Connected and Automated Vehicle Readiness Study

Technology Transition Plan

RIVER TO SEA Transportation Planning Organization
VISION - PLAN - IMPLEMENT
TPO

June 2020

River to Sea Transportation Planning Organization

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Technology Transition Plan

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EXECUTIVE SUMMARY

How will connected and automated vehicles interact with the transportation system? What other emerging technologies will impact transportation and land use? How soon do we expect these systems to be in place? And what can local agencies do to prepare? Across the country, infrastructure owner-operators and their partner agencies are trying to answer questions like these.

The River to Sea Transportation Planning Organization (TPO) is preparing for the impacts of transformational technologies (including connected and automated vehicles) and the opportunities created by new applications of these technologies through the production of this planning project. In2020, the TPO began the project by conducting a thorough review of connected and automated vehicle (CAV) readiness, including an assessment of the region's preparedness to adopt and adapt to new technologies and mobility solutions. The results of the assessment are combined with industry expert recommendations to form this Technology Transition Plan (TTP). This TTP outlines the TPO's goals and objectives for adopting and adapting to transformational transportation technologies. This TTP also provides decision-maker guidance for updating policies and procedures to keep pace with rapidly evolving technology. Most importantly, the TTP outlines a transition plan that is specific to the River to Sea TPO planning area for adopting transformational technologies at the local community level and for incorporating new transportation technologies into regional plans, land development codes, and funding.

RIVER TO SEA TPO'S TRANSFORMATIONAL TECHNOLOGY GOALS

The River to Sea TPO's goals for adopting and adapting to transformational technologies, such as connected and automated vehicles, are to:

- Identify smart technology solutions that improve **traffic management** while helping to solve our regional **mobility** challenges.
- Utilize technology to develop a multimodal transportation system that improves transportation **accessibility** for all of our residents.
- Support technology solutions that improve the **safety** of all our road users, including pedestrians, bicyclists, and motorcyclists.
- Support technology solutions that provide **equitable** access to transportation for all of our travelers, including the needs of the elderly, people with disabilities, those unable to drive, those without a smart phone, and those who are un-/under-banked.

River to Sea TPO is also focused on prioritizing the **resiliency and sustainability** of our region's transportation system. Hurricanes, natural disasters, or health pandemics may bring about uncertain changes. We are looking to technology solutions that may help us overcome uncertainties related to travel demand changes, travel behavior and pattern changes, and potential economic recession. We are also looking to technology solutions that can support basic mobility and delivery needs if supply chains and transportation networks are disrupted.

IMPACTS OF TRANSFORMATIONAL TECHNOLOGIES

Technology is a tool that can help us address our mobility challenges, provide new means of accessibility to our residents and visitors, improve the safety and equity of our transportation system, and support a resilient community. To be transformational, a technology must be successful in the marketplace, provide superior or cheaper service than what is currently available, and operate in a sustainable price range (NCHRP Report 924, 2019). Examples of transformational technologies that already impact the River to Sea planning area or will in the

near future include: wireless telecommunications, electric vehicles, ridehail services, big data analytics, and the Internet of Things (IoT). These technologies may impact safety, mobility, travel demand, infrastructure management, funding, and revenue streams.

SELF-ASSESSMENT

The River to Sea TPO conducted a self-assessment to understand the region's readiness to adopt and adapt to new technologies. The self-assessment identified the following infrastructure and communications opportunities, which the TPO can help to address:

- Update the existing traffic signal infrastructure and communication network to support new technology (such as connected and automated vehicle communications, transit signal priority, and adaptive traffic signal systems).
- Allocate or identify operations and maintenance funding to support technology improvements.
- Set resiliency standards for new infrastructure (as emphasized by the COVID-19 pandemic and other disruptive forces).
- Incorporate needs of new mobility alternatives in special event traffic management planning.
- Facilitate technology transition conversations at multiple staff/management levels, across offices within agencies, and across agencies.
- Develop data sharing policies so local agencies learn what data are available and how to use data to inform decision making.
- Share information and educate the public so they are more able and willing to accept new technologies.
- Provide training and support for elderly residents who do not have experience using new technologies.

PILOT DEPLOYMENT OPPORTUNITIES

Technology is changing rapidly. Pilot deployments are an effective way for our local agencies to get smart about new systems, new data, and new transportation models. They give us the opportunity to learn directly about the impacts these technologies will have on our community and to learn what unique challenges and solutions are needed to fit our existing infrastructure and travel demands. If we identify challenges early on, our local agencies can make changes in response to lessons learned.

RECOMMENDATIONS

As we embrace new technologies, monitoring how technology impacts travel and land use will be integral in the planning process. Local agencies can make better-informed decisions by establishing programs, funding criteria, and evaluations based on data-driven performance metrics. These metrics, in turn, can be empowered by the digital infrastructure necessary to collect, store, analyze, and disseminate data.

The following actions are recommended to ready the region's infrastructure for new technologies; to educate staff, decision makers, and the public; and to communicate and share information between agency staff and decision makers:

- Create a data marketplace and supplement it with rigorous monitoring of transportation, land-use, and demographic data.
- Establish a Working Group on Emerging Technologies. The working group could coordinate with the TPO's Technical Coordinating Committee (TCC) and facilitate ongoing technology discussions between agency staff, decision makers, elected officials, industry experts, and diverse stakeholder groups to learn about new technologies and to understand their benefits, costs, and limitations.

- Implement the recommendations of the ITS Master Plan to update the region's communications network, intelligent transportation systems (ITS) infrastructure, systems security, training needs, and staffing needs.
- Partner with local agencies and institutes of higher education to apply for innovative grant funding for piloting technology deployments in the planning area.

To maximize the TPO's new Emerging Technologies Working Group, the following actions are recommended:

- Share best-practices and example policy language with local agencies that want to develop flexible policy that can adapt to new technologies.
- Encourage transparent data sharing across member agencies and across partnerships with vendors or data providers.
- Monitor guidance on how to adapt regional travel demand models to account for transformational technologies, including connected and automated vehicles, ridehail (such as Lyft or Uber), and micromobility (such as shared bikes or e-scooter).
- Monitor the TPO's land use, population, and employment data to identify early indicators of growth.
- Provide guidance for the use, storage, and data sharing for micromobility or transportation network company partnerships.
- Monitor data from transit agencies, micromobility providers, and field sensors to identify early indicators of travel demand impacts. This data may also teach us about the resiliency of our transportation system.

Appendix B provides a detailed list of technology applications that we anticipate for the near-and mid-terms in the planning area. The TPO can consider ways to include some of these projects in regional plans like the *Unified Planning Work Program* or *Connect 2045*, the long-range plan currently under development.

1. INTRODUCTION

We live in exciting times—rapidly evolving technology is changing the way we travel and what trips we make. We also live in uncertain times—the COVID-19 pandemic has demonstrated the importance of a resilient transportation system that ensures the safe and healthy movement of people and goods. The River to Sea Transportation Planning Organization (TPO) is preparing for these impacts and opportunities by conducting a connected and automated vehicle (CAV) readiness study and developing a Technology Transition Plan (TTP).

This TTP is a guide that outlines the TPO's goals and objectives for adopting and adapting to transformational transportation technologies. This TTP also provides decision-maker guidance for adapting policies and procedures to keep pace with rapidly evolving technology. Most importantly, the TTP outlines a transition plan that is specific to the River to Sea TPO planning area for adopting CAVs and other transformational technologies at the local community level and for incorporating new transportation technologies into comprehensive plans, land development codes, legislation, or funding.

TRANSFORMATIONAL TECHNOLOGY READINESS GOALS

The River to Sea TPO's Transformational Technology Readiness Goals are consistent with the region's Connect 2045 Goals on multimodal, economic development, connectivity, safety, livability, and public involvement. The TPO's transformational technology goals are:

- Identify smart technology solutions that improve **traffic management** while helping to solve regional **mobility** challenges.
- Utilize technology to develop a multimodal transportation system that improves transportation **accessibility** for all residents.
- Support technology solutions that provide **equitable** access to transportation for all travelers, including the needs of the elderly, people with disabilities, those unable to drive, those without a smart phone, and those who are un-/under-banked.
- Support technology solutions that improve the **safety** of all road users, including pedestrians, bicyclists, and motorcyclists.

As we learn to adapt to increased uncertainty, River to Sea TPO is also focused on prioritizing the **resiliency and sustainability** of our region's transportation system. We are looking to technology solutions that may help us overcome uncertainties related to travel demand changes, travel behavior and pattern changes, and potential economic recession. We are also looking to technology solutions that can support basic mobility and delivery needs when supply chains and transportation networks may be disrupted.

WHAT PROBLEMS ARE WE TRYING TO SOLVE?

Technology may be a tool to help our local agencies address their transportation challenges.

What are the main transportation challenges in our planning area? **Table 1** outlines the local challenges identified in the River to Sea Intelligent Transportation System (ITS) Master Plan (2018).

Table 1. Local Agency Transportation Challenges

Local Agency	Challenges
Volusia County	• Managing congestion on major corridors • Upgrading CCTV system to communicate with the FDOT network • Special events causing route modification for Votran (public transit) • Implementing Transit Signal Priority (TSP) by ensuring interoperability between Votran fleet and [local and county] signal systems • Parking availability information at major destinations
Flagler County	• Improving incident and construction coordination between local agencies • Managing and maintaining existing assets such as signal controllers
Palm Coast	• Synchronizing existing connected signals along arterials with an advanced management system • Collecting automated multimodal data
Daytona Beach	• Congestion due to special events and traffic incidents • Non-interoperability between regional monitoring systems • Completing gaps in the FOC [fiber-optic communication] network
FDOT District 5	• Automating multimodal data collection process

What are the main issues with transformational technologies? Some technologies are exposing challenges today, like parking of shared bicycles, e-bikes, and e-scooters. Some desirable technologies may not succeed without some public agency help, like the need for charging stations to support electric vehicle adoption. Other technologies (such as autonomous vehicles) are still in their infancy, and the changes they may cause (modal shifts, redistribution of trips, vehicle occupancy rates) may change as these technologies evolve.

DEFINITIONS AND KEY TERMS

The transportation sector is using a vast array of technologies on our nation's highways, roads, streets, rails, air, and water. In our own backyard, Embry Riddle Aeronautical University has developed a self-driving car and even a sophisticated, self-driving boat.[1] This technology transition plan focuses on highway, road, and street vehicles; highway/road/street parking infrastructure; and personal communication devices that enable information sharing. **Appendix A** provides more detailed definitions and additional terms.

Connected Vehicle (CV): A vehicle that can communicate with other vehicles, infrastructure, or other wireless technologies.

Automated Vehicle (AV): Also known as driverless cars or self-driving vehicles, AVs are equipped with sensors (for example: cameras, radar, LiDAR, computer vision, GPS, or CV technology), which allow them to operate with little

[1] https://news.erau.edu/headlines/students-debut-one-of-the-worlds-most-sophisticated-autonomous-boats-for-its-size

to no human assistance. There are several levels of automation, some of which assist the driver but do require the human driver to perform most of the functions of the driving task.

Transportation Network Company (TNC): Private transportation technology firms that provide services such as ride-matching, ridesharing, and ridehailing through vehicle-routing software platforms and licensing. Well-known TNCs include Uber, Lyft, Via, and TransLoc.

Mobility as a Service (MaaS): Describes treats mobility as a commodity independent of mode, where a single platform handles all aspects of an individual's trip (payment, mode and vehicle selection, route planning, and navigation.) A common payment system and a common platform or app that combines public and private transportation services enables this shift. Users pay for trips on multiple modes using a single account. MaaS offers travelers mobility solutions based on their travel needs.

Micromobility: The concept of using alternative travel modes for short trips or first- and last-mile connections. Typical examples include station-based or dockless bikes, electric-bikes, and electric-scooters. Micromobility services are often provided by a TNC, which owns a fleet of mobility sources and provides the service as a shared use.

Ridehailing: When a customer hails a ride often through a mobile app or kiosk. The driver takes the customer to a destination designated by the customer for a charge, and payment is made automatically through a mobile app. Ridehailing services are operated by TNCs who adjust the cost of a ride based on current demand.

ACES: An acronym used by FDOT to refer to collectively to Automated, Connected, Electric, and Shared-Use Vehicles (ACES).

TRANSFORMATIONAL TECHNOLOGIES IN TRANSPORTATION

We can group the current transformational transportation technologies as: Internet of Things (IoT), passenger vehicle technologies, infrastructure technologies, and logistics technologies (**Figure 1**). Transformational technologies can supplement or ultimately replace the need for personal vehicle ownership, enable better use of system resources, and support better management of systems.

The applications of the technologies will have a greater impact than the technologies themselves. Applications evolve daily, and the market is continuously assessing which applications make sense under changing conditions. As a result, predictions of the impacts of transformational technologies range widely. The applications of transformational technologies may impact mobility by replacing the need for personal travel, enabling better use of system resources, and supporting better management of systems.

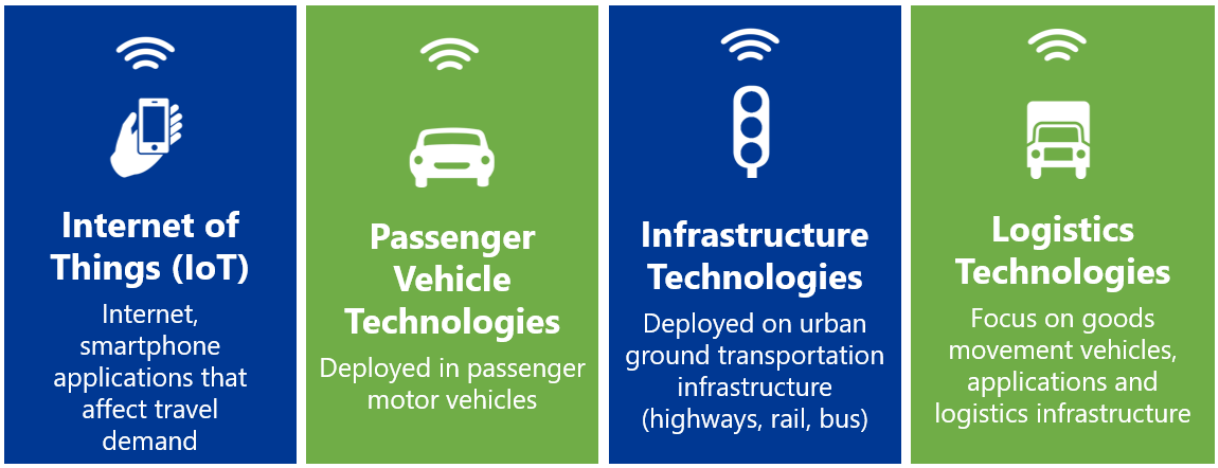


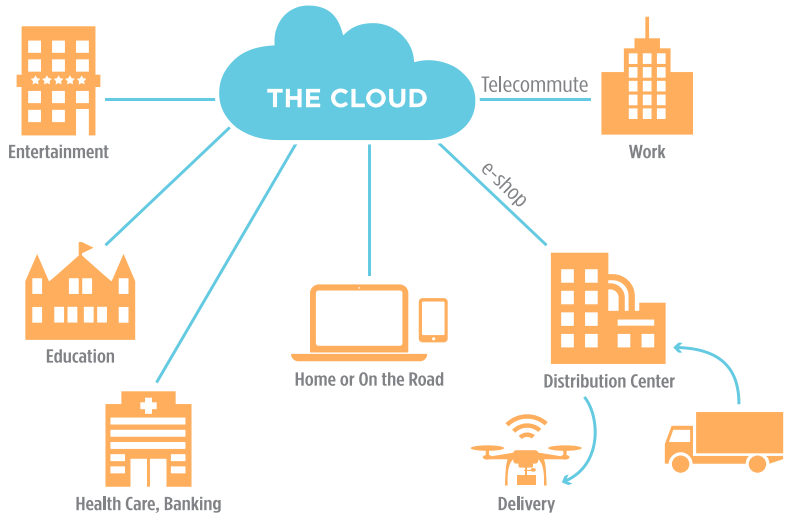
Figure 1. Transformational Technologies in Transportation

Source: NCHRP Report

Applications that Replace the Need for Personal Travel

The Internet of Things (IoT) is the network of devices with direct connections to the internet (**Figure 2**). IoT is available today. It enables e-commerce and can replace some of our needs for personal travel.

