requirements

29.3 **Construction.**

- (a) If a provision in the exhibits or the attachments conflicts with a provision in articles 1–30, then the provision in articles 1–30 prevails. If a provision in the attachments conflicts with a provision in the exhibits, then the provision in the attachments prevails.

29.4 **Integration.**

- (a) This agreement constitutes the entire agreement of the parties relating to the SMART grant program and awards under that program and supersedes any previous agreements, oral or written, relating to the SMART grant program and awards under that program.

29.5 **Definitions.** In this agreement, the following definitions apply:

“**Program Statute**” means the BIL Section 25005 of the Infrastructure Investment and Jobs Act (Pub. L. 117–58, November 15, 2021; and statutory text under the heading “Strengthening mobility and revolutionizing transportation grant program” in title I of division J of the Infrastructure Investment and Jobs Act, Pub. L. No. 117-58 (November

15, 2021), and all other provisions of that act that apply to amounts appropriated under that heading.

“Project” means the project proposed in the Grant Application, as modified by the negotiated provisions of this agreement, including article 3 and Attachments A–E.

“SMART Grant” means an award of funds that were made available under the NOFO.

“Grant Application” means the application identified in section 2.1, including Standard Form 424 and all information and attachments submitted with that form through Grants.gov.

ARTICLE 30
AGREEMENT EXECUTION AND EFFECTIVE DATE

- 30.1 **Counterparts.** This agreement may be executed in counterparts, which constitute one document. The parties intend each countersigned original to have identical legal effect.
- 30.2 **Effective Date.** The agreement will become effective when all parties have signed it. The date of this agreement will be the date this agreement is signed by the last party to sign it. This instrument constitutes a SMART Grant when the USDOT's authorized representative signs it.
- 30.3 **Termination.** Should this Grant Agreement be terminated prior to the end date of the Period of Performance, DOT reserves the right to require that the Recipient return to DOT any of the funds reimbursed for expenses subsequently deemed ineligible.

U.S. DEPARTMENT OF TRANSPORTATION
EXHIBITS TO USDOT/OST GRANT AGREEMENTS UNDER THE
FISCAL YEAR 2022 SMART GRANT PROGRAM

EXHIBIT A

APPLICABLE FEDERAL LAWS AND REGULATIONS

By entering into this agreement for a SMART Grant, the Recipient assures and certifies, with respect to this Grant, that it will comply with all applicable Federal laws, regulations, executive orders, policies, guidelines, and requirements as they relate to the application, acceptance, and use of Federal funds for this Project. Performance under this agreement shall be governed by and in compliance with the following requirements, as applicable, to the type of organization of the Recipient and any applicable sub-recipients. The applicable provisions to this agreement include, but are not limited to, the following:

General Federal Legislation

- a. Federal Fair Labor Standards Act - 29 U.S.C. §§ 201, et seq.
- b. Hatch Act - 5 U.S.C. §§ 1501, et seq.
- c. Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 - 42 U.S.C. §§ 4601, et seq.
- d. National Historic Preservation Act of 1966 - 54 U.S.C. § 306108
- e. Archeological and Historic Preservation Act of 1974 - 54 U.S.C. §§ 312501, et seq.
- f. Native American Graves Protection and Repatriation Act - 25 U.S.C. §§ 3001, et seq.
- g. Clean Air Act - 42 U.S.C. §§ 7401, et seq.
- h. Clean Water Act - 33 U.S.C. §§ 1251, et seq.
- i. Endangered Species Act - 16 U.S.C. §§ 1531 et seq.
- j. Coastal Zone Management Act - 16 U.S.C. §§ 1451 et seq.
- k. Flood Disaster Protection Act of 1973 - 42 U.S.C. §§ 4001 et seq.
- l. Age Discrimination Act of 1975, as amended - 42 U.S.C. §§ 6101, et seq.
- m. American Indian Religious Freedom Act, 42 U.S.C. 1996
- n. Drug Abuse Office and Treatment Act of 1972, as amended, 21 U.S.C. §§ 1101, et seq.
- o. The Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970, P.L. 91-616, as amended - 42 U.S.C. §§ 4541, et seq.
- p. Sections 523 and 527 of the Public Health Service Act of 1912, as amended, 42 U.S.C. §§ 290dd through 290dd-2
- q. Architectural Barriers Act of 1968 - 42 U.S.C. §§ 4151, et seq.
- r. Power Plant and Industrial Fuel Use Act of 1978, P.L. 100-42 - Section 403 - 42 U.S.C. § 8373
- s. Contract Work Hours and Safety Standards Act - 40 U.S.C. §§ 3701, et seq.
- t. Copeland Anti-kickback Act, as amended - 18 U.S.C. § 874 and 40 U.S.C. § 3145
- u. National Environmental Policy Act of 1969 - 42 U.S.C. §§ 4321, et seq.
- v. Wild and Scenic Rivers Act - 16 U.S.C. §§ 1271, et seq.
- w. Federal Water Pollution Control Act, as amended - 33 U.S.C. 1251-1376
- x. Single Audit Act of 1984 - 31 U.S.C. §§ 7501, et seq.
- y. Americans with Disabilities Act of 1990 - 42 U.S.C. § 12101, et seq.
- z. Title IX of the Education Amendments of 1972, as amended - 20 U.S.C. §§ 1681-1683 and §§ 1685-1687
- aa. Section 504 of the Rehabilitation Act of 1973, as amended - 29 U.S.C. § 794
- bb. Title VI of the Civil Rights Act of 1964 - 42 U.S.C. §§ 2000d, et seq.
- cc. Title IX of the Federal Property and Administrative Services Act of 1949 - 40 U.S.C.

- §§ 1101–1104
- dd. Limitation on Use of Appropriated Funds to Influence Certain Federal Contracting and Financial Transactions – 31 U.S.C. § 1352
 - ee. Freedom of Information Act - 5 U.S.C. § 552, as amended
 - ff. Magnuson-Stevens Fishery Conservation and Management Act – 16 U.S.C. §§ 1801, et seq.
 - gg. Farmland Protection Policy Act of 1981 – 7 U.S.C. §§ 4201, et seq.
 - hh. Noise Control Act of 1972 – 42 U.S.C. §§ 4901, et seq.
 - ii. Fish and Wildlife Coordination Act of 1956 – 16 U.S.C. §§ 661, et seq.
 - jj. Section 9 of the Rivers and Harbors Act and the General Bridge Act of 1946 - 33 U.S.C. §§ 401 and 525
 - kk. Section 4(f) of the Department of Transportation Act of 1966, 49 U.S.C. § 303 and 23 U.S.C. § 138
 - ll. Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) – 42 U.S.C. §§ 9601, et seq.
 - mm. Safe Drinking Water Act – 42 U.S.C. §§ 300f, et seq.
 - nn. The Wilderness Act – 16 U.S.C. §§ 1131, et seq.
 - oo. Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 – 42 U.S.C. 6901, et seq.
 - pp. Migratory Bird Treaty Act 16 U.S.C. §§ 703, et seq.
 - qq. The Federal Funding Transparency and Accountability Act of 2006, as amended (Pub. L. 109–282, as amended by section 6202 of Public Law 110–252)
 - rr. Cargo Preference Act of 1954 – 46 U.S.C. § 55305
 - ss. Build America, Buy America Act – Pub. L. No. 117-58, div. G, tit. IX, subtit. A, 135 Stat. 429, 1298
 - tt. Section 889 of the John D. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. 115-232

Executive Orders

- a. Executive Order 11246 – Equal Employment Opportunity
- b. Executive Order 11990 – Protection of Wetlands
- c. Executive Order 11988 – Floodplain Management
- d. Executive Order 12372 – Intergovernmental Review of Federal Programs
- e. Executive Order 12549 – Debarment and Suspension
- f. Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations
- g. Executive Order 13166 – Improving Access to Services for Persons with Limited English Proficiency
- h. Executive Order 13985 – Advancing Racial Equity and Support for Underserved Communities Through the Federal Government
- i. Executive Order 14005 – Ensuring the Future is Made in All of America by All of America’s Workers
- j. Executive Order 14008 – Tackling the Climate Crisis at Home and Abroad

General Federal Regulations

- a. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards – 2 C.F.R. Parts 200, 1201
- b. Non-procurement Suspension and Debarment – 2 C.F.R. Parts 180, 1200
- c. Investigative and Enforcement Procedures – 14 C.F.R. Part 13
- d. Procedures for predetermination of wage rates – 29 C.F.R. Part 1
- e. Contractors and subcontractors on public building or public work financed in whole or part by loans or grants from the United States – 29 C.F.R. Part 3
- f. Labor standards provisions applicable to contracts governing federally financed and assisted construction (also labor standards provisions applicable to non-construction contracts subject to the Contract Work Hours and Safety Standards Act) – 29 C.F.R. Part 5
- g. Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor (Federal and federally assisted contracting requirements) – 41 C.F.R. Parts 60, et seq.
- h. New Restrictions on Lobbying – 49 C.F.R. Part 20
- i. Nondiscrimination in Federally Assisted Programs of the Department of Transportation – Effectuation of Title VI of the Civil Rights Act of 1964 – 49 C.F.R. Part 21
- j. Uniform relocation assistance and real property acquisition for Federal and Federally assisted programs – 49 C.F.R. Part 24
- k. Nondiscrimination on the Basis of Sex in Education Programs or Activities Receiving Federal Financial Assistance – 49 C.F.R. Part 25
- l. Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance – 49 C.F.R. Part 27
- m. DOT's implementation of DOJ's ADA Title II regulations compliance procedures for all programs, services, and regulatory activities relating to transportation under 28 C.F.R. Part 35
- n. Enforcement of Nondiscrimination on the Basis of Handicap in Programs or Activities Conducted by the Department of Transportation – 49 C.F.R. Part 28
- o. Denial of public works contracts to suppliers of goods and services of countries that deny procurement market access to U.S. contractors – 49 C.F.R. Part 30
- p. Governmentwide Requirements for Drug-Free Workplace (Financial Assistance) – 49 C.F.R. Part 32
- q. DOT's implementing ADA regulations for transit services and transit vehicles, including the DOT's standards for accessible transportation facilities in Part 37, Appendix A – 49 C.F.R. Parts 37 and 38
- r. Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs – 49 C.F.R. Part 26 (as applicable under section 18.3 of this agreement)

Specific assurances required to be included in the FY 2022 SMART Grant agreement by any of the above laws, regulations, or circulars are hereby incorporated by reference into this agreement.

EXHIBIT B

ADDITIONAL STANDARD TERMS

TERM B.1
TITLE VI ASSURANCE
(Implementing Title VI of the Civil Rights Act of 1964, as amended)

**ASSURANCE CONCERNING NONDISCRIMINATION IN FEDERALLY-ASSISTED
PROGRAMS AND ACTIVITIES RECEIVING OR BENEFITING FROM FEDERAL
FINANCIAL ASSISTANCE**

(Implementing the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities
Act, as amended)

49 C.F.R. Parts 21, 25, 27, 37 and 38

The United States Department of Transportation (USDOT)

Standard Title VI/Non-Discrimination Assurances

DOT Order No. 1050.2A

By signing and submitting the Technical Application and by entering into this agreement under the FY 2022 SMART grant program, the Recipient **HEREBY AGREES THAT**, as a condition to receiving any Federal financial assistance from the U.S. Department of Transportation (DOT), through the Office of the Secretary (OST), it is subject to and will comply with the following:

Statutory/Regulatory Authorities

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin);
- 49 C.F.R. Part 21 (entitled *Non-discrimination in Federally-Assisted Programs of The Department of Transportation—Effectuation of Title VI of the Civil Rights Act Of 1964*);
- 28 C.F.R. section 50.3 (U.S. Department of Justice Guidelines for Enforcement of Title VI of the Civil Rights Act of 1964);

The preceding statutory and regulatory cites hereinafter are referred to as the “Acts” and “Regulations,” respectively.

General Assurances

In accordance with the Acts, the Regulations, and other pertinent directives, circulars, policy, memoranda, and/or guidance, the Recipient hereby gives assurance that it will promptly take any measures necessary to ensure that:

“No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity,” for which the Recipient receives Federal financial assistance from DOT.

The Civil Rights Restoration Act of 1987 clarified the original intent of Congress, with respect to Title VI and other Non-discrimination requirements (The Age Discrimination Act of 1975, and Section 504 of the Rehabilitation Act of 1973), by restoring the broad, institutional-wide scope and coverage of these non-discrimination statutes and requirements to include all programs and activities of the Recipient, so long as any portion of the program is Federally assisted.

SMART award recipients should demonstrate compliance with civil rights obligations and nondiscrimination laws, including Title VI of the Civil Rights Act of 1964, the Americans with Disabilities Act of 1990 (ADA), Section 504 of the Rehabilitation Act, and implementing regulations. This should include a current Title VI plan, completed Community Participation Plan, and a plan to address any legacy infrastructure or facilities that are not compliant with ADA standards. The Department's and the applicable Operating Administrations' Offices of Civil Rights may work with awarded grant recipients to ensure full compliance with Federal civil rights requirements.

Specific Assurances

More specifically, and without limiting the above general Assurance, the Recipient agrees with and gives the following Assurances with respect to its Federally assisted FY 2022 SMART grant program:

1. The Recipient agrees that each "activity," "facility," or "program," as defined in §§ 21.23 (b) and 21.23 (e) of 49 C.F.R. § 21 will be (with regard to an "activity") facilitated, or will be (with regard to a "facility") operated, or will be (with regard to a "program") conducted in compliance with all requirements imposed by, or pursuant to the Acts and the Regulations.
2. The Recipient will insert the following notification in all solicitations for bids, Requests For Proposals for work, or material subject to the Acts and the Regulations made in connection with the FY 2022 SMART Grant and, in adapted form, in all proposals for negotiated agreements regardless of funding source:

"The Recipient, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award."

3. The Recipient will insert the clauses of Appendix A and E of this Assurance in every contract or agreement subject to the Acts and the Regulations.
4. The Recipient will insert the clauses of Appendix B of this Assurance, as a covenant running with the land, in any deed from the United States effecting or recording a transfer

of real property, structures, use, or improvements thereon or interest therein to a Recipient.

5. That where the Recipient receives Federal financial assistance to construct a facility, or part of a facility, the Assurance will extend to the entire facility and facilities operated in connection therewith.
6. That where the Recipient receives Federal financial assistance in the form, or for the acquisition of real property or an interest in real property, the Assurance will extend to rights to space on, over, or under such property.
7. That the Recipient will include the clauses set forth in Appendix C and Appendix D of this Assurance, as a covenant running with the land, in any future deeds, leases, licenses, permits, or similar instruments entered into by the Recipient with other parties:
 - a. for the subsequent transfer of real property acquired or improved under the applicable activity, project, or program; and
 - b. for the construction or use of, or access to, space on, over, or under real property acquired or improved under the applicable activity, project, or program.
8. That this Assurance obligates the Recipient for the period during which Federal financial assistance is extended to the program, except where the Federal financial assistance is to provide, or is in the form of, personal property, or real property, or interest therein, or structures or improvements thereon, in which case the Assurance obligates the Recipient, or any transferee for the longer of the following periods:
 - a. the period during which the property is used for a purpose for which the Federal financial assistance is extended, or for another purpose involving the provision of similar services or benefits; or
 - b. the period during which the Recipient retains ownership or possession of the property.
9. The Recipient will provide for such methods of administration for the program as are found by the Secretary of Transportation or the official to whom he/she delegates specific authority to give reasonable guarantee that it, other recipients, sub-recipients, contractors, subcontractors, consultants, transferees, successors in interest, and other participants of Federal financial assistance under such program will comply with all requirements imposed or pursuant to the Acts, the Regulations, and this Assurance.
10. The Recipient agrees that the United States has a right to seek judicial enforcement with regard to any matter arising under the Acts, the Regulations, and this Assurance.
11. The Recipient shall retain all documents relevant to this Grant Agreement and the Grant Project for a period of three (3) years after completion of all projects undertaken pursuant to the Grant Agreement and receipt of final reimbursement from the U.S. Treasury, whichever is later. It shall furnish DOT, upon request, all documents and records pertaining to the determination of the amount of the Federal share or to any settlement,

litigation, negotiation, or other efforts taken to recover such funds. All settlements or other final positions of the Recipient, in court or otherwise, involving the recovery of such Federal share shall be approved in advance by DOT.

By signing this ASSURANCE, the Recipient also agrees to comply (and require any sub-recipients, contractors, successors, transferees, and/or assignees to comply) with all applicable provisions governing DOT/OST's access to records, accounts, documents, information, facilities, and staff. You also recognize that you must comply with any program or compliance reviews, and/or complaint investigations conducted by DOT/OST. You must keep records, reports, and submit the material for review upon request to DOT/OST, or its designee in a timely, complete, and accurate way. Additionally, you must comply with all other reporting, data collection, and evaluation requirements, as prescribed by law or detailed in program guidance.

The Recipient gives this ASSURANCE in consideration of and for obtaining any Federal grants, loans, contracts, agreements, property, and/or discounts, or other Federal-aid and Federal financial assistance extended after the date hereof to the recipients by the U.S. Department of Transportation under the FY 2022 SMART grant program. This ASSURANCE is binding on the Recipient, other recipients, sub-recipients, contractors, subcontractors and their subcontractors', transferees, successors in interest, and any other participants in the FY 2022 SMART grant program.

APPENDIX A

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "contractor") agrees as follows:

1. **Compliance with Regulations:** The contractor (hereinafter includes consultants) will comply with the Acts and the Regulations relative to Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Maritime Administration (DOT/OST), as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Non-discrimination:** The contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 C.F.R. Part 21.
3. **Solicitations for Subcontracts, Including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding, or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the contractor of the contractor's obligations under this contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, or national origin.
4. **Information and Reports:** The contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Recipient or DOT/OST to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the contractor will so certify to the Recipient or DOT/OST, as appropriate, and will set forth what efforts it has made to obtain the information.
5. **Sanctions for Noncompliance:** In the event of a contractor's noncompliance with the Non-discrimination provisions of this contract, the Recipient will impose such contract sanctions as it or DOT/OST may determine to be appropriate, including, but not limited to:
 - a. withholding payments to the contractor under the contract until the contractor complies; and/or
 - b. cancelling, terminating, or suspending a contract, in whole or in part.
6. **Incorporation of Provisions:** The contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The contractor will take action with respect to any subcontract or procurement as the Recipient or DOT/OST may direct as a means of enforcing such provisions including

sanctions for noncompliance. Provided, that if the contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the contractor may request the Recipient to enter into any litigation to protect the interests of the Recipient. In addition, the contractor may request the United States to enter into the litigation to protect the interests of the United States.

APPENDIX B

CLAUSES FOR DEEDS TRANSFERRING UNITED STATES PROPERTY

The following clauses will be included in deeds effecting or recording the transfer of real property, structures, or improvements thereon, or granting interest therein from the United States pursuant to the provisions of Specific Assurance 4:

NOW, THEREFORE, the U.S. Department of Transportation as authorized by law and upon the condition that the Recipient will accept title to the lands and maintain the project constructed thereon in accordance with the Consolidated Appropriations Act, 2022 (Pub. L. 116-260, Dec. 27, 2020) the Regulations for the Administration of FY 2022 SMART grant program, and the policies and procedures prescribed by the Maritime Administration (DOT/OST) of the U.S. Department of Transportation in accordance and in compliance with all requirements imposed by Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation pertaining to and effectuating the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. § 2000d to 2000d-4), does hereby remise, release, quitclaim and convey unto the Recipient all the right, title and interest of the U.S. Department of Transportation in and to said lands described in Exhibit A attached hereto and made a part hereof.

(HABENDUM CLAUSE)

TO HAVE AND TO HOLD said lands and interests therein unto Recipient and its successors forever, subject, however, to the covenants, conditions, restrictions and reservations herein contained as follows, which will remain in effect for the period during which the real property or structures are used for a purpose for which Federal financial assistance is extended or for another purpose involving the provision of similar services or benefits and will be binding on the Recipient, its successors and assigns.

The Recipient, in consideration of the conveyance of said lands and interests in lands, does hereby covenant and agree as a covenant running with the land for itself, its successors and assigns, that (1) no person will on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination with regard to any facility located wholly or in part on, over, or under such lands hereby conveyed [,] [and]* (2) that the Recipient will use the lands and interests in lands and interests in lands so conveyed, in compliance with all requirements imposed by or pursuant to Title 49, Code of Federal Regulations, U.S. Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Non-discrimination in Federally-assisted programs of the U.S. Department of Transportation, Effectuation of Title VI of the Civil Rights Act of 1964, and as said Regulations and Acts may be amended[, and (3) that in the event of breach of any of the above-mentioned non-discrimination conditions, the Department will have a right to enter or re-enter said lands and facilities on said land, and that above described land and facilities will thereon revert to and vest in and become the absolute property of the U.S. Department of Transportation and its assigns as such interest existed prior to this instruction].*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary in order to make clear the purpose of Title VI.)