There are a variety of factors influenced or enabled by IoT that are likely to impact future travel behaviors and choices. Technologies available today—such as e-commerce and on-demand delivery, telework, remote learning, unmanned aerial vehicles (drones), and ridehailing—will continue to shift travel demand and trip purpose.



Source: NCHRP Report 924.

Figure 2. Example e-commerce applications

Telework and on-demand delivery will likely impact home and work locations. In the future, 3-D printing may replace the need for some personal trips. An automated vehicle, automated sidewalk delivery robot, or even a drone might be used to deliver groceries, medicines, or goods even in rural areas. IoT connectivity and e-commerce may help many of our elderly residents age in place.

Some education may be needed to help residents, employees, and employers learn how to use remote systems and e-commerce. E-commerce may reduce the need for personal trips, but it will likely increase the demands on

that national logistics system. Providing high-speed internet service to all residents and travelers is essential for sustainable and equitable service. The ability of society to adapt to these changing technologies, and the increasing need for internet connectivity for all has been evidenced recently as a result of the COVID-19 pandemic, which shifted many jobs, schools, and shopping to the internet overnight.

Applications that Enable Better Use of System Resources

Personal mobility applications have the potential to facilitate travel by decreasing travel costs or by increasing awareness of available travel options. Mobility as a Service (MaaS) and route-guidance applications make traveling easier, thereby facilitating increased travel. On-demand mobility services enable less need for individual vehicle ownership. Ridehail services can reduce parking demand, reduce impaired driving, and provide additional passenger capacity to support special events. Designated and well-planned pickup/drop off zones are needed to move stopped vehicles out of travel lanes and to provide safe places for pedestrians to enter or exit vehicles.

Figure 3. Example of Bikeshare Corral

Many local agencies struggle with the policy challenge of regulating some of these applications to ensure we continue to meet local goals for public safety, welfare, equity, and the environment. Significant concerns include providing space for the storage of shared vehicles in the public right of way; safely mixing light vehicles, heavy vehicles, personal mobility devices, (bicycles, scooters) and pedestrians; and ensuring safety when navigational apps send traffic through residential areas.

Applications that Support Better Management of Systems

Smart city and *smart community* initiatives seek to improve the delivery of government services through technology applications. These applications are built on an integrated data repository and a communications network. These applications enable real-time monitoring of systems, which supports improved management and delivery of government services. Examples include parking management systems, intelligent highway systems, and transportation management applications.

- **Parking management systems** monitor parking utilization and can share information with drivers looking to park via mobile apps or wayfinding signs. This information sharing helps a driver navigate to an available on-street or garage parking spot without having to circle the block multiple times looking for an open space. This reduces the travel time of the trip; reduces circulating VMT from already congested areas; and improves safety for pedestrians, bicyclists, and other motorists. These applications may also be used to dynamically set parking rates based on utilization or fixed schedules.
- **Intelligent highway systems** are infrastructure technologies that use smart field devices and information from traveler devices (and eventually connected vehicles) to enable more efficient traffic management methods that reduce travel time, delay, and cost. Adaptive signal control technology monitors traffic patterns on a corridor and automatically adjusts the timing of traffic lights to ease congestion. This application helps address variable or unpredictable traffic demands, which may occur if a crash on I-95

diverts vehicles onto arterial streets. Transit Signal Priority (TSP) adjusts traffic light timing to prioritize transit vehicles (often when they are running behind schedule) to improve transit service reliability.

- **Transportation management applications** can reduce congestion, improve travel time reliability, and provide travelers and transportation providers with the real-time information they need to inform efficient, optimized trip making. These improvements can attract more drivers or transit users to the corridors that are equipped with smart infrastructure. From a land-use perspective, applications that reduce travel times and improve travel time reliability often lead to the spread of urban development.

Enabling these and other applications requires local agencies to develop the digital infrastructure necessary to collect, analyze, secure, and disseminate data to transportation users and providers, as well as non-transportation partners who may be able to apply their subject matter expertise to transportation challenges. Two specific pieces of digital infrastructure may assist in these efforts:

- **Open Data Portals** are repositories of public agency data that allow agencies, businesses, and individuals to access this data through an Application Program Interface (API) for use in their own tools.
- **Data Marketplaces** are an expansion of the Open Data Portal concept, where participating agencies and businesses can define the types, quantities, and granularity of information they are willing to exchange with others (and the price point for which they will provide this data.) The benefit of a Data Marketplace over an Open Data Portal is that a Data Marketplace can allow agencies to engage with the private sector and support non-transportation use cases.

The policy challenges for local agencies are the need to:

- Get data-smart, which includes collecting, analyzing, and securing data,
- Develop partnerships with private industry vendors, and
- Possibly provide space for platoons of vehicles or unmanned aerial vehicles (UAVs or drones) in the future. Vehicle platooning may also require infrastructure owner operators to ensure safety of roads and bridges under new load patterns.

GUIDANCE ON PLANNING FOR EMERGING TECHNOLOGIES

In the past two years, several guidebooks were published to provide agencies with best practices for incorporating emerging technologies, especially CAV technologies, into planning practice. The key documents are:

- National Cooperative Highway Research Program (NCHRP) Report 924: *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation*, 2019
- Florida Department of Transportation (FDOT) *Guidance for Assessing Planning Impacts and Opportunities of Automated, Connected, Electric and Shared-Use Vehicles*, 2018
- National Association of City Transportation Official's (NACTO) *Blueprint for Autonomous Urbanism*, 2019
- National League of Cities (NLC) *Autonomous Vehicles Policy Preparation Guide*, 2019
- National Association of Counties (NACo) *Connected and Automated Vehicles Toolkit: A Primer for Counties*, 2019
- Victoria Transport Policy Institute, *Pandemic-Resilient Community Planning: Practical ways to help communities prepare for, respond to, and recover from pandemics and other economic, social and environmental shocks*, 2020
- NCHRP Research Report 896: *Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles, Volume 2: Guidance*, 2018

The key themes for agencies planning in this era of rapidly evolving technology are to **self-assess**, **get data**, **get smart**, and **be nimble** (**Figure 3**). More detailed guidance on these themes and best practices are available in NCHRP Report 924: *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation* (2019), NACTO's *Blueprint for Autonomous Urbanism* (2019), the NCL's *Autonomous Vehicles Policy Preparation Guide* (2019), and the NACo's C*onnected and Automated Vehicles Toolkit: A Primer for Counties* (2019).

Source: NCHRP Report 924.

Figure 4. Transformational Technology Planning Themes

To follow this guidance, River to Sea TPO will:

- **Self-Assess.** Frequently assess our ability to address the impacts of new technologies and new transportation applications in our planning process and tools. Establish a timely & recurring reevaluation of existing codes, policies, standards, and procedures to ensure desired behaviors are incentivized through agency actions.
- **Get Data.** Bring new data sources into the planning processes. Establish partnerships with 3rd party data aggregation, anonymization, storage, and security firms to ensure cybersecurity of sensitive data from the connected network.
- **Get smart.** Educate existing staff on new technologies, and anticipate new skillsets required to respond to new technologies (such as cybersecurity, IT). Establish and evaluate program criteria, funding criteria, and staffing needs based on data-driven performance metrics.
- **Be nimble.** Update plans and regulations so they are more flexible in dealing with different versions of new technologies. Ensure that this framework can both adjust to, license, and permit emerging technologies and provide sufficient data to monitor trends.

ORGANIZATION OF REPORT

The remaining sections of this report are organized as follows:

- Section 2 outlines *opportunities* created by emerging technologies
- Section 3 summarizes the findings of the TPO's technology readiness *self-assessment*
- Section 4 identifies the data needs and trends the TPO can *monitor* to measure impacts of new technologies on land use and transportation
- Section 5 outlines the *training, education, and communication* needs in the region
- Section 6 guides the TPO and local agencies on developing *nimble policy* that can adapt to new technologies

- Section 7 concludes with recommendations and next steps

The following appendices are provided to give more details and background information on technologies, their applications, policy updates, needs, and guidance.

- Appendix A: Definitions and Key Terms
- Appendix B: Technology Transition Projects for R2CTPO
- Appendix C: Federal and State CAV Regulations and Legislation
- Appendix D: Florida Projects, Pilots, and Deployments
- Appendix E: Key Findings from Master Plan Reviews
- Appendix F: Key Findings from Stakeholder Interviews
- Appendix G: Agency Training Needs
- Appendix H: Los Angeles Transportation Technology Strategy
- Appendix I: San Francisco's 10 Principles for TNCs
- Appendix J: Hoboken, NJ Rules for E-Scooters
- Appendix K: Planning for Rideshare and Micromobility at the World Series

2. OPPORTUNITIES CREATED BY EMERGING TECHNOLOGIES

Technology is a tool that can help us address our mobility challenges, provide new means of accessibility to our residents and visitors, improve the safety and equity of our transportation system, and support a resilient community. To be transformational, a technology must be successful in the marketplace, provide superior or cheaper service than what is currently available, and operate in a sustainable prices range (NCHRP Report 924, 2019).

Examples of transformational technologies that are already impacting the River to Sea planning area or will soon are: wireless telecommunications, electric vehicles, ridehail services, big data analytics, and the Internet of Things (IoT). These technologies may impact safety, mobility, travel demand, infrastructure management, funding, and revenue streams.

Source: NCHRP Report 924

Figure 5. Smart, Resilient Communities Utilize Many Technologies

MOBILITY

Technology may reduce the time cost or monetary cost of travel. However, as trip times and trip costs decrease, planning for an increase in travel demand and changes in land use will be integral to the functioning of the regional transportation system. Emerging technologies can also introduce new options for populations previously without access. For example, artificial intelligence-supported algorithms (AI) are beginning to be able to dynamically route transit vehicles for on-demand pick-up and drop-off trips. By offering these services through mobile apps, web browsers, or dial-in services, these micro-transit providers can increase their service area, decrease wait times, and provide access to essential destinations for people of different ages and abilities. True mobility is multi-modal, and emerging technologies such as common payment systems, integrated shared mobility devices (e-bikes and e-scooters), and regional coordination between transit, parking, and other mobility providers can empower travelers with different mobility options suitable to each unique trip.

ACCESSIBILITY

Automated vehicles may provide unique accessibility options for travelers who cannot drive. In the future, these vehicles may be able to pick up elderly or visually impaired travelers and take them to medical appointments or to the store.

Personal mobility solutions including e-bikes and e-scooters (shown in **Figure 5**) are currently being used around the world for shorter trips at higher speeds. These personal mobility solutions can provide an easier mobility option for less physically fit people to travel further than on regular bikes or scooters. They also can provide efficient first- and last-mile access to transit. However, some of these personal mobility solutions may not be accessible to young, elderly, or disabled populations. In order to ensure the continued provision of accessible solutions for all travelers in our community, keeping a pulse on new mobility applications will be crucial in the coming years.

Figure 6. E-Scooters Staged on a Curb

SAFETY

Connected and automated vehicles (CAVs) are expected to reduce the frequency of crashes and unexpected delays due to crashes, which would improve travel time reliability. Overall crash costs will likely decrease as crash frequency or severity decreases. However, the cost to consumers or insurance agencies may increase due to the repair and replacement of expensive sensor equipment when crashes do occur. Insurance needs might change as CAV manufacturers may need to acquire insurance to cover automated system failures that lead to a crash. Responsibility of insuring shared vehicles or fleets may fall to the vehicle owners rather than the individual driver. Agencies can play a crucial role by evaluating evacuation procedures and redundancies in the local network with respect to CAVs, shared vehicles, and electric vehicles to prepare for emergency situations.

EQUITY

There is a need to engage historically marginalized and disadvantaged communities to identify barriers, to assess potential solutions to overcome these barriers, and to fully leverage mobility technology. Many of the personal mobility solutions and some of the microtransit options today are not accessible to some special populations in the community (for example, young children, elderly, disabled, or un-/under-banked).

River to Sea TPO could develop a Working Group that connects the Transportation Disadvantaged Local Coordinating Board (TDLCB) with new technology vendors, Mobility as a Service providers, and Software as a Service providers to develop a framework and potential set of strategies for addressing the current equity barriers and to monitor new technologies to identify new barriers early on.

Figure 7. Smart Phones and Credit Card Payment may be a Barrier to Some Travelers

RESILIENCY

Historically, we have planned for the threats of natural disasters like hurricanes, and as we move into the future, we recognize the many types of extreme events that necessitate a resilient transportation system. We have designed and will continue to design our transportation system to handle the demands of evacuations, power outages, and temporary changes in travel demand.

A resilient community is able to absorb economic, social, and environmental shocks from natural disasters, such as hurricanes, sea-level rise, inland flooding, economic recessions, or global health crises. The general principles for resilience planning are (Litman, 2020):

- Prepared and responsive
- Robust, secure, redundant, and flexible
- Diversity
- Affordable and resource-efficient

Resilience guidance emphasizes the importance of planning for public infrastructure that is efficient and redundant. A resilient transportation system is multimodal so that users can choose between several options as trip purpose or health and safety concerns change, and so that users are not dependent on an automobile. A resilient community has effective emergency response with two-way communication between residents and public officials, safe methods to deliver essential goods and services, and affordable housing and transportation options in walkable neighborhoods.