APPENDIX C

CLAUSES FOR TRANSFER OF REAL PROPERTY ACQUIRED OR IMPROVED UNDER THE ACTIVITY, FACILITY, OR PROGRAM

The following clauses will be included in deeds, licenses, leases, permits, or similar instruments entered into by the Recipient pursuant to the provisions of Specific Assurance 7(a):

- A. The (Recipient, lessee, permittee, etc. as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree [in the case of deeds and leases add “as a covenant running with the land”] that:
 - 1. In the event facilities are constructed, maintained, or otherwise operated on the property described in this (deed, license, lease, permit, etc.) for a purpose for which a U.S. Department of Transportation activity, facility, or program is extended or for another purpose involving the provision of similar services or benefits, the (Recipient, licensee, lessee, permittee, etc.) will maintain and operate such facilities and services in compliance with all requirements imposed by the Acts and Regulations (as may be amended) such that no person on the grounds of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities.
- B. With respect to licenses, leases, permits, etc., in the event of breach of any of the above Non-discrimination covenants, Recipient will have the right to terminate the (lease, license, permit, etc.) and to enter, re-enter, and repossess said lands and facilities thereon, and hold the same as if the (lease, license, permit, etc.) had never been made or issued.*
- C. With respect to a deed, in the event of breach of any of the above Non-discrimination covenants, the Recipient will have the right to enter or re-enter the lands and facilities thereon, and the above described lands and facilities will there upon revert to and vest in and become the absolute property of the Recipient and its assigns.*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

APPENDIX D

CLAUSES FOR CONSTRUCTION/USE/ACCESS TO REAL PROPERTY ACQUIRED UNDER THE ACTIVITY, FACILITY OR PROGRAM

The following clauses will be included in deeds, licenses, permits, or similar instruments/agreements entered into by Recipient pursuant to the provisions of Specific Assurance 7(b):

- A. The (Recipient, licensee, permittee, etc., as appropriate) for himself/herself, his/her heirs, personal representatives, successors in interest, and assigns, as a part of the consideration hereof, does hereby covenant and agree (in the case of deeds and leases add, “as a covenant running with the land”) that (1) no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or be otherwise subjected to discrimination in the use of said facilities, (2) that in the construction of any improvements on, over, or under such land, and the furnishing of services thereon, no person on the ground of race, color, or national origin, will be excluded from participation in, denied the benefits of, or otherwise be subjected to discrimination, (3) that the (Recipient, licensee, lessee, permittee, etc.) will use the premises in compliance with all other requirements imposed by or pursuant to the Acts and Regulations, as amended, set forth in this Assurance.
- B. With respect to (licenses, leases, permits, etc.), in the event of breach of any of the above Non-discrimination covenants, Recipient will have the right to terminate the (license, permit, etc., as appropriate) and to enter or re-enter and repossess said land and the facilities thereon, and hold the same as if said (license, permit, etc., as appropriate) had never been made or issued.*
- C. With respect to deeds, in the event of breach of any of the above Non-discrimination covenants, Recipient will there upon revert to and vest in and become the absolute property of Recipient and its assigns.*

(*Reverter clause and related language to be used only when it is determined that such a clause is necessary to make clear the purpose of Title VI.)

APPENDIX E

During the performance of this contract, the contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the “contractor”) agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

A. Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d *et seq.*, 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 C.F.R. Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 *et seq.*), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 *et seq.*), as amended, (prohibits discrimination on the basis of disability); and 49 C.F.R. Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U.S.C. § 6101 *et seq.*), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 U.S.C. § 471, Section 47123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms “programs or activities” to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);
- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131 – 12189) as implemented by Department of Transportation regulations at 49 C.F.R. Parts 37 and 38;
- The Federal Aviation Administration’s Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);

- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. § 1681 et seq).

TERM B.2
CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER
RESPONSIBILITY MATTERS -- PRIMARY COVERED TRANSACTIONS

2 C.F.R. Parts 180 and 1200

These assurances and certifications are applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring DOT/OST approval or that is estimated to cost \$25,000 or more – as defined in 2 C.F.R. Parts 180 and 1200.

By signing and submitting the Technical Application and by entering into this agreement under the FY 2022 SMART grant program, the Recipient is providing the assurances and certifications for First Tier Participants and Lower Tier Participants in the FY 2022 SMART Grant, as set out below.

1. Instructions for Certification – First Tier Participants:

(Applicable to all first-tier subawards regardless of potential value and require first tier-subrecipients and lower-tier subrecipients to similarly check SAM.gov; and, for all first-tier procurement contracts with a value of \$25,000 or more and all lower tiers of subcontracts under covered non-procurement transactions (2 CFR § 180.220).

- a. The prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency’s determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.
- d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.
- e. The terms “covered transaction,” “civil judgment,” “debarred,” “suspended,” “ineligible,” “participant,” “person,” “principal,” and “voluntarily excluded,” as used in this clause, are defined in 2 C.F.R. Parts 180 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a Recipient or subrecipient of Federal funds

and a participant (such as the prime or general contract). “Lower Tier Covered Transactions” refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). “First Tier Participant” refers to the participant who has entered into a covered transaction with a Recipient or subrecipient of Federal funds (such as the prime or general contractor). “Lower Tier Participant” refers to any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

- f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.
- g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled “Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions,” provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration.
- i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
– First Tier Participants:**

- a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:
 - 1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;
 - 2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment, including a civil settlement, rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
 - 3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and
 - 4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.
- b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior DOT/OST approval or estimated to cost \$25,000 or more - 2 C.F.R. Parts 180 and 1200)

- a. The prospective lower tier participant is providing the certification set out below.
- b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.
- c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.
- d. The terms “covered transaction,” “civil settlement,” “debarred,” “suspended,” “ineligible,” “participant,” “person,” “principal,” and “voluntarily excluded,” as used in

this clause, are defined in 2 C.F.R. Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a Recipient or subrecipient of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a Recipient or subrecipient of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers to any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

- e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.
- f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.
- g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the System for Award Management website (<https://www.sam.gov/>), which is compiled by the General Services Administration.
- h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.
- i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion
-- Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.
2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

TERM B.3
REQUIREMENTS REGARDING DELINQUENT TAX LIABILITY OR A FELONY
CONVICTION UNDER ANY FEDERAL LAW

As required by sections 744 and 745 of Title VII, Division E of the Consolidated Appropriations Act, 2023 (Pub. L. 116-260), and implemented through USDOT Order 4200.6, the funds provided under this award shall not be used to enter into a contract, memorandum of understanding, or cooperative agreement with, make a grant to, or provide a loan or loan guarantee to, any corporation that:

1. Has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, where the awarding agency is aware of the unpaid tax liability, unless a Federal agency has considered suspension or debarment of the corporation and made a determination that suspension or debarment is not necessary to protect the interests of the Government; or
2. Was convicted of a felony criminal violation under any Federal law within the preceding 24 months, where the awarding agency is aware of the conviction, unless a Federal agency has considered suspension or debarment of the corporation and made a determination that suspension or debarment is not necessary to protect the interests of the Government.

The Recipient therefore agrees:

1. **Definitions.** For the purposes of this exhibit, the following definitions apply:

“**Covered Transaction**” means a transaction that uses any funds under this award and that is a contract, memorandum of understanding, cooperative agreement, grant, loan, or loan guarantee.

“**Execution of Grant Agreement**” Signing of this Grant Agreement by DOT and the Recipient.

“**Felony Conviction**” means a conviction within the preceding 24 months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the United States Code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 U.S.C. 3559.

“**Participant**” means the Recipient, an entity who submits a proposal for a Covered Transaction, or an entity who enters into a Covered Transaction.

“**Tax Delinquency**” means an unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed,

and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2. **Mandatory Check in the System for Award Management.** Before entering a Covered Transaction with another entity, a Participant shall check the System for Award Management (the “SAM”) at <http://www.sam.gov/> for an entry describing that entity.

3. **Mandatory Certifications.** Before entering a Covered Transaction with another entity, a Participant shall require that entity to:

- 1) Certify whether the entity has a Tax Delinquency; and
- 2) Certify whether the entity has a Felony Conviction.

4. **Prohibition.** If

- 1) the SAM entry for an entity indicates that the entity has a Tax Delinquency or a Federal Conviction;
- 2) an entity provides an affirmative response to either certification in section 3; or
- 3) an entity’s certification under section 3 was inaccurate when made or became inaccurate after being made

then a Participant shall not enter or continue a Covered Transaction with that entity unless the USDOT has determined in writing that suspension or debarment of that entity are not necessary to protect the interests of the Government.

5. **Mandatory Notice to the USDOT.**

- 1) If the SAM entry for a Participant indicates that the Participant has a Tax Delinquency or a Felony Conviction, the Recipient shall notify the USDOT in writing of that entry.
- 2) If a Participant provides an affirmative response to either certification in section 1, the Recipient shall notify the USDOT in writing of that affirmative response.
- 3) If the Recipient knows that a Participant’s certification under section 1 was inaccurate when made or became inaccurate after being made, the Recipient shall notify the USDOT in writing of that inaccuracy.

6. **Flow Down.** For all Covered Transactions, including all tiers of subcontracts and subawards, the Recipient shall:

- a. require the SAM check in section 2;

- b. require the certifications in section 3;
- c. include the prohibition in section 4; and
- d. require all Participants to notify the Recipient in writing of any information that would require the Recipient to notify the USDOT under section 5.

TERM B.4
RECIPIENT POLICY TO BAN TEXT MESSAGING WHILE DRIVING

Definitions. The following definitions are intended to be consistent with the definitions in DOT Order 3902.10, Text Messaging While Driving (Dec. 30, 2009) and Executive Order 13513, Federal Leadership on Reducing Text Messaging While Driving (Oct. 1, 2009). For clarification purposes, they may expand upon the definitions in the executive order.

For the purpose of this Term B.3, “**Motor Vehicles**” means any vehicle, self-propelled or drawn by mechanical power, designed and operated principally for use on a local, State or Federal roadway, but does not include a military design motor vehicle or any other vehicle excluded under Federal Management Regulation 102-34-15.

For the purpose of this Term B.3, “**Driving**” means operating a motor vehicle on a roadway, including while temporarily stationary because of traffic congestion, a traffic signal, a stop sign, another traffic control device, or otherwise. It does not include being in your vehicle (with or without the motor running) in a location off the roadway where it is safe and legal to remain stationary.

For the purpose of this Term B.3, “**Text messaging**” means reading from or entering data into any handheld or other electronic device (including, but not limited to, cell phones, navigational tools, laptop computers, or other electronic devices), including for the purpose of Short Message Service (SMS) texting, e-mailing, instant messaging, obtaining navigational information, or engaging in any other form of electronic data retrieval or electronic data communication. The term does not include the use of a cell phone or other electronic device for the limited purpose of entering a telephone number to make an outgoing call or answer an incoming call, unless this practice is prohibited by State or local law. The term also does not include glancing at or listening to a navigational device that is secured in a commercially designed holder affixed to the vehicle, provided that the destination and route are programmed into the device either before driving or while stopped in a location off the roadway where it is safe and legal to remain stationary.

For the purpose of this Term B.3, the “**Government**” includes the United States Government and State, local, and tribal governments at all levels.

Workplace Safety. In accordance with Executive Order 13513, Federal Leadership on Reducing Text Messaging While Driving (Oct. 1, 2009) and DOT Order 3902.10, Text Messaging While Driving (Dec. 30, 2009), the Recipient, subrecipients, contractors, and subcontractors are encouraged to:

(1) adopt and enforce workplace safety policies to decrease crashes caused by distracted drivers including policies to ban text messaging while driving—

(i) Company-owned or -rented vehicles or Government-owned, leased or rented vehicles; or

(ii) Privately-owned vehicles when on official Government business or when performing any work for or on behalf of the Government.

(2) Conduct workplace safety initiatives in a manner commensurate with the size of the business, such as—

(i) Establishment of new rules and programs or re-evaluation of existing programs to prohibit text messaging while driving; and

(ii) Education, awareness, and other outreach to employees about the safety risks associated with texting while driving.

(c) *Subawards and Contracts.* To the extent permitted by law, the Recipient shall insert the substance of this exhibit, including this paragraph (c), in all subawards, contracts, and subcontracts under this award that exceed the micro-purchase threshold, other than contracts and subcontracts for the acquisition of commercially available off-the-shelf items.

EXHIBIT C

QUARTERLY REPORTS AND RECERTIFICATIONS: FORMAT AND CONTENT

1. **Purpose.** The purpose of the Quarterly Reports and Recertifications under this agreement for the FY 2022 SMART grant program are to ensure that the project scope, schedule, and budget will be maintained to the maximum extent possible.
2. **Format and Content.** The Recipient shall produce a quarterly cost, schedule, and status report that contains the sections enumerated in the following list. At the discretion of the USDOT, modifications or additions can be made to produce a quarterly reporting format that will most effectively serve both the Recipient and the USDOT. Some projects will have a more extensive quarterly status than others. For smaller projects, the USDOT may determine that the content of the quarterly reports will be streamlined, and project status meetings will be held on a less-frequent basis. The first quarterly progress report should include a detailed description and, where appropriate, drawings of the items funded.
 - a. **Project Overall Status.** This section provides an overall status of the project's scope, schedule and budget. The Recipient shall note and explain any deviations from the scope of work, the schedule, or the budget that are described in this agreement.
 - b. **Project Significant Activities and Issues.** This section provides highlights of key activities, accomplishments, and issues occurring on the project during the previous quarter. Activities and deliverables to be reported on should include meetings, audits and other reviews, design packages submitted, advertisements, awards, construction submittals, construction completion milestones, submittals related to any applicable Recovery Act requirements, media or Congressional inquiries, value engineering/constructability reviews, and other items of significance. This section should specifically address progress towards compliance and issues related to the National Environmental Policy Act (NEPA), the Build America Buy America Act, and the high labor standards prioritized in Executive Order 14052, "Implementation of the Infrastructure Investments and Jobs Act."
 - c. **Action Items/Outstanding Issues.** This section should draw attention to, and track the progress of, highly significant or sensitive issues requiring action and direction in order to resolve. The Recipient should include administrative items and outstanding issues that could have a significant or adverse effect on the project's scope, schedule, or budget. Status, responsible person(s), and due dates should be included for each action item/outstanding issue. Action items requiring action or direction should be included in the quarterly status meeting agenda. The action items/outstanding issues may be dropped from this section upon full implementation of the remedial action, and upon no further monitoring anticipated.

- d. **Project Scope Overview.** The purpose of this section is to provide a further update regarding the project scope. If the original scope contained in the grant agreement is still accurate, this section can simply state that the scope is unchanged.
- e. **Project Schedule.** An updated master program schedule reflecting the current status of the program activities should be included in this section. A Gantt (bar) type chart is probably the most appropriate for quarterly reporting purposes, with the ultimate format to be agreed upon between the Recipient and the USDOT. It is imperative that the master program schedule be integrated, i.e., the individual contract milestones tied to each other, such that any delays occurring in one activity will be reflected throughout the entire program schedule, with a realistic completion date being reported. Narratives, tables, and/or graphs should accompany the updated master program schedule, basically detailing the current schedule status, delays and potential exposures, and recovery efforts. The following information should also be included:
- Current overall project completion percentage vs. latest plan percentage.
 - Completion percentages vs. latest plan percentages for major activities such as right-of-way, major or critical design contracts, major or critical construction contracts, and significant force accounts or task orders. A schedule status description should also be included for each of these major or critical elements.
 - Any delays or potential exposures to milestone and final completion dates. The delays and exposures should be quantified, and overall schedule impacts assessed. The reasons for the delays and exposures should be explained, and initiatives being analyzed or implemented in order to recover the schedule should be detailed.
- f. **Project Cost.** An updated cost spreadsheet reflecting the current forecasted cost vs. the latest approved budget vs. the baseline budget should be included in this section. One way to track project cost is to show: (1) Baseline Budget, (2) Latest Approved Budget, (3) Current Forecasted Cost Estimate, (4) Expenditures or Commitments to Date, and (5) Variance between Current Forecasted Cost and Latest Approved Budget. Line items should include all significant cost centers, such as prior costs, right-of-way, preliminary engineering, environmental mitigation, general engineering consultant, section design contracts, construction administration, utilities, construction packages, force accounts/task orders, wrap-up insurance, construction contingencies, management contingencies, and other contingencies. The line items can be broken-up in enough detail such that specific areas of cost change can be sufficiently tracked, and future improvements made to the overall cost estimating methodology. A Program Total line should be included at the bottom of the spreadsheet. Narratives, tables, and/or graphs should accompany the updated cost spreadsheet, basically detailing the current cost status, reasons for cost deviations, impacts of cost overruns, and efforts to mitigate cost overruns. The following information should be provided:

- Reasons for each line-item deviation from the approved budget, impacts resulting from the deviations, and initiatives being analyzed or implemented in order to recover any cost overruns.
- Transfer of costs to and from contingency line items, and reasons supporting the transfers.
- Speculative cost changes that potentially may develop in the future, a quantified dollar range for each potential cost change, and the current status of the speculative change. Also, a comparison analysis to the available contingency amounts should be included, showing that reasonable and sufficient amounts of contingency remain to keep the project within the latest approved budget.
- Detailed cost breakdown of the general engineering consultant (GEC) services (if applicable), including such line items as contract amounts, task orders issued (amounts), balance remaining for tasks, and accrued (billable) costs.
- Federal obligations and/or disbursements for the project, compared to planned obligations and disbursements.

g. Certifications.

- i. A certification that the Recipient is in compliance with 2 C.F.R. 200.303 (Internal Controls) and 2 C.F.R. Part 200, Subpart F (Audit Requirements).
 - ii. The certification required under 2 C.F.R. 200.415(a).
3. Recipients are required to complete post-award reports per the terms and conditions of the award. The types of reports include financial, performance, and other types of required reports.
 4. End dates for reporting periods are 3/31, 6/30, 9/30, or 12/31, regardless of budget period start dates. Deadlines for quarterly and semi-annual reports are no later than 30 days after the end of the reporting period. Annual reports are due no later than 90 days after the end of the reporting period. The Recipient shall provide all reporting deliverables detailed below. Reports should be submitted/mailed to smartreports@dot.gov .

Deliverable	Due Date
<p>Milestone Progress Performance Reports</p> <p>Submit progress reports to monitor project progress and ensure accountability and financial transparency, as well as to document activities performed, anticipated activities, and any changes to schedule or anticipated issues.</p>	<p>Quarterly (or semi-annual if directed)</p>
<p>Federal Financial Report (FFR) (SF-425)</p> <p>The Federal Financial Report (SF-425) is a financial reporting form used throughout the Federal Government Grant system. Recipients shall complete this form and attach it to each quarterly Milestone Progress Performance Reports. The form is available at https://www.grants.gov/forms/post-award-reporting-forms.html.</p>	<p>Quarterly (or semi-annual if directed)</p>
<p>Evaluation and Data Management Plan</p> <p>The Recipient shall submit an evaluation and data management plan that provides an overview of how the project will be evaluated and how the data collected will be managed and stored. The Evaluation and Data Management Plan shall include the following three sections:</p> <ol style="list-style-type: none"> a. An overview of how the proof-of-concept or prototype will be evaluated and how the data collected will be managed and stored. b. A description of the anticipated impact areas (i.e. goals) of the project if implemented at scale and the methods that will be used to estimate the anticipated benefits and costs associated with implementation. c. Robust performance metrics and measurable targets based on the project goals to inform whether the proof-of-concept or prototype meets expectations and whether full implementation would meet program goals d. The baseline data for each performance measure that is identified in the Performance Measure Table in Attachment A and a detailed description of the data sources, assumptions, variability, and estimated levels of precision for each performance measure. 	<p>Within 90 calendar days after execution of this Agreement.</p>
<p>Implementation Report</p> <p>The Recipient shall submit an implementation report that assesses the anticipated costs and benefits of the project and demonstrates the feasibility of at-scale implementation. The Implementation Report shall include the following five sections:</p>	<p>Annual- Stage 1 grants require a Draft report due within 1 year of the grant award.</p>

<ul style="list-style-type: none"> a. A description of the anticipated deployment and operational costs of the project as compared to the benefits and savings from the project if implemented at scale. b. The means by which the project has met the original expectation, as projected in the grant application, including data describing the means by which the project met the specific goals. c. Lessons learned and recommendations for future deployment strategies to optimize transportation efficiency and multimodal system performance. d. A description of the requirements for a successful at-scale deployment and an assessment of the feasibility of at-scale implementation. e. An analysis of the success, challenges and validity of the initial approach, any changes or improvements they would make in Stage 2 if recommended for award and any challenges to continued maintenance and operations in stage 2. f. The performance measurement data for each performance measure that is identified in the Performance Measure Table in Attachment A. 	
<p>Program Evaluation</p> <p>As a condition of grant award, grant recipients may be required to participate in an evaluation undertaken by USDOT or another agency or partner. Evaluation may take different forms such as an implementation assessment across grant recipients, an impact and/or outcomes analysis of all the selected sites within or across grant recipients, or a benefit/cost analysis or assessment of return on investment. As a part of the evaluation, as a condition of award, grant recipients must agree to</p> <ul style="list-style-type: none"> a. Make records available to the evaluation contractor or USDOT staff. b. Provide access to program records, and any other relevant documents to calculate costs and benefits. c. In case of an impact analysis, facilitate the access to relevant information as requested. d. Follow evaluation procedures as specified by the evaluation contractor or USDOT staff. 	<p>As applicable</p>