3. SELF-ASSESSMENT

For this study, we conducted a self-assessment by reviewing local agency plans and conducting stakeholder interviews to identify the challenges and opportunities we face related to transportation technology applications. It is important to conduct ongoing self-assessments to identify stakeholders, identify gaps, set priorities, monitor progress, and adjust the action plan. This section summarizes the key take-aways from the self-assessment, including stakeholder input, anticipated impacts, existing resources, gaps, and key conclusions.

WHAT DID OUR STAKEHOLDERS TELL US?

Through workshops and an online survey, we collected input from the region's stakeholders, including: City of Daytona Beach, City of Palm Coast, Daytona State College, Embry-Riddle Aeronautical University, FDOT District 5, Town of Pierson, Town of Ponce Inlet, Via, Volusia County Sheriff's Office, Volusia County Traffic Engineering, Votran, VCARD, and West Volusia Tourism Advertising Authority. We heard:

- Existing traffic signal infrastructure needs updates to support new technology
- Funding to make needed improvements is limited
- New infrastructure should be resilient
- Travel demand management for special event traffic should adapt to new mobility alternatives (such as pick-up/drop-off zones for ride hail, or corrals for micromobility like e-scooters)
- Communication between departments and agencies needs to improve
- Technology transition conversations need to begin at multiple levels of staff and management
- Data exists, but agencies need to learn how to use it to inform decision making
- Technology selection should be based on a need, not simply a desire to deploy
- An informed/educated public is less opposed to change
- Older generation is not as comfortable with technology

WHAT IMPACTS DO WE EXPECT TO SEE IN OUR COMMUNITIES?

NCHRP published *Report 924* in 2019, which provides a comprehensive assessment of transformational technologies and their potential impacts on travel, policy and planning challenges, and special considerations unique to rural areas. In 2018, FDOT published guidance for metropolitan planning organizations (MPOs) on planning for automated, connected, electric, and shared-use vehicles (ACES). The following sections summarize the anticipated impacts.

The potential impacts of transformational technologies are varied and subject to technology development, market direction, and policy guidance. The impacts discussed in this section are broad and will likely change. As they develop, further refinement to planning strategies will be necessary to amplify or to mitigate these impacts.

Curb Management: Ridehail and e-commerce are increasing demand for curb space. Alternative last-mile delivery options, such as short-distance aerial delivery vehicles, smart locker systems, and automated sidewalk robots are being tested. E-shopping demand may increase as technology reduces delivery costs. Dynamic pricing by time, day, and mode can manage parking demand.

Transit & Microtransit: Ridehailing and ridesharing services have increased in popularity and trip share. Fixed route bus transit use has decreased nationwide, partially as a result of increased shared use services, while rail use has increased. In an increasingly shared and connected transportation system, traditional transit systems will most likely adopt CAV technologies to increase mode split and trip share. Mobility as a Service, Microtransit, and Bus Rapid Transit are potential strategies for Votran and Flagler County Public Transportation to consider through partnerships with private Mobility as a Service providers or through investments to upgrade their fleets to incorporate available and future CAV technologies. A Mobility as a Service partnership may help Flagler County provide enhanced connections in night and weekend service hours, sparsely populated areas, and ADA paratransit service provisions.

Mobility as a Service (MaaS): Flexible, on-demand, asset-lite services increase mode choice options, especially in places with strong transit systems in addition to private transportation providers. User-friendly interfaces for trip planning and payment may make travel planning easier for elderly populations who may not be as familiar with mobile apps.

Micromobility: Micromobility offers first- and last-mile connections to other modes of travel, such as transit and carpooling. If deployed, shared micromobility devices could offer quick, cheap, and typically enjoyable rides for trips between 0.5-3 miles long (which would typically be made by walking, biking, or transit). If deployed, shared e-scooters and e-bikes may increase demand for dedicated roadway space.

WHAT RESOURCES DO WE HAVE TO WORK WITH?

The River to Sea TPO member agencies have an advantage of some forward-thinking equipment purchases and established communications channels, in addition to the proactive and progressive outlook that the TPO champions.

Inter-Agency Special Event Coordination at the Traffic Management Centers (TMCs): The local agencies have strong communication networks in place for special event traffic management. For Daytona Speedway events, the TMC is staffed by Volusia County, City of Daytona Beach, and FDOT District 5 traffic operations staff. This enables easy communication and problem solving.

Transit Technology: Votran was forward-thinking and decided to equip all new buses with automatic vehicle location (AVL) and automatic passenger count (APC) technology. These systems enable mobile bus tracking and trip planning, along with service alerts. These buses have the equipment to communicate with traffic signal controllers once the signal equipment is upgraded.

Opportunities for Engagement: The existing TPO committee and Board meetings provide venues to share information and updates on emerging technology opportunities, impacts, and lessons learned. The TPO is already well-equipped and experienced with public education and outreach to engage the community about new technologies.

Long-Range Planning Cycle: The TPO is currently updating the 2045 long-range transportation plan, which provides the opportunity to highlight the emerging technology projects in the LRTP that are consistent with the recommendations in this study.

National and State Guidance: Guidance documents are available, including:

- NCHRP Report 924: *Foreseeing the Impact of Transformational Technologies on Land Use and Transportation* (2019)
- FDOT, *Guidance for Assessing Planning Impacts and Opportunities of Automated, Connected, Electric and Shared-Use Vehicles* (2018)
- NCHRP Report 896: *Updating Regional Transportation Planning and Modeling Tools to Address Impacts of Connected and Automated Vehicles, Volume 2: Guidance* (2018) – report and summary PowerPoint

WHAT ARE THE GAPS?

The self-assessment identified the following gaps in infrastructure, data, policies, and communication.

Infrastructure:

- **Traffic Signal Controller and Communication Network:** The River to Sea TPO's 2018 ITS Master Plan, Phase 2 recommended a phased deployment plan to expand the regions fiber optic cable network to connect traffic signals along key corridors, TMCs, County emergency operations centers, and the Daytona International Speedway. Volusia County has deployed considerably more ITS projects than Flagler County, mostly due to the joint Daytona Area Smart Highways project along I-4 between SR 44 and I-95 and along I-95 between I-4 and US 92.

  The region's signal controllers do not have the equipment required to implement a Transit Signal Priority (TSP) system, which would communicate with the Votran bus AVL systems to prioritize transit vehicles at signalized intersections along key transit routes.

- **Cybersecurity:** Cyberattacks will happen, and most local agencies do not have strong cybersecurity protocols in place. The FDOT District 5 ITS Master Plan (2016) recommended that to increase security of signal controllers, no more #2 keys (universal cabinet keys) will be used for cabinets that have communications. The solutions are to use cyber-oks, rekey the cabinets, or add padlocks.

- **Mobile and Common Payment Systems:** Votran is working on a plan to integrate smartphone and contactless payment (such as a reloadable transit card, shown in **Figure 7**) into their buses. These connected technologies could remove barriers to exact change payments and facilitate easier transfers between transit routes. Special consideration is needed to ensure that transit-dependent riders have access to these new payment options (particularly for travelers who are un-/under-banked or do not have access to a smartphone with a data plan).

Figure 8. Reloadable transit card

Data:

- **Data Sharing:** A lack of correspondence and data sharing between TMCs hinders the efficiency and efficacy of ITS technologies in the planning area. Fiber optic cabling exists between the Deland TMC and FDOT Regional TMC, but data sharing is limited to CCTV video feeds. Fiber also connects Votran, Daytona Beach, Volusia County, and FDOT District 5; however, currently no data is shared.

- **Data Marketplace:** The TPO could support the local agencies in developing an open data portal that maps the public agency's assets, such as curb management, parking capacity, public electric vehicle charging stations. This data could be shared across agencies to inform collaborative decision making.

Combining the public data with private data in a Data Marketplace, would tell a more complete story about the current capacity, utilization, and needs.

- **Cybersecurity:** The TPO can collaborate with FDOT District 5 and local agencies to learn cybersecurity best practices to reduce the risk of attacks on agency networks, databases, and transportation systems. Ongoing training and coordination are needed to share lessons learned from national research and other agency experiences. Share information about any attack with all agencies in the region to mitigate risk of additional threats and to continue to improve agency protocols and responses.

Policies:

- **Electric Vehicle Charging Infrastructure:** Electric vehicles are on the road today, but the region's infrastructure does not yet accommodate their charging needs. Policy is needed to require or incentivize EV charging infrastructure in new developments.
- **Development Codes and Policy:** The TPO's Traffic Impact Analysis (TIA) Guidelines do not currently require evaluation of alternative mobility solutions, such as micromobility and ridehail services.

  Transportation planning discussions do not typically include other departments, like county codes and ordinances. Land use codes will need to be modified as transportation demand changes due to new technologies, such as applications that reduce the need to travel. Building codes may need to be modified to ensure new infrastructure supports emerging technologies (such as electric vehicle charging) and is resilient to change and transportation demands change (such as providing space for curb pick-up/drop-off of passengers and packages).

Figure 9. Example Electric Vehicle Charging Infrastructure

Communication:

- **Communication:** Agency staff need more opportunities to present issues, opportunities, and needs to decision makers and to coordinate across agencies to share best practices and to brainstorm pilot projects.
- **Funding:** The cities and counties lack the funding required for operations and maintenance of new technologies.
- **Staffing:** Many public agencies struggle with hiring and retaining staff. If they have the staff, many agencies struggle to keep up with new transportation technologies and applications that are beyond their staff's areas of expertise.

SELF-ASSESSMENT CONCLUSIONS

The self-assessment identified areas where the TPO can focus its technology transition efforts:

- **Data Collection and Monitoring:** Agencies do not know what data to collect to monitor the impacts of transformational technologies. *Section 4. Monitoring to Stay Informed* highlights data the TPO and its member agencies can collect and analyze to monitor trends and share findings.

- **Agency Staff Training:** Agency staff is well trained on planning methods and traffic analysis, but they are behind on tools, skills, and methods for evaluating exceptionally big data sets and ensuring cybersecurity of advanced systems. *Section 5. Training, Educating, and Communicating* outlines the staff training needs that were identified in the FDOT District 5 ITS Master Plan and based on this readiness study. *Appendix G* provides additional details on the agency training needs.

- **Pilot Project Training:** Agencies need to undertake more joint public/private sector pilot projects to self-educate agency staff and the public on the potential challenges, costs, and benefits of new tech. Potential pilot deployments for the River to Sea planning area are discussed in *Section 2. Opportunities Created by Emerging Technologies* and *Section 7. Recommendations and Next Steps.* One example is a potential partnership with a Mobility as a Service vendor to provide on-demand transit alternatives for travel demand in Flagler county, which does not support fixed-route transit. For background, *Appendix C* summarizes the current status of automated vehicle regulations. *Appendix D* summarizes the ongoing connected and automated vehicle deployments across Florida. *Appendix J* provides an example of local policies for an e-scooter pilot deployment in Hoboken, NJ. *Appendix K* provides examples from Washington, DC on multimodal special event traffic planning for the World Series and a step-by-step guide to innovative curbside management.

- **Communication:** Agencies and departments within each agency are not aware of the activities of others. They are not aware of the resources other departments have. Therefore, they cannot take advantage of the available resources to solve problems. River to Sea TPO can support better communication and information sharing by facilitating working group meetings that engage staff across departments, agencies, and management levels as outlined in Section 5. Training, Educating, and Communicating.

- **Learning to Be Nimble:** It takes a full year to update the LRTP or TIP. These updates are so expensive that they are updated only once every 3-5 years. Agencies need a nimble process for updating aspects of the plans to address technology developments within the year. To be nimbler, the River to Sea TPO can reassess its planning process to find ways to adapt quickly to new technologies and trends. The TPO can also share example policy language to local agencies looking to adopt their own nimble policies. As the TPO updates its Traffic Impact Analysis (TIA) Guidelines, it may consider including a new requirement to evaluate the impacts of alternative mobility solutions, such as micromobility and ridehail services.

4. MONITORING TO STAY INFORMED

Technology is evolving rapidly, costs are changing, and we cannot predict with certainty which technologies have the staying power at this time. Look at how quickly docked bikeshare was replaced by e-scooters. Rather than focusing on specific technologies, which may be enhanced or become obsolete in the near future, River to Sea TPO can plan for the applications of technology that best meet the needs of the community. For example, personal mobility applications (which include technologies such as docked bikeshare, dockless bikeshare, or e-scooters) are innovative solutions to support short trips or transit connections.

Local agencies can make better-informed decisions by establishing programs, funding criteria, and evaluations based on data-driven performance metrics. To monitor changes, River to Sea TPO can incorporate new data sources into the planning processes. The following metrics will help River to Sea TPO measure and monitor the effects of transformational technologies on our technology deployment goals.

Table 2. Candidate Metrics for Monitoring Impacts of New Technologies.

Impact	Candidate Metrics	Sources of Information
Growth	Population, Employment, Tax Receipts (Sales Tax, Property Tax, Transient Occupancy Tax, other taxes), Licenses and Permits	River to Sea TPO data, State Finance Department, US Census, State Employment Department, Local and State Collection Agencies, Permit/License Issuing agencies and departments
Land Use and location	Permits Pulled	Issuing agency and department
Early Indicators of Code and Plan Problems	Complaints, code enforcement requests, conditional use permits, zoning variance requests, comprehensive plan amendments	Volusia and Flagler county planning/community development department
Parking	Curb, lot, and loading zone parking utilization, price, average stay	Operator records, video and/or volunteer monitoring, purchased data
Travel Demand	Daily ridership and vehicle miles traveled (VMT) by mode of travel	Votran data and Flagler County Public Transportation data, purchased data, field sensors

Source: NCHRP Report 924.

It is important to monitor the trends and impacts of new technologies. If ride hail and micromobility applications continue to reduce parking demand, Volusia and Flagler counties may reassess their minimum parking requirements:

- *Volusia County Code of Ordinances*, Sec. 72-286 – Off-street parking and loading https://library.municode.com/fl/volusia_county/codes/code_of_ordinances
- *Flagler County Code of Ordinances*, Sec. 3.06.04 – Parking requirements for all districts https://library.municode.com/fl/flagler_county/codes/code_of_ordinances

DEVELOP AN OPEN DATA PORTAL OR DATA MARKETPLACE

With data collection and data sharing comes the need to collect, store, analyze, secure, and disseminate data to transportation users and providers, as well as to non-transportation partners who may be able to apply their subject matter expertise to transportation challenges.

River to Sea TPO can evaluate two alternative technologies to assist in this: open data portals and data marketplaces.