<p>Reporting of Matters Related to Recipient Integrity and Performance</p> <p>If the total value of a selected applicant’s currently active grants, cooperative agreements, and procurement contracts from all Federal awarding agencies exceeds \$10,000,000 for any period of time during the period of performance of this Federal award, then the applicant during that period of time must maintain the currency of information reported to the SAM that is made available in the designated integrity and performance system (currently FAPIIS) about civil, criminal, or administrative proceedings described in paragraph 2 of this award term and condition.</p> <p>This is a statutory requirement under section 872 of Public Law 110-417, as amended (41 U.S.C. 2313). As required by section 3010 of Public Law 111- 212, all information posted in the designated integrity and performance system on or after April 15, 2011, except past performance reviews required for Federal procurement contracts, will be publicly available.</p>	<p>As applicable</p>
<p>Tangible Personal Property Report (SF-428)</p> <p>The recipient must report on the status of personal property in which the Federal Government retains an interest. Interim property reports may be required at DOT discretion. A final personal property report is required at closeout.</p>	<p>As applicable</p>
<p>Real Property Status Report (SF-429)</p> <p>The report is a multi-purpose form that DOT may require for general reporting about real property acquired or constructed under a federal award, as well as for recipients to make a request related to acquisition or improvement of real property or to request disposition instructions. If applicable, recipients shall submit this report in accordance with the terms provided in 2 CFR § 200.329, no less frequently than annually.</p>	<p>As applicable</p>
<p>Final Report The Recipient shall submit (in a format to be provided by DOT) the Recipient’s assessment of the Grant Project to DOT within the Closeout process of the grant agreement.</p>	<p>Final report shall be submitted not later than 120 days after the end of the period of performance</p>
<p>Additional Reporting may be required</p>	<p>As applicable</p>

EXHIBIT D

CERTIFICATION REGARDING INFLUENCING ACTIVITIES CERTIFICATION FOR CONTRACTS, GRANTS, LOANS, AND COOPERATIVE AGREEMENTS

The undersigned certifies, to the best of his or her knowledge and belief, that:

1. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Influencing Activities," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

EXHIBIT E

FAA REGULATIONS

Innovative aviation projects must comply with all FAA and other federal, state, and local regulations relevant to the technologies and usages thereof. For instance, in the case of innovative aviation projects involving small, unmanned aircraft systems (UAS), applicants are responsible for complying with regulations which may include, and are not limited to the following, as necessary to achieve desired outcomes:

- 14 CFR Part 91 General Operating and Flight Rules
- 14 CFR Part 107 small UAS rule; Small UAS
- UAS Operations over People rule; Operations Over People General Overview
- UAS Remote identification rule; UAS Remote Identification Overview

Proponents of innovative aviation projects are also responsible for using U.S. government tools and resources which may include, and are not limited to the following, as necessary to fulfill requirements to operate technologies and achieve desired outcomes:

- FAA DroneZone, used to register UAS
- FAA Low Altitude Authorization and Notification Capability (LAANC), used to obtain airspace authorization to fly in controlled airspace
- Part 107 Waiver Resources, used to enable more complex UAS operations

EXHIBIT F

Communications Technology

Projects that use communications technologies must either:

- 1) use Vehicle-to-Everything (V2X) services that utilize Cellular Vehicle-to-Everything (C-V2X) based technology designed to operate within the 30 MHz of spectrum (5.895 - 5.925 GHz) that are consistent with the rules established in waivers associated with Federal Communications Commission (FCC) ET Docket No. 19-138 and future Report and Orders effective at the time when the Department selects projects for funding under the FY22-SMART Grants Program; or
- 2) leverage other communications technologies that can support V2X services and operate in spectrum outside of the 5.895 -5.925 GHz range.

EXHIBIT G

Equipping or Retrofitting Motor Vehicles

Projects that involve equipping or retrofitting motor vehicles with additional technologies are only eligible if the vehicles are publicly owned, leased or used in a contracted service; equipping privately owned and operated vehicles outside of a leased or contracted service is not an eligible activity. Projects involving motor vehicles must involve only vehicles that comply with all applicable Federal Motor Vehicle Safety Standards (FMVSSs) and Federal Motor Carrier Safety Regulations (FMCSRs), or vehicles that are exempt from the requirements in a manner that allows for the legal acquisition and operation of the vehicles in the proposed project.

EXHIBIT H

Eligible Costs

Broadly, eligible activity costs must comply with the cost principles set forth in 2 CFR Part 200, Subpart E (i.e., 2 CFR § 200.403 and § 200.405). USDOT reserves the right to make cost eligibility determinations on a case-by-case basis. Eligible development and construction activities for grant funding are the following:

- planning;
- feasibility analyses;
- revenue forecasting;
- environmental review;
- permitting;
- preliminary engineering and design work;
- systems development or information technology work;
- acquisition of real property (including land and improvements to land relating to an eligible project);
- construction;
- reconstruction;
- rehabilitation;
- replacement;
- environmental mitigation;
- construction contingencies; and
- acquisition of equipment, including vehicles.

The following are not eligible costs for SMART Grants Program funding:

- reimbursement of any pre-award costs or application preparation costs of the SMART grant application;
- traffic or parking enforcement activity; or
- purchase or lease of a license plate reader.

Federal funds may not be used to support or oppose union organizing, whether directly or as an offset for other funds.

EXHIBIT I

Data Collection Requirements Data Management

To fulfill the reporting requirements and in accordance with the USDOT Public Access Plan, award recipients must consider, budget for, and implement appropriate data management for data and information outputs acquired or generated during the grant. Applicants are expected to account for data and performance reporting in their budget submission. Projects must:

- Defaulting to open access when appropriate (exceptions include protecting personally identifiable information [PII], Indigenous data sovereignty, or confidential business information [CBI]);
- Protecting PII, intellectual property rights, and CBI;
- Utilize, when possible, open licenses and protect USDOT's non-exclusive copyright to data and corresponding outputs;
- Make the source code or tools necessary to analyze the data available to the public, if relevant;
- Provide relevant metadata (in a DCAT-US file, and, optionally, a discipline-appropriate metadata standard file), and data documentation (README.txt files, data dictionaries, code books, supporting files, imputation tables, etc.); and
- Where applicable, consider contributing data to voluntary resources such as NHTSA's AV TEST Initiative.

Projects should implement data management best practices including, but not limited to, implementation of published data specifications and standards (formal and informal); increasing data discoverability and data sharing; and enabling interaction of systems, interoperability, and integration of data system

Gwinnett County SMART Transportation Initiative Evaluation Plan

Project Title	Gwinnett County SMART Transportation Initiative
Recipient Name	Gwinnett County Department of Transportation
Fiscal Year of Award	2023
Period of Performance	October 1, 2023 to April 1, 2025
Organization Preparing the Evaluation Plan	Gwinnett County Department of Transportation
Date Submitted	December 15, 2023

PART 1: INTRODUCTION AND PROJECT OVERVIEW

The Gwinnett County SMART Transportation Initiative is a dynamic and comprehensive project aimed at tackling some of the key transportation challenges faced by one of the fastest-growing counties in the U.S. - Gwinnett County, Georgia. This project is particularly focused on the Singleton Road corridor, an area that has been struggling with increasing traffic issues and a lack of sufficient pedestrian facilities, which have unfortunately led to several pedestrian fatalities in recent years. Growth in Gwinnett County has led to a steady increase in traffic volumes, creating a pressing need to address safety, mobility, and operational concerns, with many of these hazards disproportionately affecting aging, low-income and minority communities. To help solve this growing problem, the County intends to incorporate new technologies and ITS, such as active pedestrian detection systems, enhanced transit delivery services, and connected vehicle technologies to reduce and prevent fatalities and serious injuries. These new technologies will also improve traffic operations, mobility, and overall quality of life for all residents, visitors, and employees.

At the heart of this initiative is the use of cutting-edge technology solutions to significantly enhance safety, mobility, and operational efficiency across the county's transportation network. The project specifically addresses the needs of communities that have historically been underserved, ensuring that improvements in transportation are inclusive and beneficial to all, including elderly, low-income, and minority populations.

The initiative takes a holistic approach, combining innovative technology with practical improvements to revitalize transportation. This includes upgrading pedestrian infrastructure like crosswalks and traffic signals and integrating advanced systems to make roads safer and more efficient for vehicles, pedestrians, and cyclists alike. This forward-looking strategy aims to transform the way residents and visitors experience transportation in Gwinnett County, making it safer, more accessible, and more reliable for everyone.

Goals and Desired Outcomes

The Gwinnett County SMART Transportation Initiative is guided by a set of strategic goals and desired outcomes aimed at transforming the transportation landscape to be safer, more resilient, more accessible, environmentally friendly, and well-integrated with other systems.

Area of Emphasis	Goal
Safety and Reliability	To enhance the safety of pedestrians and the broader traveling public, including improving emergency response efficiency and reducing pedestrian fatalities and injuries.
Resiliency	Increase the transportation system's reliability and resilience, including better responses to cybersecurity threats and adaptability to climate change effects.
Equity and Access	Improve access to transportation for underserved populations, thus enhancing connectivity to jobs, education, and essential services.
Climate	Address climate concerns by reducing congestion and air pollution; and improving energy efficiency of transportation systems.
Partnerships	Foster partnerships with the community and other stakeholders
Integration	Integrate different transportation systems for a cohesive, efficient network.

Potential Technologies to Be Deployed

To enhance the safety and efficiency of the Singleton Road corridor, the Gwinnett County SMART Transportation Initiative is exploring a range of advanced technological solutions. These potential technologies will be carefully selected to address specific challenges and improve the overall transportation experience.

- **Connected Vehicle Technologies:** The project will consider deploying connected traffic signals and pedestrian safety applications. This may include systems that notify motorists of pedestrian traffic with enough lead time to avoid collisions and transit treatments that interface with transit signal priority.
- **Intelligent Sensor-Based Infrastructure:** Passive pedestrian detection systems will also be considered, which could automatically detect pedestrians and activate crossing signals without manual input. These systems could be crucial for facilitating safe mid-block crossings.
- **Systems Integration:** The integration of pedestrian signal and beacon technologies with existing traffic management systems is a key aspect. This integration ensures a cohesive approach to traffic and pedestrian flow management.

Stakeholder Engagement Strategy

Effective stakeholder engagement is crucial for the success of the Gwinnett County SMART Transportation Initiative. Our strategy focuses on integrating feedback from a diverse range of stakeholders into the evaluation process to ensure the project meets the community's needs and expectations.

Methods of Engagement: We will employ a variety of engagement methods to ensure broad and inclusive participation. These methods include public forums, surveys, focus group discussions, and interactive online platforms. Public forums may be held at key project milestones to update the community and gather feedback. Surveys may be distributed both online and in person to collect quantitative and qualitative data on community perceptions and suggestions. Focus groups may involve specific segments of the community, such as local business owners, pedestrian and cyclist groups, and representatives from underserved populations, to gain in-depth insights. Additionally, an interactive online platform could be established for ongoing dialogue, where stakeholders can provide feedback, ask questions, and receive updates.

Types of Stakeholders Involved: Our stakeholder group will likely include local residents, business owners, commuter groups, pedestrian and cyclist advocacy organizations, local government agencies, transportation experts, and emergency services. Special attention will be given to ensuring that historically disadvantaged communities are included in the engagement process to ensure their voices are heard and their needs are addressed.

Utilization of Stakeholder Input for Continuous Improvement: Stakeholder feedback will be instrumental in guiding project adjustments and improvements. Input on safety concerns, usability of transportation systems, and community impact will inform ongoing project evaluation and potential course corrections. Feedback will be regularly reviewed by the project team, and actionable insights will be integrated into the project plan. Regular updates will be provided to stakeholders on how their feedback has been used, thereby fostering a sense of ownership and partnership in the project. This iterative process will ensure the project not only meets its initial goals but also evolves in response to the community's changing needs and priorities.

Additional Information

Gwinnett County has a strong foundation in ITS and existing infrastructure, such as traffic signals, CCTV cameras, and fiber-optic cables, which will support the deployment of new technologies.

The Gwinnett County SMART Transportation Initiative represents a significant step forward in using advanced technologies to address critical transportation challenges, with a focus on safety, equity, and efficiency. It leverages connected vehicle technology, intelligent sensors, and system integration to create a safer, more resilient, and accessible transportation environment for Gwinnett County's diverse population.

Project Scale

The Gwinnett County SMART Transportation Initiative involves a project assessment focused on improving pedestrian safety and traffic management by incorporating several advanced technologies and strategies.

Initial Deployment

The initial deployment will occur along Singleton Road, a minor arterial road handling nearly 23,000 vehicle trips daily. The technology may be implemented at key intersections and mid-block crossing points identified as high-risk areas for pedestrian traffic.

The project will likely include a specific number of pedestrian hybrid beacons, RRFBs, and transit signal priority systems. The exact numbers will depend on the corridor's length and identified critical points.

Expansion Across Gwinnett County

Following the successful deployment and assessment along the Singleton Road Corridor, the county may look to implement similar solutions across other high-risk corridors in Gwinnett County.

The scale of deployment will be expanded, potentially involving more intersections, additional pedestrian safety measures, and broader integration with the county's transportation network.

Project Evaluation Process

The evaluation plan for the Gwinnett County SMART Transportation Initiative is designed to be comprehensive and accessible to those who may not be familiar with the intricacies of the project. The process involves:

- **Setting Performance Measures and Targets:** Establishing clear metrics and objectives for each goal of the project.
- **Baseline Data and Comparative Analysis:** Utilizing existing data and industry standards as benchmarks to measure the project's impact.
- **Data Collection and Analysis:** Systematically gathering and analyzing data to assess the effectiveness of the deployed technologies.
- **Continuous Feedback and Improvement:** Engaging with stakeholders and incorporating feedback to refine and improve the project continuously.

The evaluation is structured to provide a clear understanding of the project's impact and to ensure that the objectives are met effectively and efficiently. The outcomes of this evaluation will not only inform the progress of the Gwinnett County SMART Transportation Initiative but also serve as a valuable resource for similar future projects.

Project Stakeholders

A diverse group of stakeholders will play pivotal roles in the project's success. The final selection of these stakeholders will be meticulously curated once a consultant firm is onboarded to lead and implement the project, ensuring a balanced representation of expertise, resources, and local insights.

Group	Role	Responsibilities
Project Team	Lead project planning, implementation, and management.	Coordinate with partners, oversee technology deployment, ensure project goals are met, and manage data collection efforts.
Partners	Support the project through resources, expertise, or technology.	Assist in technology deployment, provide technical support, and contribute to data collection and analysis.
Evaluation Team	Conduct the project evaluation.	Design the evaluation methodology, collect and analyze data, and prepare the evaluation report.
Local Community & Other Interest Groups	Provide local insights and support community engagement.	Facilitate community feedback, assist in disseminating information about the project, and participate in data collection where applicable.

Evaluation Schedule

The outlined evaluation schedule represents an initial framework for the Gwinnett County SMART Transportation Initiative, with the understanding that a final and detailed schedule will be established once a consultant team is selected to lead and implement the project. Gwinnett County remains committed to completing the project by April 1, 2025, ensuring a thorough and effective evaluation process.

- **Months 1-2:** Project kickoff, stakeholder meetings, finalizing objectives.
- **Months 3-4:** Baseline data collection.
- **Months 5-6:** Technology deployment and start of data collection.
- **Months 7-8:** Ongoing data collection and preliminary analysis.
- **Months 9-10:** Conclude data collection.
- **Months 11-12:** Final analysis and evaluation report preparation.
- **Month 13:** Submission of the evaluation report and project review meeting.

This schedule is indicative and can be adjusted based on the specific timelines and milestones of the project. The evaluation process is critical to determining the project's success and providing actionable insights for future implementations.

PART 2: PROJECT GOALS AND OBJECTIVES FOR AT-SCALE IMPLEMENTATION

The table below delineates the specific performance measures, approaches, and the anticipated impacts for each key area of the Gwinnett County SMART Transportation Initiative, showcasing how targeted strategies should lead to tangible improvements in safety, reliability, resiliency, equity, climate responsiveness, partnerships, and system integration.

Area of Emphasis	Approach	Anticipated Impacts
Safety and Reliability	Utilization of intelligent transportation systems (ITS) and new technologies like active pedestrian detection systems, enhanced transit delivery services, and connected vehicle technologies.	Reduction in pedestrian fatalities and serious injuries, improved traffic operations and mobility, enhanced overall quality of life for residents, visitors, and employees.
Resiliency	Updating the Connected Vehicle Technology Master Plan (CVTMP) to integrate the latest advancements in technology and address resiliency concerns.	Enhanced reliability and resilience of the transportation system, including better cybersecurity and adaptation to climate change effects.
Equity and Access	Engaging underserved communities in the planning process and focusing on transportation solutions that address their specific needs.	Expanded access for underserved or disadvantaged populations, improved connectivity to jobs, education, and essential services.
Climate	Deployment of ITS and smart transportation solutions that optimize traffic flow and reduce emissions.	Reduction in congestion and air pollution, including greenhouse gases, and improvement in energy efficiency.
Partnerships	Leveraging technical and financial commitments for the proposed solution, demonstrating strong leadership and community collaboration	Strengthened economic competitiveness, enhanced private sector investments or partnerships.
Integration	Implementing advanced detection systems and connected vehicle technology to enhance communication and safety across various modes of transportation.	Improved integration of systems and enhanced connectivity of infrastructure, vehicles, pedestrians, bicyclists, and the broader public.

Estimated Costs

Initial Deployment

The following estimated costs for the Gwinnett County SMART Transportation Initiative are preliminary and subject to variation, depending on factors such as the consultant team selected, the specific types of technologies chosen, and decisions regarding their locations and quantities. These estimates provide an initial financial framework for the various phases of the project, from concept layout and planning to implementation and reporting.

Task	Description	Estimated Amount
Technical Reports and Assessments	This includes costs for updating the Connected Vehicle (CV) Master Plan, CV Deployment Prioritization and Implementation Plan, Systems Engineering Documentation, Public Outreach Plan and Public Participation Workshop, and Project Feasibility Assessment.	\$125,000.00
Project Prototyping	This covers expenses for the Project Concept Layout and Planning, Design, Development and Implementation, Integration and Testing, and Results Reporting and Lessons Learned.	\$676,000.00
Project Design Documentation	This encompasses Pre-Design Activities and Conceptual Engineering Design.	\$115,000.00
Additional Costs	This includes costs for managing compliance with grant requirements and other contingencies.	\$ 137,400.00

The Total Estimated Cost for the proof-of-concept or prototype phase is **\$1,053,400.00**.

Expansion Across Gwinnett County

In planning for at-scale implementation, it is essential to anticipate the associated costs accurately. Preliminary estimates suggest that the at-scale implementation will be significantly more resource-intensive than the initial deployment phase. This is due to the expanded scope, covering a larger geographical area and potentially incorporating more advanced technological solutions. The estimated cost range for at-scale implementation is projected to be between \$1.5 million to \$10 million. This estimate accounts for broader deployment across multiple areas, extensive infrastructure enhancements, and the integration of more sophisticated technology and resources.

The primary sources of funding for at-scale implementation are anticipated to come from a combination of federal grants, such as the continuation of SMART grants, state-level transportation funding, and local government allocations. Additional financial support may be sought through public-private partnerships, especially with technology providers and local communities that stand to benefit from improved transportation infrastructure.

Several factors will influence the final costs of at-scale implementation. Key among these are the scale of deployment, the specific technologies chosen based on the initial deployment phase outcomes, labor and material costs at the time of implementation, and ongoing maintenance and operational expenses. The costs may also be affected by unforeseen challenges during deployment, such as the need for additional infrastructure modifications or upgrades to existing systems.

It is important to note that these estimates are preliminary and subject to change based on the results and learnings from the initial deployment phase. Detailed budget planning will be conducted as part of the transition from initial deployment to the at-scale implementation phase, taking into account the latest data, technological advancements, and stakeholder feedback.

Historical Data

Below is a high-level summary of the historical data available and how it informs the project goals, performance measures, or performance targets for at-scale implementation.

Area of Emphasis	Historical Data	Impact on Evaluation Plan
Safety and Reliability	Gwinnett County has experienced rapid growth, leading to increased traffic volumes and safety concerns, particularly in areas like Singleton Road. There has been a significant number of pedestrian fatalities in recent years.	This data underscores the critical need for safety enhancements, informing the goal to reduce pedestrian fatalities and injuries and improve overall traffic operations and mobility.
Resiliency	The development of the Connected Vehicle Technology Master Plan (CVTMP) and the county's partnership with the Georgia Department of Transportation (GDOT) indicate a focus on using emerging technologies for transportation improvements.	This data should guide the evaluation of improvements in the transportation system's reliability and resilience, including cybersecurity and climate change adaptability.
Equity and Access	The county's comprehensive transportation plans and stakeholder engagement efforts demonstrate a focus on equitable solutions and accessibility for disadvantaged communities.	Insights from community engagement will inform goals to improve transportation access for underserved populations.
Climate	The use of ITS and connected vehicle technologies in the county points to a commitment to addressing climate concerns through improved transportation systems.	The historical data supports the goal of reducing congestion and air pollution while improving energy efficiency.
Partnerships	Gwinnett County's collaborations with various local jurisdictions and organizations in developing the CVTMP and other projects show a strong emphasis on partnerships.	This data should help shape the evaluation plan's focus on fostering partnerships to enhance the project's technical and financial capabilities.
Integration	The county's extensive ITS network, including traffic signals, CCTV cameras, and fiber-optic cables, demonstrates a foundation for integrating various transportation systems.	The existing ITS infrastructure should inform goals for improved integration of systems and connectivity across different modes of transportation.

This historical data provides a comprehensive understanding of the current transportation infrastructure, community needs, and technological capabilities in Gwinnett County, which is instrumental in setting realistic and achievable goals for the project and establishing appropriate performance measures and targets for at-scale implementation.

PART 3: PERFORMANCE MEASURES FOR THE PROJECT

The table below is based upon the goals described in the Gwinnett County SMART Application and considers the objectives of evaluating the project during initial deployment.