- **Open Data Portals** are repositories of public agency data that allow agencies, businesses, and individuals to access this data through an Application Program Interface (API) for use in their own applications. An example of how such portals are used may be found in the transit industry, where many agencies provide their schedule data through APIs to allow private partners to develop customer-facing applications. This allows the agencies to focus on providing quality data, leaving the cost and effort of application development to private entities more attuned to the needs of their specific customer demographics.
- **Data Marketplaces** are an expansion of the Open Data Portal concept, where participating agencies and businesses can define the types, quantities, and granularity of information they are willing to exchange with others (and the price point for which they will provide this data). The benefit of a Data Marketplace over an Open Data Portal is that it can allow agencies to engage with the private sector and support non-transportation use cases.

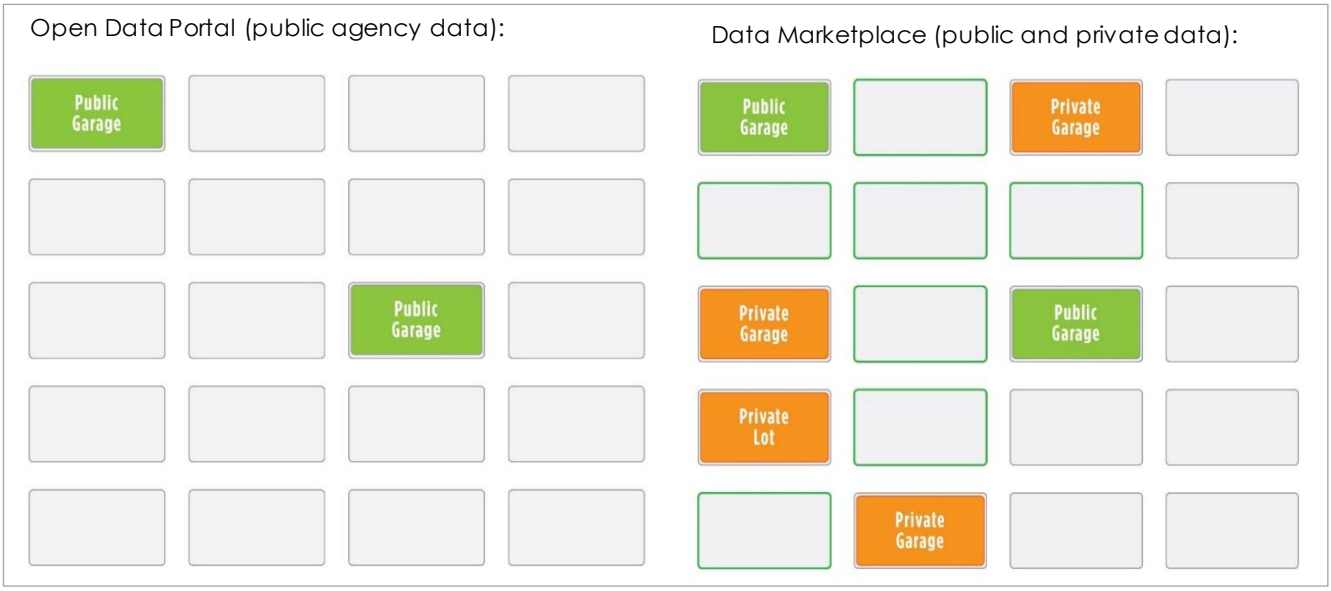


Figure 10. Examples of Open Data Portals and Data Marketplaces

Figure 8 provides examples of how Open Data Portals and Data Marketplaces may be applied to parking management. On the left is an example of an Open Data Portal that provides real-time information on parking occupancy rates at city-owned garages. This information may be helpful to the city or a private company that is interested in developing a parking app; however, it only covers those garages owned by the city, leaving out information on on-street parking, private garages, and private lots in the area—information that may or may not be available to the agency managing public parking garage data. The right side of **Figure 8** shows the data that could be incorporated into a Data Marketplace, providing a much more comprehensive view of parking utilization in the city. This information could be used not only for parking apps but could also be used to drive real estate decisions, trip generation estimates, and other applications to support both transportation and land use decisions.

Data Recommendations: River to Sea TPO can establish partnerships with third party data aggregation, anonymization, storage, and security firms to assess how open data portals or a data marketplace could support the data strategy needed to enable emerging technologies. River to Sea TPO can also assess how such systems could be implemented and operated to ensure the cybersecurity of sensitive data from the connected network.

5. TRAINING, EDUCATING, AND COMMUNICATING

To take advantage of the opportunities presented by new transportation applications, agency staff will need to get smart on new technologies. The reality most public agencies face is that they are undertrained, short staffed, or not sure who to hire.

STAFFING NEEDS

Agency staffing needs were identified in the Florida Department of Transportation (FDOT) District 5 Intelligent Transportation System (ITS) Master Plan (2016) and are summarized in **Appendix E**. Many suburban public agencies struggle with hiring and retaining staff. If they have the staff, many agencies still struggle to keep up with new transportation technologies and applications that are beyond their staff's areas of expertise. An alternative to hiring is engaging with outside experts during the planning process.

During the stakeholder interviews, Votran identified the need for a data analyst to process the transit service and ridership data. A partnership between Votran and Daytona State College or Embry Riddle Aeronautical University may provide a solution to the data analytics needs without hiring new staff. **Appendix F** provides a summary of the stakeholder interviews, which identified this and other solutions.

TRAINING NEEDS

Emerging technologies are becoming entrenched in daily life and in our transportation network. In order to empower our communities, we can empower agency staff with the knowledge, tools, training, and resources necessary to troubleshoot, and problem solve to ensure they provide the best service possible. Sharing specialized staff between partner agencies is a useful tactic for maximizing the expertise available for proble m-solving. As there is a significant cost that accompanies upgrading and shifting staff skillsets, these investments in staff training can be best utilized when collaboratively shared among partners. **Appendix G** details resource areas that will most likely require additional training for staff to harness the benefits of CAV technologies related to scenario planning, travel demand modeling, and smart infrastructure. The 2016 FDOT District 5 ITS Master Plan outlined a Uniform Training Program for ITS Staff, with goal of sharing staff resources between partner agencies (also summarized in **Appendix E**).

The TPO can share cost-effective training solutions with local agencies. Free training webinars are available on a variety of topics addressing emerging technologies, land use impacts, economic impacts, and state and federal funding. These webinar providers include:

- Eno Center for Transportation: https://www.enotrans.org/events/categories/webinars/
- University of California, Davis's 3 Revolutions Future Mobility Program: https://3rev.ucdavis.edu/
- National Association of City Transportation Officials (NACTO): https://nacto.org/nacto-webinars/

COMMUNICATION NEEDS

As technologies change and new technologies enter the market, local agency staff may require additional communication opportunities to teach managers, decision makers, and the public about benefits and costs of new technologies. These discussions also provide opportunities for agency staff to learn new perspectives on problems to find innovative solutions.

The TPO could establish a Working Group to monitor and report on emerging technologies, deployments, and impacts. It is recommended that this working group be made up of local agency traffic engineers and planners, representatives of the Transportation Disadvantaged Local Coordinating Board (TDLCB), private-sector representatives, and educational institutions. This working group would regularly report to the TPO's Technical Coordinating Committee (TCC) and would look for opportunities to train and engage staff, decision makers, and the community.

BEST PRACTICES FOR PILOT DEPLOYMENTS

Technology is changing rapidly. The need is growing to find effective methods for our local agencies to get smart about new systems, new data, and new transportation models. Pilot Deployments are a great way to get our foot in the door and learn about a new technology. They give us the opportunity to learn directly about the impacts these technologies will have on our community and to learn what unique challenges and solutions are needed to fit our existing infrastructure and travel demands. Identifying challenges early on enables an agency to make changes in response to lessons learned.

Florida is a leading state in the testing of CAV technology. There are many past, current, and planned CAV technology projects across the state. These pilot projects provide valuable lessons that the River to Sea TPO stakeholders can learn from before planning a CAV deployment in the future. **Appendix D** provides a brief summary of the CAV technology deployments across Florida.

The following sections outline some of the potential pilot deployments that the River to Sea planning area could consider.

Parking Management Preliminary Guidance:

- Partner with local agencies to develop a consistent strategy to manage parking, especially in high-demand areas such as the beaches.
- Share information with local agencies to stay informed about "smart parking" technology and facilities.
- Upgrade parking facilities to collect real-time information on parking availability and utilization.
- Improve wayfinding through static and dynamic message signs that inform drivers where available parking is located, which may reduce congestion caused by drivers searching for available parking.
- Use dynamic parking reservation systems to provide users the opportunity to reserve a parking spot before arriving.
- Use dynamic pricing to adjust with demand and to incentivize the use of transit, carpooling, or ridesharing services.
- Monitor parking demand and understand how weekend, special event, and seasonal parking needs vary.
- Track parking utilization over time to see if parking demand decreases, which may indicate that minimum parking requirements in county development codes could be reduced.

Electric Vehicle (EV) Charging Infrastructure Preliminary Guidance:

- Amend parking minimum codes to include a comparable ratio of charging-enabled parking spaces at all new and re-zoned developments. It is cheaper to install charging equipment at time of construction than to retrofit later.
- Partner with existing parking garages to retrofit facilities with charging-enabled parking spaces.
- Encourage responsible agencies to retrofit on-street parking facilities with charging stations, especially near highly-trafficked businesses.

- Monitor charging-enabled parking space demand and understand how weekend, special event, and seasonal parking and charging needs vary.
- Partner with solar power companies to include solar panels at charging stations (this can also help support LEED certifications and other sustainability efforts).

E-Scooter or Bikeshare Micromobility Pilot Preliminary Guidance:

- Consider tiered licensing fees for MaaS providers.
- Monetize the mobility data streams that agencies control.
- Update city ordinances to allow safe operation of micromobility and efficient storage of shared scooters and bikes. (See **Appendix J** for Hoboken, NJ's pilot deployment regulations.)
- Develop special event traffic management strategies for storage, and geofence locations where scooter use is not permitted. (See **Appendix K** for Washington DC's World Series plans.)
- Define equity zones and develop requirements for MaaS providers to ensure equitable access to the vehicles across communities.
- Allocate curb space for micromobility parking/staging (See **Figure 9** for an e-scooter staging zone in San Diego).

Source: Fox News 5 San Diego.

Figure 11. Curbside Micromobility Parking Zone

Automated Shuttle Deployment Preliminary Guidance:

- Partner with local agencies to develop a *smart community* strategy for grant and other funding opportunities.
- Enter into public-private partnerships (PPPs) with a vendor that manages the operations and maintenance of an automated shuttle.
- Include ADA accessibility specifications in procurement requirements, because not all automated shuttles being tested today are equipped with wheelchair ramps.
- Engage with the National Highway Traffic Safety Administration (NHTSA) early in the planning process to learn the vehicle and operational review and exemption processes.
- Conduct public outreach and education to teach about the capabilities and limitations of automated vehicle technology.

6. DEVELOPING NIMBLE POLICY

Adapting the planning process to keep pace with rapidly advancing and evolving technology is critical to maintaining the relevance and ensuring the success of the TPO goals. Towards this endeavor, the River to Sea TPO can monitor trends and update its plans, procedures, policies, codes, and ordinances every few years, rather than every five to 10 years.

To ensure open collaboration and context-sensitive solutions, regulations are best when they are technology-agnostic. Shared micromobility offers a valuable lesson that technologies change rapidly and the rules that regulate them, if flexible, produce desired outcomes. In a few years, we have watched shared micromobility evolve from docked bikeshare to dockless bikeshare, and now to shared e-scooters. River to Sea TPO and its member agencies may consider nimble policy to:

- Update plans and regulations so they are more flexible in dealing with new technologies.
- Ensure that this framework can both adjust to, license, and permit emerging technologies and provide sufficient data to monitor trends.
- Establish a timely & recurring reevaluation of existing codes, policies, standards, and procedures to ensure desired behaviors are incentivized through agency actions.

NATIONAL GUIDANCE FOR LOCAL REGULATION SETTING

There are many ongoing research efforts to develop national guidance for regional planning organizations on the regulation, deployment, and planning for new technologies. Some of the recent national guidance includes:

- National League of Cities (NLC) *Autonomous Vehicle Pilots Across America* (2018) – provides guidance on establishing rules and regulations for automated vehicle pilot testing.
- National Association of City Transportation Officials (NACTO) *Policy 2018, Guidelines for the Regulation and Management of Shared Active Transportation, Version 1* – provides regulation-setting guidance on shared active transportation vehicles.
- NACTO *Guidelines for Regulating Shared Micromobility* (2019) – outlines best practices for regulating and managing micromobility pilots.
- *NCHRP Report 924* (2019) – provides additional guidance for local agencies to develop nimble policies through technology-agnostic regulations, regulating through incentives, flexible plans, empowered staff, and within-agency silo busting.
- Institute of Transportation Engineers (ITE) *Curbside Management Practitioners Guide* – provides guidance for local jurisdictions on how to measure inventory and performance of the curb, prioritize space for different uses, and explain the value of the curb to different stakeholders.

EXAMPLE AGENCY POLICIES

In April 2020, Chicago changed its municipal code to prepare its infrastructure to support the projected growth in electric vehicles (EVs). The changes expand the scope of the new developments that must install EV charging. They increase the percentage of total parking spaces that property owners must designate for EVs. They specify that EV-designated parking spaces must actually be equipped with an electrical plug. (Source: PR News Wire, "New Electric Vehicle Ordinance Makes Chicago National Leader". April 24, 2020.)

Additional representative examples of local agency policies on transformational technologies are provided in the Appendices for reference:

- Washington, DC: Innovative Curbside Management Guidance (**Appendix H**)
- San Francisco, California: Regulating TNCs (**Appendix I**)
- Hoboken, New Jersey: E-Scooter Pilot Deployment (**Appendix J**)
- Washington, DC: Ridehail and Micromobility Traffic Management for the World Series (**Appendix K**)

7. RECOMMENDATIONS AND NEXT STEPS

To prepare for new technologies, it is recommended that local agencies and the TPO take certain actions. These sections identify those actions, as well as projects that the TPO may consider incorporating into the Unified Planning Work Program (UPWP), the Transportation Improvement Program (TIP) or future long-range transportation plans (LRTPs). **Appendix B** provides a matrix of the key elements that decision makers can consider as we prepare for new technologies coming to the region.

WHAT PROJECTS COULD BE ADDED TO THE UPWP, TIP, OR LRTP?

Appendix B provides a detailed description of technology applications the River to Sea planning area could adopt, estimates of timelines, as well as recommendations for partnerships. River to Sea TPO is currently in the process of developing *Connect 2045*, its Long-Range Transportation Plan (LRTP). The project and partnership opportunities listed in **Appendix B** are candidate projects to be included in the UPWP, TIP, or LRTP and are summarized in **Table 3** below.