Area of Emphasis & Evaluation Question	Performance Measure	Target Measure
Safety and Reliability: How effective is the system in reducing pedestrian and bicyclist accidents?	Reduction in the number of pedestrian and bicyclist accidents.	20% reduction in accidents involving pedestrians and bicyclists.
Resiliency: How resilient is the transportation system to cyber threats and climate change effects?	Number of successful cyber-attacks thwarted, system uptime during severe weather conditions.	100% resistance to cyber-attacks, 95% system uptime during severe weather.
Equity and Access: How well does the system improve connectivity for underserved populations?	Increase in transportation access points in underserved areas.	30% increase in access points in identified underserved areas.
Climate: What is the impact of the system on reducing congestion and air pollution?	Reduction in average travel time, decrease in air pollutants.	15% reduction in average travel time, 10% decrease in key air pollutants.
Partnerships: How effective are the partnerships in enhancing the project's technical and financial capabilities?	Number of private sector and/or community group partnerships formed.	Establishment of 5 new partnerships.
Integration: How well integrated are the various systems (vehicles, infrastructure, etc.)?	Efficiency in data exchange between systems, reduction in system integration errors.	95% efficiency in data exchange, 20% reduction in integration errors.

These performance measures and targets aim to provide a detailed and informative evaluation of the project, enabling a realistic understanding of what could be achieved through at-scale implementation. The findings from this evaluation will help refine expectations and guide further development of the project.

PART 4: EVALUATION METHODOLOGY FOR THE PROJECT

The following evaluation methodology forms the backbone of the Gwinnett County SMART Transportation Initiative's initial deployment phase. It is tailored to provide a comprehensive understanding of the project's efficacy, guide budget adherence, and inform the scalability of the project, ultimately shaping the future of transportation in Gwinnett County.

Performance Measurements Against Baseline

In the execution of the Gwinnett County SMART Transportation Initiative, a pivotal step is to contrast the performance metrics of the prototype against a pre-deployment baseline. This approach involves leveraging existing data and industry norms as the foundation for benchmarking the project's impact. Historical data, particularly from areas such as Singleton Road, will be instrumental in this comparison, providing insights into traffic dynamics, safety concerns, and technological gaps. The baseline will be constituted from an array of sources, notably:

- Historical traffic volume records.
- Safety concerns and incident reports, with an emphasis on pedestrian fatalities.
- Pre-existing ITS frameworks and their operational benchmarks.

Comprehensive Evaluation Framework

The evaluation process is designed to be holistic, encompassing:

- **Establishing Metrics and Targets:** Clear, quantifiable objectives will be set for each project goal, ensuring measurable outcomes.
- **Data Collection and Analysis:** A systematic approach will be adopted for the collection and analysis of data post-deployment, assessing the efficacy of the implemented technologies.
- **Ongoing Feedback Integration:** Stakeholder feedback will be an integral part of the process, promoting continuous refinement and enhancement of the project.

Evaluation will cover multiple dimensions, including but not limited to: **Safety and Reliability, Resiliency, Equity and Access, Environmental Impact, Partnership Efficacy, and System Integration.**

Benefit and Cost Estimation Methodology

The benefits of deploying ITS and emerging transportation technologies will be appraised, with a particular focus on enhancing safety, mobility, and overall community wellbeing. Key indicators will likely include reductions in pedestrian fatalities, improvements in traffic flow, and enhancement of life quality for residents and visitors.

The project will entail an in-depth assessment of performance improvements alongside a cost-saving analysis. This dual approach ensures that all project objectives are not only met, but are achieved economically.

Documentation of Learnings and Future Recommendations

Throughout the project, a meticulous record will be kept of the challenges encountered, best practices identified, and recommendations for future deployments. This repository of knowledge will be vital for scaling the project beyond the proof-of-concept stage.

Following the initial deployment, the project aims to extend these technologies to other high-risk areas within the county. This phase will build upon the learnings from the Singleton Road prototype, refining and enhancing the methodology for broader application.

Technical Terms and Acronyms

Acronym/Term	Definition
ITS	Intelligent Transportation Systems
CCTV	Closed-Circuit Television
CVTMP	Connected Vehicle Technology Master Plan
GDOT	Georgia Department of Transportation
SigOps	GDOT's Active Traffic Management Program
SMART	Strengthening Mobility and Revolutionizing Transportation
ROI	Return on Investment
V2X	Vehicle-to-Everything Communication

Plan Overview

A Data Management Plan created using DMPTool

Title: Singleton Road Corridor Technology Improvements

Creator: Jerry Oberholtzer

Affiliation: United States Department of Transportation (DOT) (transportation.gov)

Funder: United States Department of Transportation (DOT) (transportation.gov)

Funding opportunity number: DOT-SMART-FY23-01

Grant: 69A3552341004-SMARTFY22N1P1G21

Template: SMART Grants Stage 1 Data Management Plan (DMP)

Project abstract:

In response to the rapid growth and increasing diversity of Gwinnett County, the Singleton Road Corridor Technology Improvements project aims to address critical challenges in traffic safety, mobility, and operational efficiency. This project is particularly focused on serving the needs of disadvantaged communities, which have been disproportionately affected by traffic-related hazards.

The core objective is to enhance pedestrian safety and improve traffic flow, leveraging Intelligent Transportation Systems (ITS) and cutting-edge technologies. This initiative recognizes the urgent need to incorporate advanced solutions like active pedestrian detection systems, enhanced transit delivery services, and connected vehicle technologies. These innovations are crucial for reducing and preventing fatalities and serious injuries, particularly in areas like the Singleton Road corridor, which has seen a significant number of pedestrian accidents, including fatalities.

The project encompasses a comprehensive approach, including updating the Connected Vehicle Technology Master Plan (CVTMP) to reflect the latest advancements in transportation technology and identifying specific solutions tailored to the unique needs of the Singleton Road corridor. This includes exploring a variety of safety measures such as pedestrian hybrid beacons, rectangular rapid flashing beacons, and other Federal Highway Administration-approved safety countermeasures.

Moreover, the project will assess and deploy technology that aids in detecting non-vehicular traffic and integrates this data into a unified platform. This approach ensures the dissemination of critical safety information through various channels, like active managed traffic beacons and dynamic message signs, directly interfacing with the traveling public.

In summary, the Singleton Road Corridor Technology Improvements project in Gwinnett County is a strategic initiative aimed at promoting safer, more efficient transportation networks. By focusing on ITS and emerging technologies, the project aspires to significantly enhance the quality of life for all residents, with a particular emphasis on safeguarding and empowering historically underserved communities.

Start date: 10-01-2023

End date: 04-01-2025

Last modified: 12-15-2023

Singleton Road Corridor Technology Improvements

Dataset and Contact Information

Please provide as much of the the following information as possible:

1. Name of the project;
2. Grant number;
3. Name of the person submitting this DMP;
4. ORCID of the person submitting this DMP (need an ORCID? Register here: <https://orcid.org/>);
5. Email and phone number of the person submitting this DMP;
6. Name of the organization for which the person submitting this DMP is working;
7. Email and phone number for the organization;
8. Link to organization or project website, if applicable; and,
9. Date the DMP was written.

1. Name of the project: Singleton Road Corridor Technology Improvements
2. Grant number: 69A3552341004-SMARTFY22N1P1G21
3. Name of the person submitting this DMP: Jerry T. Oberholtzer
4. ORCID of the person submitting this DMP: N/A
5. Email and phone number of the person submitting this DMP:
jerry.oberholtzer@gwinnettcounty.com, 678.237.5266
6. Name of the organization for which the person submitting this DMP is working:
Gwinnett County Board of Commissioners
7. Email and phone number for the organization: jerry.oberholtzer@gwinnettcounty.com,
678.237.5266
8. Link to organization website: <http://www.gwinnettcounty.com>
9. Date the DMP was written: December 14, 2023

Data Description

Please provide as much information as possible:

1. Provide a description of the data that you will be gathering in the course of your project or data from a third party that you will re-use, if any;
 1. If there will be no data collected or re-used from another source, state that

this is case;

2. Address the expected nature, scope, and scale of the data that will be collected, as best as you can at this stage;
 3. As best as you can, describe the characteristics of the data, their relationship to other data, and provide sufficient detail so that reviewers will understand any disclosure risks that may apply;
 1. If data might be sensitive, please describe how you will protect privacy and security, if you know that now;
 2. You may need to update your DMP later to add more detail;
 4. Discuss the expected value of the data over the long-term.
1. Provide a description of the data that you will be gathering in the course of your project or data from a third party that you will re-use, if any; If there will be no data collected or re-used from another source, state that this is case:

Data collection will likely focus on traffic volumes, pedestrian movements, accident reports, and the effectiveness of Intelligent Transportation Systems (ITS) and connected vehicle technologies. This may include real-time and historical traffic data, detailed pedestrian safety metrics, and public transportation usage patterns. Additionally, feedback from community engagement activities will be gathered to inform project decisions. If relevant, third-party data from existing traffic and safety studies may also be re-used to supplement the project's data collection.

2. Address the expected nature, scope, and scale of the data that will be collected, as best as you can at this stage:

The expected nature of the data will be multifaceted, likely encompassing quantitative traffic and pedestrian movement data, qualitative community feedback, and technical performance data from ITS and connected vehicle technologies. The scope includes detailed traffic flow analyses, pedestrian safety metrics, accident incidence reporting, public transit usage statistics, and effectiveness assessments of deployed technologies. The scale of data collection is extensive, covering the entire Singleton Road corridor and potentially integrating third-party studies for a comprehensive understanding.

3. As best as you can, describe the characteristics of the data, their relationship to other data, and provide sufficient detail so that reviewers will understand any disclosure risks that may apply; If data might be sensitive, please describe how you will protect privacy and security, if you know that now; You may need to update your DMP later to

add more detail:

The data will likely be characterized by a mix of individual-level details (like pedestrian movements) and aggregated information (such as traffic flow patterns). Traffic and pedestrian data will have a temporal and spatial relationship, enabling an understanding of patterns over time and across different areas of the corridor. Community feedback data will add qualitative insights to this quantitative mix. All personal data, especially from pedestrian and public transportation usage, will be handled with strict adherence to privacy laws to mitigate disclosure risks. Care will be taken to anonymize and aggregate individual data to prevent identification, addressing potential concerns about the privacy and security of personal information. This approach ensures that while the data remains comprehensive and informative, it upholds the highest standards of data protection and confidentiality.

4. Discuss the expected value of the data over the long-term:

Over the long term, the data collected is expected to provide significant value in shaping sustainable and safe urban mobility. By offering insights into traffic patterns, pedestrian safety, and the efficacy of ITS technologies, this data will guide future infrastructure and policy decisions not only in Gwinnett County but potentially in similar urban settings. The longitudinal analysis of this data can reveal trends, enable predictive modeling for traffic and safety management, and foster continuous improvements in public transportation systems. Additionally, the data serves as a valuable resource for academic and governmental research in urban planning and traffic safety, contributing to broader efforts in enhancing urban livability and resilience.

Data Format and Metadata Standards Employed

Please provide as much information as you can:

1. Describe the anticipated file formats of your data and related files;
2. To the maximum extent practicable, your DMP should address how you will use platform-independent and non-proprietary formats to ensure maximum utility of the data in the future;
 1. If you are unable to use platform-independent and non-proprietary formats, you should specify the standards and formats that will be used and the rationale for using those standards and formats.

3. Identify the metadata standards you will use to describe the data.

1. At least one metadata file should be a DCAT-US v1.1

(<https://resources.data.gov/resources/dcat-us/>) .JSON file, the federal standard for data search and discovery.

1. Describe the anticipated file formats of your data and related files:

Data is anticipated to primarily be stored in formats like CSV and Excel for tabular records such as traffic counts and accident reports, GIS formats (e.g., Shapefiles, GeoJSON) for spatial data, and standard document formats like PDF and Word for textual reports and community feedback. Visual data from traffic monitoring will be in common image and video formats like JPEG and MP4. Additionally, data logs from ITS technologies are expected to be in JSON or XML formats for better system interoperability. These formats are preferred as they are in widespread use, allow for ease of data processing and analysis, and compatibility with various analytical tools.

2. To the maximum extent practicable, your DMP should address how you will use platform- independent and non-proprietary formats to ensure maximum utility of the data in the future; If you are unable to use platform-independent and non-proprietary formats, you should specify the standards and formats that will be used and the rationale for using those standards and formats:

We will prioritize platform-independent and non-proprietary data formats to maximize the utility and longevity of the data. Formats like CSV, JSON, and GeoJSON are selected for their wide compatibility across various software and systems, ensuring data accessibility and ease of sharing. These formats are universally recognized and can be easily migrated or integrated into future technologies, preserving the data's usability over time. In cases where specific proprietary formats are necessary (such as specialized GIS software formats or database systems), the rationale lies in their advanced features that are crucial for in-depth spatial analysis or complex data management tasks. These proprietary formats will be accompanied by comprehensive documentation to facilitate future data conversion or migration if needed. This approach balances the need for advanced technical capabilities with the goal of maintaining long-term data accessibility.

3. Identify the metadata standards you will use to describe the data. At least one metadata file should be a DCAT-US v1.1 (<https://resources.data.gov/resources/dcat-us/>) .JSON file, the federal standard for data search and discovery:

Key metadata standards will be employed to ensure comprehensive and standardized data description. The DCAT-US v1.1 standard, in a JSON format, will be a primary metadata framework, aligning with federal guidelines for data search and discovery. Additionally, the Dublin Core standard may be used for basic resource descriptions, while ISO 19115 may be applied to geographic information, making it ideal for spatial data. For survey and statistical data, the Data Documentation Initiative (DDI) should provide detailed context and structure. This combination of metadata standards should ensure that the project's data is well-documented, easily accessible, and compatible with broader data management practices.

Access Policies

In general, data from DOT-funded projects must be made publicly accessible. Exceptions to this policy are: data that contain personally identifiable information (PII) that cannot be anonymized; confidential business information; or classified information. Protecting research participants and guarding against the disclosure of identities and/or confidential business information is an essential norm in scientific research. Your DMP should address these issues and outline the efforts you will take to provide informed consent statements to participants, the steps you will take to protect privacy and confidentiality prior to archiving your data, and any additional concerns. In general, in matters of human subject research, your DMP should describe how your informed consent forms will permit sharing with the research community and whether additional steps, such as an Institutional Review Board (IRB), may be used to protect privacy and confidentiality. Additionally, when working with, or conducting research that includes Indigenous populations or Tribal communities, researcher will adhere to the CARE Principles for Indigenous Data Governance <https://www.gida-global.org/care> and make an explicit statement to that effect in this portion of the DMP.

Please provide as much information as possible:

1. Describe any sensitive data that may be collected or used;
2. Describe how you will protect PII or other sensitive data, including IRB review, application of CARE Principles guidelines, or other ethical norms and practices;
 1. If you will not be able to deidentify the data in a manner that protects privacy and confidentiality while maintaining the utility of the dataset, you should describe the necessary restrictions on access and use;

3. Describe any access restrictions that may apply to your data;
4. If necessary, describe any division of responsibilities for stewarding and protecting the data among Principal Investigators or other project staff.

1. Describe any sensitive data that may be collected or used:

Sensitive data that may be collected includes personal identifiable information (PII) from community feedback surveys, pedestrian movement data, and public transportation usage records. This could encompass details like names, contact information, and potentially locations and times of travel. This sensitive data could be crucial for in-depth analysis and enhancing transportation safety and efficiency.

2. Describe how you will protect PII or other sensitive data, including IRB review, application of CARE Principles guidelines, or other ethical norms and practices; If you will not be able to deidentify the data in a manner that protects privacy and confidentiality while maintaining the utility of the dataset, you should describe the necessary restrictions on access and use:

To ensure the protection of PII and other sensitive data, the project's approach adheres to stringent security guidelines as outlined in Gwinnett County Information Technology document ITS-SST-006 "Security Requirements for Purchases". These guidelines are applied to all systems the county procures and implements, ensuring comprehensive data security and compliance with relevant standards and ethical norms, including IRB review and CARE Principles. In scenarios where data cannot be fully deidentified, the county system's stringent security measures, as detailed in the guidelines, provide the necessary framework for restricted access and controlled use of the data.

3. Describe any access restrictions that may apply to your data:

Access to data will be subject to specific restrictions in line with Gwinnett County's ongoing implementation of a Zero Trust environment. This approach fundamentally adjusts data accessibility protocols, ensuring stringent verification for every access request, regardless of the user's location or network. The Zero Trust model emphasizes rigorous authentication and authorization processes, making data access contingent on continuous validation and adherence to the latest security protocols. This implementation significantly strengthens the county's data security framework, limiting access to authorized personnel under strict compliance guidelines.

4. If necessary, describe any division of responsibilities for stewarding and protecting the data among Principal Investigators or other project staff:

If necessary, the division of responsibilities for stewarding and protecting the data among Principal Investigators and project staff will be structured to align with the principles of the Zero Trust security model. Each team member would be assigned specific data stewardship roles, ensuring that access and management of data are strictly controlled and monitored. Responsibilities would be clearly delineated and regularly audited to ensure adherence to the stringent security protocols of the Zero Trust framework, enhancing accountability and minimizing risks related to data handling and protection.

Re-use, Redistribution, and Derivatives Products Policies

Recipients are reminded:

1. Data, as a collection of facts, cannot be copyrighted under US copyright law;
2. Projects carried out under a US DOT SMART Grants is federally funded; therefore, as stated in grant language:
 1. Recipients must comply with the US DOT Public Access Plan, meaning, among other requirements, project data must be shared with the public, either by the researchers or by US DOT;
 2. That by accepting US DOT funding through this grant, recipients have granted to US DOT a comprehensive non-exclusive, paid-up, royalty-free copyright license for all project outputs (publications, datasets, software, code, etc.). This includes all rights under copyright, including, but not limited to the rights to copy, distribute, prepare derivative works, and the right to display and/or perform a work in public; and,
 3. In accordance with Chapter 18 of Title 35 of the United States Code, also known as the Bayh-Dole Act, where grant recipients elect to retain title to any invention developed under this grant, US DOT retains a statutory nonexclusive, nontransferrable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any such invention throughout the world.

Please provide as much information as possible:

1. Describe who will hold the intellectual property rights for the data created or used during the project;

2. Describe whether you will transfer those rights to a data archive, if appropriate;
3. Identify whether any licenses apply to the data;
 1. If you will be enforcing terms of use or a requirement for data citation through a license, indicate as much in your DMP;
4. Describe any other legal requirements that might need to be addressed.

1. Describe who will hold the intellectual property rights for the data created or used during the project:

Gwinnett County

2. Describe whether you will transfer those rights to a data archive, if appropriate; Identify whether any licenses apply to the data; If you will be enforcing terms of use or a requirement for data citation through a license, indicate as much in your DMP; Describe any other legal requirements that might need to be addressed:

Currently, there is no plan to transfer the rights of collected data to a data archive and it is anticipated that no licenses will apply to the subject data. There is no intention to enforce any terms of use or data citation requirements through a license at this time. If the need arises, our data management plan (DMP) will be updated to reflect any changes in our approach or to comply with legal requirements.

Archiving and Preservation Plan

Please provide as much information as possible:

1. State where you intend to archive your data and why you have chosen that particular option;
2. Provide a link to the repository;
3. You must describe the dataset that is being archived with a minimum amount of metadata that ensures its discoverability;
 1. Whatever archive option you choose, that archive should support the capture and provision of the US Federal Government DCAT-US Metadata Schema <https://resources.data.gov/resources/dcat-us/>
4. In addition, the archive you choose should support the creation and maintenance of persistent identifiers (e.g., DOIs, handles, etc.) and must provide for maintenance of those identifiers throughout the preservation

lifecycle of the data;

5. Your plan should address how your archiving and preservation choices meet these requirements.

1. State where you intend to archive your data and why you have chosen that particular option:

Data will likely be archived within the county's databases, leveraging its robust security and efficient data management capabilities, ensuring data integrity, and streamlined access. This approach will likely be chosen for its alignment with stringent security standards and operational efficiency.

2. Provide a link to the repository;

As data collection for this project has not yet begun, a specific repository location has not been established. Access to the project's data repository link is restricted and provided solely on an as-needed basis, in line with the Zero Trust model's stringent security protocols. The development and oversight of the data repository will heavily involve the county's Information Technology Data Management Team once data collection commences. Should it be decided that the data will be open access upon completion of the project, the Data Management Plan (DMP) will be updated accordingly with a repository link.

3. You must describe the dataset that is being archived with a minimum amount of metadata that ensures its discoverability; Whatever archive option you choose, that archive should support the capture and provision of the US Federal Government DCAT-US Metadata Schema <https://resources.data.gov/resources/dcat-us/>

All datasets pertaining to this project will be archived with a minimum amount of metadata to ensure its discoverability. This will include essential details adhering to the US Federal Government DCAT-US Metadata Schema (<https://resources.data.gov/resources/dcat-us/>), which provides a standardized approach to data cataloging for enhanced search and discovery.

4. In addition, the archive you choose should support the creation and maintenance of persistent identifiers (e.g., DOIs, handles, etc.) and must provide for maintenance of those identifiers throughout the preservation lifecycle of the data;

The selected archival solution will support the creation and maintenance of persistent

identifiers, such as DOIs (Digital Object Identifiers) and handles. This feature is crucial for ensuring the long-term accessibility and reference of our data. The archive will not only facilitate the generation of these identifiers but also ensure their ongoing maintenance, thereby guaranteeing the persistent and reliable linkage to our datasets over time. This commitment enhances the data's traceability, credibility, and utility in both current and future research and applications.

5. Your plan should address how your archiving and preservation choices meet these requirements.

Gwinnett County will ensure that the selected archival solution is capable of supporting the DCAT-US Metadata Schema for enhanced discoverability and facilitates the creation and maintenance of persistent identifiers like DOIs. These elements are integral to our strategy, ensuring our data is not only preserved effectively but also remains accessible and useful for long-term applications, fully aligning with the established guidelines and standards.