In addition to these projects, a Research and Development contingency fund could be added to the UPWP or the LRTP to adapt to risks associated with new technologies.

Table 3. Recommended Projects and Partnerships

Project Name	Issue/Opportunity	Scenario	Goal Alignment	Priority
Infrastructure Projects				
Fiber Optic Cables	Build the network of high-speed communications that is the foundation for advanced signal systems and CV communications	Long-term	Traffic Management, Safety	**High**
Traffic Management Centers Open Data Portal	Develop Concept of Operations for an Open Data Portal to collect, store, analyze, secure, and disseminate data between the 4 TMCs	Short-term	Traffic Management, Safety	**High**
Traffic Management Software	Update traffic management software to Volusia County, City and Daytona Beach, and City of Palm Coast TMCs use same software for easier coordination	Mid-term	Traffic Management	Medium
Traffic Signal Controllers	Upgrade signal controllers along fiber-optic-equipped corridors to enable CV technology	Long-term	Traffic Management, Safety	**High**
Votran Transit Signal Priority (TSP)	Implement transit signal priority along key, connected corridors to take advantage of technology already equipped on buses	Mid-term	Traffic Management, Mobility, Equity	**High**
Signal Controller Cabinets	Consider larger cabinets to provide room for new techs when replacing cabinets	Short-term	Traffic Management	Low
Electric Vehicle Charging Stations	Modify land development codes to require or incentivize electric vehicle charging stations	Mid-term	Mobility, Accessibility	**High**
Parking Management	Install real-time parking occupancy monitoring systems at beach lots and garages to enable accurate wayfinding information sharing	Mid-term	Traffic Management, Mobility, Accessibility	Medium
ITS Implementation and Data Collection	Install data collection equipment following the TPO's ITS Master Plan to support data-driven decision making and to measure and monitor impacts	Mid-term	Traffic Management, Safety	**High**
Special Event Projects				
Curbside Pick-up and Drop-off Zones	Designate curbside pick-up/drop-off zones at special events to improve safety for motorists and pedestrians	Short-term	Traffic Management, Mobility, Accessibility, Safety, Equity	Medium
Votran/AV Shuttle	Pilot test an AV shuttle for special event short circulator trips. Teach staff and public about new technology	Long-term	Traffic Management, Mobility, Accessibility, Safety, Equity	Medium
Law-Enforcement and TMC Communication	Invite Sheriff or local law enforcement to staff a representative in the TMCs during special events to improve communication between law enforcement and traffic system managers	Short-term	Traffic Management, Safety	**High**

Project Name	Issue/Opportunity	Scenario	Goal Alignment	Priority
Agency Partnership Projects				
Enforcing Electric Vehicle Charging Spaces	Set policy and enforce EV charging spaces the same way handicap spaces are enforced to encourage and support EV use and to take advantage of EV infrastructure installed or incentivized by the counties and cities	Short-term	Mobility, Accessibility, Equity	**High**
Votran / Daytona State College Data Analytics Partnership	Partner with Daytona State College to process and analyze the transit ridership data for Votran	Short-term	Mobility, Accessibility, Equity	Medium
TNC Mobility Transit Partnerships	The two transit agencies could partner with a TNC to provide on-demand transportation as a first-/last-mile connection to fixed route transit or as an alternative to pre-scheduled, demand-responsive service.	Mid-term	Mobility, Accessibility, Equity	Medium
Academic Partnerships	Partner with local colleges and utilize student researchers to develop educational materials such as videos and presentations to demonstrate the benefits of CAVs and emerging technologies to the public	Short-term	Accessibility, Equity	Low
Law Enforcement	Organize national experts on CAV technology, traffic laws, and transportation policies to train law-enforcement officers how to handle situations related to changing transportation technologies	Short-term	Safety, Equity	**High**
Funding	To fund technology deployments, operations, and maintenance, the TPO can identify new funding sources and support grant applications	Short-term	Mobility, Accessibility, Safety, Equity	**High**
Transportation Data Marketplace	Assess how an Open Data Portal or Data Marketplace could be implemented and operated to ensure sharing of transportation data and security of sensitive data from the connected network	Mid-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**
Mobility and Accessibility Projects				
Curb Management	Partner with a data management company, such as Coord, to digitize curbside assets in Daytona Beach and surrounding mixed-use zones. The TPO can use the data to pilot pick-up/drop-off zones, define freight delivery zones, and maximize the efficiency of multi-modal street parking through a web-based dashboard, ideally hosted by and connected to the TMCs.	Mid-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**
Shared Micromobility	Share example policy language for micromobility deployments with local agencies interested in piloting a program. Examples of this guidance are provided in Appendices J and K. Collect data to monitor the impacts	Short-term	Accessibility, Mobility, Equity	Medium
Common Payment System	Develop concept of operations for a mobile payment on Votran and a common payment system between Votran, Flagler County Public Transportation, SunRail, and possibly private TNC services like Lyft or e-scooter programs	Short-term	Accessibility, Equity	**High**
Policy Projects				
Update TIA Guide	Update the TPO's Traffic Impact Analysis (TIA) Guide to require analysis of future technology impacts	Short-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**
Incorporate "Smart City" Concepts in Agency Business Practices	Incorporate some “Smart City” concepts (such as interdepartmental data and resource sharing, performance monitoring, and public access to more information on agency services) into local agency business practices and delivery of services to the public	Mid-term	Mobility, Accessibility, Mobility, Equity	**High**

WHAT CAN LOCAL AGENCIES DO TO PREPARE FOR UNKNOWN TECHNOLOGIES?

There are a number of initial actions that local agency can take to prepare for new technologies and adapt to their impacts.

Potential Local Agency Actions:

- ❑ Replace technology-specific policies with nimble policies that can adapt to new technology.
- ❑ Review transportation and land use policies to identify areas to incorporate new technology in the decision-making process.
- ❑ Encourage EV charging infrastructure development
- ❑ Create training opportunities for staff, elected officials, and the public.
- ❑ Change the traditional planning mindset to think creatively about how roads can be used in the future.
- ❑ Consider right-of-way reallocation for non-auto uses.
- ❑ Consider flexible alternatives to fixed-route transit.
- ❑ Initiate public-private partnerships to pilot new technologies.
- ❑ Identify new revenue sources to replace vehicle-related revenue.

Local agencies can adopt a resilient approach to technologies by updating inflexible or technology-specific policies so that they can adapt to changing technology. For example, Volusia and Flagler Counties could modify their codes and ordinances to reduce the minimum number of parking spaces required for developments if data indicate ridehail, micromobility, transit, e-commerce, or teleworking reduce parking demands in the region.

The counties or cities could also amend their development codes to require that a percentage of all parking spaces be dedicated to EV charging and equipped with plugs.

Planners and designers can incorporate new methods of predicting roadway demand by mode and by land development.

City and county staff can engage with the TPO in a comprehensive review of transportation and land use policies to identify areas for improvement to nimbly incorporate emerging technologies into the decision-making process, to identify new revenue sources to replace current vehicle-related revenue sources, and to consider right-of-way reallocation that prioritizes vulnerable road users and incentivizes shared services that provide equitable and reliable transportation access for all users.

Flagler County Public Transportation and Votran may consider partnerships with Mobility as a Service vendors to deliver on-demand transportation, especially for off-peak or rural uses. As transportation modes and technology advance, the transit agencies can integrate connected and automated vehicle technologies and explore public-private partnerships to expand service hours, area, and reliability.

WHAT CAN RIVER TO SEA TPO DO TO ADVANCE TECHNOLOGY?

Potential TPO Actions:

- ❑ Establish an Emerging Technology Working Group under the TCC.
- ❑ Facilitate ongoing training and discussion opportunities with diverse stakeholder groups.
- ❑ Share best practices and example policy language with local agencies.
- ❑ Incorporate new performance metrics into the planning process.
- ❑ Work with FDOT District 5 to develop cybersecurity guidance to implement at the TPO and share with local agencies.
- ❑ Update the TPO's TIA Guidelines to require assessment of future technology impacts.
- ❑ Monitor data to measure land use and transportation impacts of new technologies.
- ❑ Develop a regional Open Data Portal or Data Marketplace to share data across agencies.
- ❑ Encourage technology pilot testing by leading grant application writing.

It is recommended that the Technical Coordinating Committee (TCC) establish a Working Group to monitor and report on emerging technologies, deployments, and impacts. An ideal and empowered task force would consist of local agency traffic engineers and planners, representatives of the Transportation Disadvantaged Local Coordinating Board (TDLCB), private-sector representatives, and educational institutions. This Working Group would report to the TCC regularly. Through this working group, the TPO can create opportunities for engagement to support the education of elected officials and decision makers about the benefits and costs of new technologies.

The TPO and local agencies can support their staff through training and resource sharing. One way to do this is to facilitate ongoing technology discussions between agency staff, decision makers, elected officials, industry experts, and diverse stakeholder groups to learn about new technologies and to understand their benefits, costs, and limitations. Another way to support staff is to share best-practices and example policy language with local agencies that want to develop flexible policy that can adapt to new technologies. Presentations or technology demonstrations are great opportunities to learn.

New performance metrics are necessary to measure the effects and efficacy of new technologies, as well as to pursue alignment with TPO goals. Data collection, aggregation, anonymization, analysis, security, and storage will be crucial to the successful deployment of CAVs and other transformational technologies.

It is recommended that the TPO update its 2016 Traffic Impact Analysis (TIA) Guidelines to require the assessment of future technology impacts.

The TPO can adopt the 'monitoring mindset' by keeping a pulse on:

- Guidance for adapting regional travel demand models to account for transformational technologies, including connected and automated vehicles, ridehail and micromobility.
- The TPO's land use, population, and employment data to identify early indicators of growth.

- Data from transit agencies, micromobility providers, and field sensors to identify early indicators of travel demand impacts. This data may also teach us about the resiliency of our transportation system and how quickly residents and visitors return to normal travel demand patterns.

The TPO can lead by encouraging transparent data sharing across member agencies and across partnerships with vendors or data providers.

Education can ease technology transitions and diffuse opposition. Pilot programs can introduce skeptical populations to CAV technology in a gradual, temporary, and controlled manner. The TPO can lead by developing educational resources on CAV technologies to engage with the local community during the planning phase of future technology deployments. Pilot programs today may include micromobility deployments, like e-scooters or e-bikes. In the future, these programs may deploy connected or automated vehicle technology. The TPO can encourage partnerships with local academic institutions during pilot deployments. For example, trade schools with automotive repair programs can support in-vehicle equipment installation, which provides a training opportunity for the next generation of employees in the region.

WHAT GRANTS ARE AVAILABLE TO FUND TECHNOLOGY DEPLOYMENTS?

Several federal grant programs are available to support new technology deployments. The TPO could help to champion a pilot deployment by leading the coordination of a grant application.

Federal grants are advertised on www.grants.gov. Examples of recent and current emerging technology grant opportunities include:

- Federal Transit Administration (FTA): Accelerating Innovative Mobility (AIM) Challenge Grants – *currently advertised*
- USDOT BUILD Grants for national infrastructure investment. FDOT District 5 won a BUILD grant in partnership with Tavistock to deploy automated shuttles in Lake Nona, Florida.
- FHWA Surface Transportation System Funding Alternatives (STSFA) Program funds user-based alternative revenue programs.
- USDOT Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD) Program is the program that funds FDOT District 5's connected vehicle deployment in Orlando, Florida at the University of Central Florida.
- Bloomberg Philanthropies Initiative for Global Road Safety is a non-federal grant that funds the implementation of safety measures to prevent traffic deaths and injuries.

The River to Sea planning area is ready to embrance emerging technologies. The communication, data sharing, training, and technology investments, the region will be able to learn best practices, share ideas, and find innovative solutions that meet the needs of the region.

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APPENDIX A: DEFINITIONS AND KEY TERMS

ACES: An acronym used by FDOT to refer to collectively to Automated, Connected, Electric, and Shared-Use Vehicles (ACES).

Advanced Driver-Assistance Systems (ADAS): ADAS are specific features that assist humans with the driving task. Most ADAS features are safety-related (such as automatic emergency braking), but some are designed to simplify the driving task (such as automatic parking and adaptive cruise control). Many ADAS features are already commercially available in cars, trucks, and buses. These include, but are not limited to:

- Automatic Parking
- Lane Keep Assistance
- Adaptive Cruise Control
- Automatic Emergency Braking
- Anti-Lock Braking System
- Electronic Stability Control
- Blind Spot Monitoring Systems

Automated Vehicle (AV): Also known as driverless cars or self-driving vehicles, automated vehicles (AVs) are equipped with sensors (for example: cameras, radar, LiDAR, computer vision, GPS, and CV technology), which allow them to operate with little to no human assistance.

Bus Rapid Transit (BRT): Much like how rail or metro systems function, bus rapid transit creates a convenient, fast, and reliable bus service in metro areas through the use of both technology and existing infrastructure. Key components of bus rapid transit are transit signal priority (detailed above), dedicated right-of-way (bus lanes), and center-aligned stations with off-board fare collection and platform level boarding.

Services like BRT are advanced by intelligent transportation systems in addition to deliberate policy, planning, and design to center active and shared mobility in the transportation system. Transit agencies have the unique capacity to incorporate connected and automated vehicles into their fleet and to expose large sections of their community to CAV technology.

Connected Vehicle (CV): A vehicle that can communicate with other vehicles, infrastructure, or other wireless technologies. CVs can communicate using Wi-Fi, the LTE or 5G network, or the dedicated short-range communication (DSRC) radio frequency. CVs use a variety of equipment to sense, collect, and transmit real-time data, such as road or traffic conditions, weather conditions, vehicle speeds, etc.

- V2V: Vehicle to vehicle communication
- V2I: Vehicle to infrastructure communication
- V2X: Vehicle to Internet-of-Things (IoT) communication

Intelligent Transportation System (ITS): ITS is a system in which information and communication technologies are applied to road transportation, including infrastructure, vehicles, and users, in traffic and mobility management. Intelligent transportation systems include a variety of safety, mobility, efficiency impacts. Some examples of ITS technologies include:

- Detection of vehicles, pedestrians, and bicyclists through video, Bluetooth, or inductive loops
- Emergency vehicle notification systems
- Automatic road enforcement
- Variable speed limits
- Collision avoidance systems
- Transit signal priority

As CAV pilots and deployments become more widespread and common, the policies that support, and the infrastructure that provides ITS services will become increasingly important to the success of CAVs.

Microtransit: This type of transit began to gain popularity in the early 2010's, as GPS technology and vehicle-routing software became available. Encompassing a few different service types, microtransit can be a door-to-door service, like using a taxi or a ride-hailing service; point-to-point, which connects people to destinations such as employment centers, universities, or transit centers from other hubs; or be a first and last mile connection, meaning that the vehicle will operate from 'door-to-point' – this can be helpful for connecting people to traditional fixed route transit services. As a dynamic transit service, microtransit incorporates technologies such as automated vehicle location (AVL), a function of GPS, as well as vehicle routing services, which connect riders with drivers.

Some common characteristics that all microtransit services share include:

- Vehicles that are larger than a private automobile (sedan) and smaller than a traditional 40-ft public transit bus – typically 5- to 15-person passenger vans
- Intelligent Routing and Shared Rides: Using algorithms and trip data, the vehicle routing software optimizes each van's route to accommodate the most people with the shortest waiting times, which leads to shared rides
- Multiple Payment Options: In-app fare collection, in-vehicle cash, and transit pass
- Multiple Booking Options: in-app booking, online browser booking, or dial-in concierge booking

Additionally, as an emerging technology, some microtransit providers are exploring using data analytics, artificial intelligence, and autonomous vehicles with their fleets.

Mobility as a Service (MaaS): Mobility as a Service (MaaS) describes a shift away from personally owned modes of transportation towards mobility provided as a service. A unified gateway (in other words, a common payment system and a common platform or app) that combines public and private transportation services enables this shift. Users can pay for trips on multiple modes using a single account. MaaS offers travelers mobility solutions based on their travel needs. The city of Helsinki, Finland is currently the only region in the world with a comprehensive MaaS system. Connected and automated vehicles (CAVs) will be an important component of the connected, multimodal transportation system as the emerging technologies that propel MaaS evolve.

Public Private Partnership (PPP or P3): As an increasingly popular arrangement for the piloting of technologies for real-world application and learning, a public-private partnership combines the resources of government and business to provide for their communities. P3s are a crucial tool for the development of CAV technologies.

Ridehailing: When a customer hails a ride often through a mobile app or kiosk. The driver takes the customer to a destination designated by the customer for a charge, and payment is made automatically through a mobile app. Ridehailing services are operated by TNCs who adjust the cost of a ride based on current demand.

Transit Signal Priority (TSP): This traffic engineering tool is used to improve service and reduce delay for transit vehicles, by using V2I communications technology to receive and Signal Phase and Timing (SPaT) information, allowing the signal to provide priority to approaching buses. The technologies that enable TSP are crucial to the decision-making process of CAVs.

Transportation Network Company (TNC): Private transportation technology firms that provide services such as ride-matching, ridesharing, and ridehailing through vehicle-routing software platforms and licensing. Well-known TNCs include Uber, Lyft, Via, and TransLoc.

APPENDIX B: TECHNOLOGY TRANSITION PROJECTS FOR R2CTPO

Appendix B provides an outline of the action items, new projects, or policy changes that the River to Sea TPO and its member agencies could consider taking to address connected vehicles (CVs), automated vehicles (AVs), and other transformational technologies. These projects could be included in future updates of the Unified Planning Work Program (UPWP), the Transportation Improvement Program (TIP), or the Long Rang Transportation Plan (LRTP).

Table B-1 presents a high-level summary of the recommendations for:

- Infrastructure,
- Special events,
- Agency partnerships,
- Mobility and accessibility, and
- Policy.

Additional details are provided after the tables.

Table B-1. Technology Transition Recommendations for River to Sea TPO: Infrastructure

Project Name	Issue/Opportunity	Scenario	Goal Alignment	Priority	Data or Resource Needs	Partnership Needs
Infrastructure Projects						
Fiber Optic Cables	Build the network of high-speed communications that is the foundation for advanced signal systems and CV communications	Long-term	Traffic Management, Safety	**High**	Location of existing FOC and location of needed cables	FDOT District 5, Volusia County, Flagler County, City of Daytona Beach, or City of Palm Bay
Traffic Management Centers Open Data Portal	Develop Concept of Operations for an Open Data Portal to collect, store, analyze, secure, and disseminate data between the four TMCs	Short-term	Traffic Management, Safety	**High**	Existing ITS data	TMCs, FDOT District 5, data management vendors
Traffic Management Software	Update traffic management software to Volusia County, City and Daytona Beach, and City of Palm Coast TMCs use same software for easier coordination	Mid-term	Traffic Management	Medium	New software	Interagency traffic signals management coordination
Traffic Signal Controllers	Upgrade signal controllers along fiber-optic-equipped corridors to enable CV technology	Long-term	Traffic Management, Safety	**High**	New signal controllers that support CV communications and are interoperable with existing equipment	Traffic signal controller vendors (to ensure interoperability)
Votran Transit Signal Priority (TSP)	Implement transit signal priority along key, connected corridors to take advantage of technology already equipped on buses	Mid-term	Traffic Management, Mobility, Equity	**High**	Mapping of existing signals located along congested corridors in Volusia County	Volusia County Traffic Signal Management, Votran
Signal Controller Cabinets	Consider larger cabinets to provide room for new techs when replacing cabinets	Short-term	Traffic Management	Low	Larger signal controller cabinets, as needed	None
Electric Vehicle Charging Stations	Modify land development codes to require or incentivize electric vehicle charging stations	Mid-term	Mobility, Accessibility	**High**	Consumer and demographic data for hybrid and electric vehicles	Electric charging station vendors, Volusia and Flagler County land development offices
Parking Management	Install real-time parking occupancy monitoring systems at beach lots and garages to enable accurate wayfinding information sharing	Mid-term	Traffic Management, Mobility, Accessibility	Medium	Parking inventory in all public and privately owned lots and garages used for event parking and beach parking	Public and private parking lot owners, automated parking payment and parking application services, Open Data Portal or Data Marketplace data sharing
ITS Implementation and Data Collection	Install data collection equipment following the TPO's ITS Master Plan to support data-driven decision making and to measure and monitor impacts	Mid-term	Traffic Management, Safety	**High**	Existing and proposed CCTV and Bluetooth locations	Traffic technology vendors
Special Event Projects						
Curbside Pick-up and Drop-off Zones	Designate curbside pick-up/drop-off zones at special events to improve safety for motorists and pedestrians	Short-term	Traffic Management, Mobility, Accessibility, Safety, Equity	Medium	Historical TNC data	Local law-enforcement agencies, special events organizations
Votran/AV Shuttle	Pilot test an AV shuttle for special event short circulator trips. Teach staff and public about new technology	Long-term	Traffic Management, Mobility, Accessibility, Safety, Equity	Medium	Mapping of parking lots used for events, research into successful AV shuttles	Votran, AV Shuttle Manufacturers, insurance providers, NHTSA

Project Name	Issue/Opportunity	Scenario	Goal Alignment	Priority	Data or Resource Needs	Partnership Needs
Law-Enforcement and TMC Communication	Invite Sheriff or local law enforcement to staff a representative in the TMCs during special events to improve communication between law enforcement and traffic system managers	Short-term	Traffic Management, Safety	**High**	None	Country or city law-enforcement, TMCs
Agency Partnership Projects						
Enforcing Electric Vehicle Charging Spaces	Set policy and enforce EV charging spaces the same way handicap spaces are enforced to encourage and support EV use and to take advantage of EV infrastructure installed or incentivized by the counties and cities	Short-term	Mobility, Accessibility, Equity	**High**	Mapping of all existing electric vehicle charging stations to be shared through the Open Data Portal	City and county law-enforcement agencies; city parking enforcement departments
Votran / Daytona State College Data Analytics Partnership	Partner with Daytona State College to process and analyze the transit ridership data for Votran	Short-term	Mobility, Accessibility, Equity	Medium	Ridership data	Daytona State College, Votran
TNC Mobility Transit Partnerships	The two transit agencies could partner with a TNC to provide on-demand transportation as a first-/last-mile connection to fixed route transit or as an alternative to request-based service.	Mid-term	Mobility, Accessibility, Equity	Medium	Ridership data; common payment system	TNCs, Flagler County Public Transportation, Votran
Academic Partnerships	Partner with local colleges and utilize student researchers to develop educational materials such as videos and presentations to demonstrate the benefits of CAVs and emerging technologies to the public	Short-term	Accessibility, Equity	Low	None	TPO, local higher education institutions
Law Enforcement	Organize national experts on CAV technology, traffic laws, and transportation policies to train law-enforcement officers how to handle situations related to changing transportation technologies	Short-term	Safety, Equity	**High**	None	National industry experts, local law-enforcement
Funding	To fund technology deployments, operations, and maintenance, the TPO can identify new funding sources and support grant applications	Short-term	Mobility, Accessibility, Safety, Equity	**High**	Transportation funding sources; new revenue sources	Funding experts, partner agencies
Transportation Data Marketplace	Assess how an Open Data Portal or Data Marketplace could be implemented and operated to ensure sharing of transportation data and security of sensitive data from the connected network	Mid-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**	Public data sources, private data sources	TPO, local agencies, 3rd party data firms
Mobility and Accessibility Projects						
Curb Management	Partner with a data management company, such as Coord, to digitize curbside assets in Daytona Beach and surrounding mixed-use zones. The TPO can use the data to pilot pick-up/drop-off zones, define freight delivery zones, and maximize the efficiency of multi-modal street parking through a web-based dashboard, ideally hosted by and connected to the TMCs.	Mid-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**	Curb asset database development	Transportation Data Management Company, local institute of higher education

Project Name	Issue/Opportunity	Scenario	Goal Alignment	Priority	Data or Resource Needs	Partnership Needs
Shared Micromobility	Share example policy language for micromobility deployments with local agencies interested in piloting a program. Examples of this guidance are provided in Appendices J and K. Collect data to monitor the impacts	Short-term	Accessibility, Mobility, Equity	Medium	Existing bicycle and pedestrian data, demographic data	Micromobility Providers
Common Payment System	Develop concept of operations for a mobile payment on Votran and a common payment system between Votran, Flagler County Public Transportation, SunRail, and possibly private TNC services like Lyft or e-scooter programs	Short-term	Accessibility, Equity	**High**	Votran payment data, Parking utilization data	Votran, Department of Public Health, Data Management Company
Policy Projects						
Update TIA Guide	Update the TPO's Traffic Impact Analysis (TIA) Guide to require analysis of future technology impacts	Short-term	Traffic Management, Mobility, Accessibility, Safety, Equity	**High**	None	Planning departments
Incorporate "Smart City" Concepts in Agency Business Practices	Incorporate some “Smart City” concepts (such as interdepartmental data and resource sharing, performance monitoring, and public access to more information on agency services) into local agency business practices and delivery of services to the public	Mid-term	Mobility, Accessibility, Mobility, Equity	High	None	Interdepartmental agency coordination and data sharing

INFRASTRUCTURE

Infrastructure is the backbone of the transportation system. The transportation network, whether sidewalk, rail, or roadway, and the system of supporting infrastructure and computers that allow these networks to cross paths are crucial for the success of the current transportation system and preparation for the changes to come. Although R2CTPO does not maintain any existing infrastructure, there are many opportunities to support and inform those that do. The following recommendations can help prepare the region as a whole as well as individual agencies within the TPO boundaries for the infrastructure needs of the future.

Fiber Optic Cables

- **Issue/Opportunity:** Fiber optic cables (FOC) are needed along signalized corridors to provide communication between signals. Advanced and connected signal systems require reliable, high-speed connection for communication. FOC allow the conveyance of traffic information quickly and effectively.
- **Scenario Summary:** Long-Term (9-15 years)
  Follow the River to Sea ITS Master Plan, Phase 2, which details the installation or upgrade of 96 single-mode FOC along major signalized corridors. The ITS Master Plan also recommends connecting the existing TMCs with FOC for improved communication and data sharing. The Master Plan referenced the following routes for installing new or upgraded FOC:
  - US 92
  - US 1
  - SR A1A
  - SR 40
  - SR 44
  - SR 100
  - SR 400
  - SR 42
  - SR 442
  - Nova Rd
  - Clyde Morris Blvd
  - LPGA Blvd
- **Goal Alignment:** Traffic Management, Safety
- **Data Needs:** Location of existing FOC and location of needed cables.
- **Partnership Needs:** FDOT District 5, Volusia County, Flagler County, City of Daytona Beach, or City of Palm Bay

Traffic Management Center Open Data Portal

- **Issue/Opportunity:** There are four Traffic Management Centers (TMCs) in the R2CTPO planning area with Volusia County operating two in DeLand and Holly Hill, City of Daytona Beach operating one, and the City of Palm Coast operating one. The R2CTPO ITS Master Plan Phase 1 identified the lack of data sharing and communication between the TMCs, reducing efficiency and efficacy of ITS technologies.
- **Scenario Summary:** Short-Term (2-3 years)
  Develop a Concept of Operations for an Open Data Portal to collect, store, analyze, secure, and disseminate data between the four TMCs. The TPO could arrange for meetings and trainings to be conducted by outside partners on the best way to manage, store, protect, and share data between agencies. The TPO could coordinate and facilitate monthly or quarterly meetings between agencies to discuss what data can be shared and to provide feedback and track progress on communication and data sharing. Additionally, meetings could be held following all major events to discuss challenges and opportunities for improvement.
- **Goal Alignment:** Traffic Management, Safety
- **Data Needs:** Existing ITS data.
- **Partnership Needs:** A partnership with FDOT District 5 and private data management vendor could aid in understanding how to store, protect, and share data between agencies.

Traffic Management Software

- **Issue/Opportunity:** Traffic management software is used in TMCs to manage and monitor traffic signals and to adjust timing as needed. The City of Daytona Beach and City of Palm Coast use Trafficware ATMS.now for managing signal operations, while Volusia County currently uses Econolite Centracs ATMS.
- **Scenario Summary:** Mid-term (4-8 years)
  Consistency in both signal controllers and signal management system software used will aid in management of corridors that cross regional boundaries as well as collaboration. Adopting a consistent software will aid collaboration – sharing data and staff across agencies.
- **Goal Alignment:** Traffic Management
- **Data Needs:** None. | **Resource Needs:** New ATMS software.
- **Partnership Needs:** Inter-agency coordination on traffic signals management.

Traffic Signal Controllers

- **Issue/Opportunity:** There are over 500 traffic signals in the R2CTPO planning area. Table B-1 shows the number of signals each agency currently controls.
- **Scenario Summary:** Long-Term (9-15 years)
  When installing new traffic signals, consider ensuring that the new signals have Dedicated Short Range Communication (DSRC) and 5G capabilities allowing Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication. These communication features will enable equipped corridors to smoothly transition into connected corridors, capable of communicating with CAVs. Coordination is needed with traffic signal controller vendors to ensure new equipment is compatible with existing.
- **Goal Alignment:** Traffic Management, Safety
- **Data Needs:** None.
- **Resource Needs:** New traffic signal controllers
- **Partnership Needs:** Traffic signal controller vendors.

Table B-1: Traffic Signals in Volusia and Flagler Counties

Agency: / Equipment:	Volusia County	City of Daytona Beach	Flagler County	City of Palm Coast
Connected Signals	187	93	0	34 (Planned)
Total Signals	326	125	4	50
Signal Controller Standard	Econolite ACS#	Trafficware ATC	Unspecified	Unspecified
Signal Controller Cabinets Standard	TS2 Type 1	Unspecified	Unspecified	TS2
CCTV Cameras	35	60	No	Yes
Traffic Management Center	2 (DeLand & Holly Hill)	1	0	1
Signal Management System (Software)	Econolite Centracs ATMS	Trafficware ATMS.now	None	Trafficware ATMS.now
CCTV Management System (Software)	Lucity	Genetech	None	Bosch CCTV
Emergency Vehicle Preemption (GPS or Infrared)	At 65 Signals	Unspecified	Some	Yes
Transit Signal Priority	Planned	None	None	None
Fiber Optic Cable (mi)	52	90	None	40
Microwave Point-to-Point Links	Yes	Yes	None	None

Votran Transit Signal Priority (TSP)

- **Issue/Opportunity:** Votran has successfully implemented automatic vehicle location (AVL) and automatic passenger count (APC) systems, enabling service alerts, mobile bus tracking, and trip planning. While these systems provide the Votran fleet with traffic signal priority (TSP) capability, traffic signal controllers require corresponding equipment for TSP to function.

- **Scenario Summary:** Mid-Term (4-8 years)
  Volusia County could install the necessary equipment for TSP along Votran routes that run on congested corridors that are equipped with fiber optic communications.
- **Goal Alignment:** Traffic Management, Mobility, Equity
- **Data Needs:** Mapping of existing signals located along congested corridors in Volusia County
- **Partnership Needs:** Volusia County Traffic Signal Management, Votran

Signal Controller Cabinets

- **Issue/Opportunity:** Many existing signal controller cabinets do not have sufficient space for the additional equipment that is required for advanced traffic signals. Upgrading traffic signal cabinets is an easy way to prepare for the installation of new equipment.
- **Scenario Summary:** Short-Term (2-3 years)
  Consider installing upgraded signal controller cabinets as part of any construction project that requires the cabinet to be relocated or as part of any scheduled cabinet replacement.
- **Goal Alignment:** Traffic Management
- **Data Needs:** None.
- **Partnership Needs:** None.

Electric Vehicle Charging Stations

- **Issue/Opportunity:** As use of electric vehicles becomes more prevalent, the need for charging stations is necessary to support long distance traveling.
- **Scenario Summary:** Mid-Term (4-8 years)
  Just as traditional vehicles require publicly available fueling stations, it is necessary for electric vehicles to have a system of charging stations available throughout a transportation network. Electric charging stations can be installed in public and private parking lots and garages, including at commercial, office, and restaurant locations to increase access. Focus can be placed on major travel corridors and event locations such as the speedway and beaches.
- **Goal Alignment:** Mobility, Accessibility
- **Data Needs:** Consumer and demographic data for hybrid and electric vehicles.
- **Partnership Needs:** Electric charging station vendors.
- **Policy Change:** Volusia and Flagler counties could change their land development codes to incentivize or require new developments to provide electric vehicle charging infrastructure,

Parking Management

- **Issue/Opportunity:** During special events at the Daytona Speedway, beach locations, and other areas of interest, traffic circulation due to individuals searching for parking increases congestion levels. The Daytona Speedway, through the Daytona Area Event Management project, has successfully managed parking demand through pre-paid parking for events and implementation of Blank Out Signs (BOS) to direct traffic to parking areas. Public and private parking lots regularly used at beach locations must accommodate a high volume of visitors who are unaware of existing parking locations.
- **Scenario Summary:** Mid-Term (4-8 years)
  Parking technology can be implemented at parking lots and garages to reduce extraneous vehicle circulation around areas of interest. Parking technology (e.g. sensors, cameras, and gates) can be installed to monitor parking utilization and availability in real time. Data can be disseminated to visitors through a parking mobile application – such as Parking Hero or Park Mobile – or through dynamic message signs located on-street. Wayfinding signs and dynamic message signs can inform visitors of location and availability of parking spots in specific locations.
- **Goal Alignment:** Traffic Management, Mobility, Accessibility

- **Data Needs:** Parking inventory in all public and privately owned lots and garages used for event parking and beach parking.
- **Partnership Needs:** Public and private parking lot owners, automated parking payment and parking application services

ITS Implementation and Data Collection

- **Issue/Opportunity:** Data collection is necessary for informed transportation decision making. As CAVs become more prevalent, data will be at a premium to support and understand new technology impacts. The River to Sea TPO's ITS Master Plan recommends the installation of Closed-Circuit Television (CCTV) cameras and Bluetooth data collection locations.
- **Scenario Summary:** Mid-term (4-8 years)
  Implement ITS projects including CCTV and Bluetooth installations described in the ITS Master Plan.
- **Goal Alignment:** Traffic Management, Safety
- **Data Needs:** Existing and proposed CCTV and Bluetooth locations
- **Partnership Needs:** Traffic technology vendors

SPECIAL EVENTS

Volusia County is home to several recurring events that significantly impact transportation systems in the R2CTPO planning area. These events occur over short periods of time, but involve relatively high volumes of visitors, causing significant strain on the existing network. Due to the network's design for day-to-day needs, special planning and coordination strategies are needed to accommodate events with high tourist influx. The following recommendations provide opportunities to manage the movement of people associated with special events.

Curbside Pick-up and Drop-off Zones

- **Issue/Opportunity:** Ridehail services (e.g., Uber, Lyft) are becoming more popular for providing transportation to and from events. Riders often request pick-up and drop-off locations based on convenience rather than safety, sometimes requiring pedestrians to cross the street at unmarked locations. Some events are correlated with increased alcohol consumption, necessitating special considerations for pedestrian safety. Additionally, vehicles stopped in traffic lanes during pick-ups/drop-offs increase the risk of a crash.
- **Scenario Summary:** Short-term (2-3 years)
  Designate curbside pick-up and drop-off areas during special events to provide opportunities for safe and coordinated ridehail service. The TPO can coordinate with venues and event vendors to identify and designate these areas, as well as coordinate with law-enforcement to require TNCs to utilize these areas through app-based geofencing and enforcement.
- **Goal Alignment:** Traffic Management, Mobility, Accessibility, Safety, Equity
- **Data Needs:** Historical TNC data to determine popular/frequent pick up and drop off locations (ride trip origin – destination data).
- **Partnership Needs:** Local law-enforcement agencies, special events organizations (i.e., Daytona International Speedway)
- **Policy Changes:** Changes may be needed to local land development codes and ordinances to establish pick-up/drop-off zones in public or private right of way. Pick-up/drop-off zones may be defined in temporary traffic management plans for special events. (See Washington DC World Series example in **Appendix J**.)

Votran/AV Shuttle

- **Issue/Opportunity:** Visitors to special events often use public and private parking lots that are located at a substantial distance from the event venue. Pedestrians that leave events, especially in the evening, require safe transit as they return to their vehicles.

- **Scenario Summary:** Long-term (2-15 years)
  Votran can service event attendees by providing a shuttle between parking lots and event venues. The TPO could begin working with local agencies to plan for an AV shuttle that could run during events to transport attendees.
- **Goal Alignment:** Traffic Management, Mobility, Accessibility, Safety, Equity
- **Data Needs:** Mapping of parking lots used for events, research into successful AV shuttles
- **Partnership Needs:** Votran, AV Shuttle Manufacturers, insurance providers, NHTSA

Law-Enforcement and TMC Communication

- **Issue/Opportunity:** Reduce response times to traffic events and increase inter-agency coordination by inviting law enforcement to sit in the TMCs during special events. Law-enforcement officers can identify issues on the ground and quickly relay that information to TMC operators. Additionally, TMC operators may notice traffic incidents or issues and need to notify law-enforcement of where those incidents are.
- **Scenario Summary:** Short-term (1-2 years)
  Invite a Sheriff's office representative or local law enforcement to operate out of the TMC during special events to help with coordination between deputies on the streets and TMC staff operating the signals. This communication allows officials to quickly handle traffic incidents that may arise.
- **Goal Alignment:** Traffic Management, Safety
- **Data Needs:** None.
- **Partnership Needs:** City or county law-enforcement, TMCs

AGENCY PARTNERSHIPS

The TPO can coordinate with a variety of organizations, both public and private, to achieve desired outcomes in the planning area. Due to reduced funding and resources, partnerships are an essential aid to staying current in knowledge of changing technologies, and to providing valuable service to the public. The following partnership recommendations may assist the TPO and other local agencies in improving transportation services.

Enforcing Electric Vehicle Charging Spaces

- **Issue/Opportunity:** Finding electric vehicle (EV) charging stations today is often difficult due to the low number of public charging stations available. Availability can be further reduced when non-EVs park in spots that are designated for EVs. Enforcement of EV parking spaces is needed to support and encourage EV use, similar to enforcement of handicap parking spaces.
- **Scenario Summary:** Short-term (2-3 years)
  It is recommended that law-enforcement agencies increase enforcement and ticketing of those illegally parking in EV charging spots. Drivers will be more likely to use EVs if they have confidence in the availability of public charging stations.
- **Goal Alignment:** Mobility, Accessibility, Equity
- **Data Needs:** Mapping of all existing electric vehicle charging stations to be shared through the Open Data Portal
- **Partnership Needs:** County and city law-enforcement agencies; city parking enforcement departments

Votran / Daytona State College Data Analytics Partnership

- **Issue/Opportunity:** Votran collects data through their automated passenger counting system, which allows them to measure ridership on fixed transit routes. Ridership data can be used to develop a cost-benefit comparison, determining the value of the route. Votran cannot process and analyze the recorded ridership data due to insufficient staffing.
- **Scenario Summary:** Short-term (1-3 years)

A partnership with Daytona State College would give local college students hands-on experience processing data and would provide ridership information to Votran in a useable format. This data can inform Votran's route and scheduling decisions. Share the processed data on the Open Data Portal.

- **Goal Alignment:** Mobility, Accessibility, Equity
- **Data Needs:** Ridership data
- **Partnership Needs:** Daytona State College, Votran

TNC Mobility Transit Partnerships

- **Issue/Opportunity:** Votran provides essential fixed-route transportation services throughout Volusia County, and Flagler County Public Transportation provides request-based services. In rural areas, low volume routes, or off-peak hours, fixed route transit may not be cost effective.
- **Scenario Summary:** Mid-term (4-8 years)
  TNCs, such as Via, can provide first- and last-mile connections that are impractical for fixed route transit services to offer. A partnership between Votran and Via could involve Via providing staged vehicles at bus stops, allowing riders to transfer directly from one mode of transport to the next. Flagler County could partner with Via to provide on-demand transportation using private passenger vehicles, rather than Flagler county transport vans. The transit agencies could subsidize some or all of the trip costs. A common payment system (like a mobile app) could be used for seamless transition between services.
- **Goal Alignment:** Mobility, Accessibility, Equity
- **Data Needs:** Ridership data
- **Partnership Needs:** TNCs, Votran, and Flagler County Public Transportation

Academic Partnerships

- **Issue/Opportunity:** Some members of the community are unfamiliar with transformational technologies and are sometimes reluctant to accept technology and change. CAV technology is evolving rapidly, and communities that wish to incorporate CAVs will need to begin planning now to inform and prepare citizens for changes in transportation technology.
- **Scenario Summary:** Short-term (2-3 years)
  Opportunities exist to conduct public outreach through demonstrations of transformational technology for the River to Sea communities. A partnership with local colleges or universities such as Embry Riddle Aeronautical University or Daytona State College could utilize student researchers to develop educational materials such as videos and presentations to demonstrate the benefits of CAVs. TPOs could facilitate and host these presentations.
- **Goal Alignment:** Accessibility, Equity
- **Data Needs:** None
- **Partnership Needs:** University partnerships (e.g., Embry Riddle Aeronautical University, Daytona State College), industry academics

Law Enforcement

- **Issue/Opportunity:** As transportation technology continues to change and vehicles become increasingly automated, policies and regulations are not keeping up with the changes. Without guidance, it is difficult for law-enforcement officers to know how to enforce traffic laws, determine fault in incidents, and maintain traffic safety on roadways.
- **Scenario Summary:** Short-term (1-3 years)
- **Goal Alignment:** Safety, Equity
  The TPO could organize national experts on CAV technology, traffic laws, and transportation policies to train law-enforcement officers how to handle situations related to changing transportation technologies.
- **Data Needs:** None

- **Partnership Needs:** National industry experts, local law-enforcement

Funding

- **Issue/Opportunity:** As transportation technologies develop, the is an increasing need for new infrastructure; operations and maintenance; additional staff and staff training; and data collection, management, security, and sharing. Additional funding is required to meet these increasing costs. Existing funding sources are either decreasing, becoming obsolete, or have not been updated to reflect modern times (i.e., the gas tax).
- **Scenario Summary:** Short-term (2-3 years),
- **Goal Alignment:** Mobility, Accessibility, Safety, Equity
  The TPO can identify resources and experts in agency funding and develop partnerships with other agencies that have been successful in finding additional funding sources. The TPO could identify resources and support writing grant proposals for federal funds.
- **Data Needs:** Transportation funding sources
- **Partnership Needs:** Funding experts

Transportation Data Marketplace

- **Issue/Opportunity:** With data collection and data sharing comes the need to collect, store, analyze, secure, and disseminate data to transportation users and providers
- **Scenario Summary:** Mid-term (4-8 years)
  Establish partnerships with 3rd party data aggregation, anonymization, storage, and security firms to assess how open data portals and/or a data marketplace could support the data strategy needed to enable emerging technologies. The TPO could also assess how such systems could be implemented and operated to ensure the cybersecurity of sensitive data from the connected network.
- **Goal Alignment:** Traffic Management, Mobility, Accessibility, Safety, Equity
- **Data Needs:** Public data sources, private data sources
- **Partnership Needs:** Local government agencies, TNCs, 3rd party data firms

MOBILITY AND ACCESSIBILITY

Curb Management

- **Issue/Opportunity:** Curbside space is a valuable resource wherever there are competing uses for the curb, such as parking, deliveries, and ridehail. Creating and maintaining a digital inventory of curbside infrastructure (signing, striping, utilities, accessibility infrastructure, zoning) will be crucial in the coming years for understanding how parking, loading, and usage policies interact, managing these assets, and communicating rules and regulations to all users (both human and computer-based). The curbside data, which empowers agencies to manage their curbs, will be an integral aspect of the connected, automated, and shared future and will continue to increase in value.
- **Scenario Summary:** Short-term (2-3 years)
- Partner with a data management company, such as Coord, to digitize curbside assets in Daytona Beach and surrounding mixed-use zones. The TPO can use the data to pilot pick-up/drop-off zones, define freight delivery zones, and maximize the efficiency of multi-modal street parking through a web-based dashboard, ideally hosted by and connected to the TMCs. **Goal Alignment:** Traffic Management, Mobility, Accessibility, Safety, Equity
- **Data Needs:** Curb asset database development
- **Partnership Needs:** Transportation Data Management Company, local institute of higher education (for data collection and analysis)

Shared Micromobility

- **Issue/Opportunity:** Technology-enabled personal mobility (or micromobility) solutions, such as e-scooters and e-bikes, have already transformed urban and suburban environments in the short period of their existence. These shared micromobility devices have presented successes and challenges – connecting riders to transit stops, blocking ADA ramps, increasing low-carbon mode availability, littered parking, being fun, and a lack of allocated roadway space. Integrating these modes into the transportation system thoughtfully can result in safe, equitable, and profitable results.
- **Scenario Summary:** Short-term (2-3 years)
  Share example policy language for micromobility deployments with local agencies interested in piloting a program. Examples of this guidance are provided in Appendices J and K.
- **Goal Alignment:** Accessibility, Mobility, Equity
- **Data Needs:** Existing bicycle and pedestrian data, demographic data, safety data
- **Partnership Needs:** Micromobility Providers

Common Payment System

- **Issue/Opportunity:** Fare regulations and payment options (such as exact change, credit card, reusable fare card, paper ticket) can impact the convenience and ease with which a transit rider, bikeshare user, or person parking a vehicle can interact with the transportation system. Unify multiple services into a singular platform to facilitate a seamless multimodal journey, while also providing a tool for people who are under-banked or experiencing homelessness by providing an encompassing transportation service through additional payment programs.
- **Scenario Summary:** Short-term (2-3 years)
  Develop concept of operations for a mobile payment on Votran and a common payment system between Votran, Flagler County Public Transportation, SunRail, and possibly private TNC services like Lyft or e-scooter programs.
- **Goal Alignment:** Accessibility, Equity
- **Data Needs:** Votran payment data, Parking utilization data
- **Partnership Needs:** Votran, Department of Public Health, Data Management Company

APPENDIX C: FEDERAL AND STATE CAV REGULATIONS AND LEGISLATION

There are no federal safety standards related to CV or AV systems in motor vehicles at this time. In the past two years, there has been legislative activity at the state and national levels.

Florida Legislation: In 2019, the Florida legislature passed Act No. 2019-44: Use of Wireless Communications Devices While Driving, which prohibits the use of wireless communications devices while driving but does not apply to a motor vehicle operator who is operating an autonomous vehicle in autonomous mode.

FCC Notice of Proposed Rulemaking: CV Spectrum Sharing: The primary policy and planning challenges related to CVs are whether to continue to invest in the proven technology (dedicated short-range communication (DSRC) radios) or to wait for the commercial development of 5G. In November 2019, the Federal Communications Commission (FCC) proposed a change in policy that would allow unlicensed operations to share some of the communications bandwidth that has been reserved for transportation use only, including DSRC. All of the major CV Pilot projects across the country currently use DSRC (including the Tampa, New York City, and Wyoming CV Pilot Deployment Projects). The FCC is seeking public comment on this change.

AV START Act: In 2019, the 116th Congress began efforts to develop a bi-partisan bill related to automated vehicle safety. In 2018, both the House and Senate each passed partisan bills (H.R. 3388: the SELF DRIVE Act and S. 1885: the AV START Act), but they were not able to bring the bills to the floor before the end of the term.

APPENDIX D: FLORIDA PROJECTS, PILOTS, AND DEPLOYMENTS

Florida is a leading state in the testing of CAV technology. There are many past, current, and planned CAV technology projects across the state. These pilot projects provide valuable lessons learned that the River to Sea TPO stakeholders may carefully consider before planning a CAV deployment in the future.

Project	Description	Status
The Villages	Voyage Auto is a self-driving taxi van that provides door-to-door service within The Villages community.	Design / Implementation
Lake Nona	NAVYA's AUTONOM shuttle, named Beep, connects Lake Nona Town Center to Laureate Park Village Center.	Operational
Babcock Ranch	Transdev provided an autonomous school shuttle service to the Babcock Ranch community, prior to being ordered by NHTSA to stop service.	Stopped
SunTrax	Official testing site for CAVs, operated by Florida Turnpike Enterprise, FDOT, and Florida Polytechnic University.	Operational
Tampa Hillsborough Expressway Authority (THEA) & U.S. DOT Connected Vehicle Pilot	12-month CV pilot, providing V2V and V2I equipment to commuters to test congestion, safety, and transit impacts.	Operational
Florida's Regional Advanced Mobility Elements (FRAME)	Roadside units and onboard units will be deployed along I-75 in Gainesville and Ocala to implement TSP and FSP.	Design / Implementation
FDOT District 5 & The University of Central Florida Pedestrian / Safe Greenway	Implementation of a pedestrian and bicycle collision avoidance system and signal optimization.	Operational
FDOT District 1 Automated Shuttle Circulator Route Planning Study	Identifying potential route locations for an automated shuttle used as a circulator.	Study
Osceola County, Osceola Parkway	Roadside units equipped with DSRC technology are deployed along Osceola Parkway to test intersection processing capabilities.	Operational
Seminole County, SR 434	Six intersections equipped with V2I communications and automated traffic signal performance metrics (ATSPM) data collection and piloting emergency vehicle preemption and TSP.	Planning Phase
Lee County	CAV readiness study	Planning Phase
City of Tampa	Autonomous shuttle pilot in conjunction with the Hillsborough Area Regional Transit (HART) Agency along Marion St to provide satellite parking for the Marion Transit Center.	Planning Phase
City of Gainesville & University of Florida with FDOT	Gainesville Autonomous Transit Shuttle (GATORS) provides shuttle service to the city's Innovation Square. 20 Roadside and 20 Passive Pedestrian Detection systems will be implemented to test real-time notifications.	Design / Implementation
City of Jacksonville	Autonomous shuttle testing projects with NAVYA and EasyMile.	Operational
City of Tallahassee	Signal testing at 22 intersections along US 90 using DSRC and Roadside Units.	Operational

APPENDIX E: KEY FINDINGS FROM MASTER PLAN REVIEWS

The River to Sea Transportation Planning Organization (TPO) developed an Intelligent Transportation System (ITS) Master Plan in two phases. Phase 1, completed in 2016, identified transportation issues. Phase 2, completed in 2018, developed the Transportation Systems Maintenance and Operation (TSM&O) Master Plan. Florida Department of Transportation (FDOT) District 5 completed an ITS Master Plan in 2016. This appendix presents a summary of these three recent regional plans.

- **Local Agency Challenges**:
  - Volusia County:
    - Congestion on major corridors
    - Upgrading CCTV system to communicate with the FDOT network
    - Special events causing route modification for Votran (public transit)
    - Implementing Transit Signal Priority (TSP) by ensuring interoperability between Votran fleet and signal system
    - Parking availability information at major destinations
  - Flagler County:
    - Improving incident and construction coordination between local agencies
    - Managing and maintaining existing assets such as signal controllers
  - Palm Coast:
    - Synchronizing existing connected signals along arterials with an advanced management system
    - Collecting automated multimodal data
  - Daytona Beach:
    - Congestion due to special events and traffic incidents
    - Non-interoperability between regional monitoring systems
    - Completing gaps in the FOC network
  - FDOT District 5:
    - Automating multimodal data collection process
- **Local Agency Staffing Needs**:
  - All local transportation agencies are concerned about shortages or lack of appropriate staff for ITS projects.
  - FDOT outlined anticipated staffing needs by county and across the planning area.
- **Security/Cybersecurity Needs**: FDOT recommends no more #2 keys in cabinets that have communications. Suggests the use of cyber-oks, rekeying the cabinets or padlocks.
- **Votran Status**:
  - Fleet is equipped with automatic vehicle location (AVL) and automatic passenger count (APC) systems, which enable mobile bus tracking, trip planning, and service alerts.
  - No Transit Signal Priority (TSP) systems are in place. Requires updates to signal controllers and signal timing plans.

- **Traffic Management Center Status**:
  - Within the R2CTPO planning area, there are four traffic management centers (TMCs) in operation (Daytona Beach, Palm Coast, and two operated by Volusia County in Deland and Holly Hill). FDOT District 5 operates a Regional TMC (RTMC) in Orlando.
    - City of Daytona Beach TMC: Monitors and controls all signals within city limits
    - City of Palm Coast TMC: Can monitor and control all Flagler County signals, but not all signals are currently connected
    - Volusia County TMC: Monitors and controls all signals within the county outside of Daytona Beach
  - Lack of correspondence and data sharing between TMCs is a major hindrance to the efficiency and efficacy of ITS technologies in the R2CTPO planning area.
  - Fiber optic cabling exists between the Deland TMC and FDOT RTMC, but data sharing is limited to CCTV video feeds.
  - Physical fiber infrastructure exists to connect Votran, Daytona Beach, Volusia County, and FDOT D5, however currently no data is shared.
- **ITS Deployment Status**: Volusia County has deployed considerably more ITS projects than Flagler County, mostly due to the joint Daytona Area Smart Highways project along I-4 between SR 44 and I-95 and along I-95 between I-4 and US 92, which provided traffic surveillance, incident management, and traveler information through the combined the efforts of FDOT District 5, the City of Daytona Beach, and the Daytona Beach Police Department.

The FDOT District 5 ITS Master Plan (2016) identified the following **staffing needs**:

- Flagler County: no changes necessary for current system
- Volusia County staffing needs include:
  - 1 additional Traffic Signal/ITS Engineer (2 total)
  - 1.75 additional Traffic Signal Analysts/Technicians (2 total)
  - 3 additional Traffic Signal Maintenance/ITS Fiber Technicians (10 total)
  - 1 additional Electronics Specialist (1 total)
  - 0.5 additional TMC Manager (1 total)
  - 0.75 additional TMC Operators (1 total)
- City of Palm Coast (based on pre-TMC operations):
  - 0.5 additional Electronics Specialist (0.5 total)
- R2CTPO area regional staffing needs include:
  - 1 additional Traffic Signal/ITS Engineer (1 total)
  - 2.35 additional Traffic Signal Analysts/Technicians (3.1 total)
  - 5.75 additional Traffic Signal Maintenance/ITS Fiber Technicians (18.25 total)
  - 0.5 additional Network Specialist (1.5 total)
  - 1.5 additional Electronics Specialist (2 total)
  - 1.5 additional TMC Manager (2 total)
  - 1 additional Supervisor (2 total)
  - 1.25 additional TMC Operators (2 total)
- Staffing Needs Total Cost ~ $1,162,000 + $265,000 + $406,000 = $1,833,000 annually

The 2016 FDOT District 5 ITS Master Plan also outlined the following Uniform Training Program for ITS Staff, with goal of sharing staff resources between partner agencies:

- Operations Training Modules: Basic Operations Overview, Basic Operator Training, Multi-Agency Response and Coordination, Traffic Signals Operations.
  - For Traffic Signal Engineers, Traffic Engineering Operations Managers, Arterial TMC Managers, Signal Operations Center Managers, Arterial TMC Operators, Signal Operations Center Operators
- Maintenance Training Modules: IMSA Traffic Signal Level 1, IMSA Traffic Signal Level 2 Field, Vendor Specific Signal Controller, Vendor Specific CCTV, Vendor Specific DMS/ADMS, Grounding and Surge Suppression, Fiber Optic, Advanced Maintenance of Traffic (MOT), SHRP2 National Traffic Incident Management Responder
  - For Maintenance Managers, Signal Technicians (Levels 1 and 2)
- Networking Training Modules: Vendor Specific Layer 2 Switches, Vendor Specific Layer 2 Switch/Router, Vendor Specific CCTV, Vendor Specific DMS. ADMS, Fiber Optics, SHRP2 National Traffic Incident Management Responder
  - For Network Managers, Network Technicians

APPENDIX F: KEY FINDINGS FROM STAKEHOLDER INTERVIEWS

The River to Sea TPO held three stakeholder meetings to gain input and understanding on the current readiness and needs to prepare for and to adopt new technologies. These meetings were held February 13, 19, and 25, 2020. The following sections summarize the discussions and feedback received in the stakeholder meetings.

MEETING ATTENDEES

Table F-1. In-Person Stakeholder Meeting Attendees

Organization	Name	Stakeholder Meeting Date
City of Daytona Beach	Andy Holmes	02/13/2020
Town of Ponce Inlet	Aref Joulani	02/13/2020
VCARD	Shannon Ruby Julien	02/13/2020
VCARD	R Sans Lassiter	02/13/2020
VCARD	Kerry Karl	02/13/2020
FDOT D5	Jeremy Dilmore	02/19/2020
FDOT D5	Tushar Patel	02/19/2020
Volusia County Sheriff's Office	Sgt. Jeff Wingard	02/19/2020
Town of Pierson	Mark Karet	02/19/2020
Votran	John Cotton	02/25/2020
City of Palm Coast	Jose Papa	02/25/2020
Daytona State College	Dr. Ronald Eaglin	02/25/2020
Volusia County Traffic Engineering	Melissa Winsett	02/25/2020
Via	Olivia Blahut	02/25/2020
R2CTPO	Colleen Nicoulin	02/13/2020
R2CTPO	Lois Bollenback	02/13/2020
R2CTPO	Crystal Mercedes	all
Kittelson	Abby Morgan	all
Kittelson	Adam Burghdoff	all
Kittelson	Ryan Mansfield	all

KEY FINDINGS

What are the region's infrastructure challenges?

- Existing traffic signal infrastructure needs updates to support new technology
- Funding to make needed improvements is limited
- New infrastructure should be resilient

What are the region's communication challenges?

- Communication between departments and agencies needs to improve
- Technology transition conversions need to begin at multiple levels
- Data exists, but agencies need to learn how to use it to inform decision making
- Leadership is motivated to embrace technology - not always with a clear need
- An informed/educated public is less opposed to change
- Older generation is not as comfortable with technology

What can local agencies do to prepare for unknown technologies?

- Adopt a resilient approach to technologies
- Develop flexible policies that can adapt to changing technology (zoning, traffic management, etc.), and they need guidance on how to develop these policies
- Change how road use is anticipated
- Consider alternatives to fixed route transit
- Consider how new development can be influenced to meet future needs
- Teach elected officials the benefits of technology so they can understand the high costs

What can River to Sea TPO do to advance technology?

- Create opportunities for agencies to talk with decision makers
- Support staff training and resource sharing
- Create opportunities to inform elected officials about new technology
- Share guidance with local agencies on developing flexible policy for new technologies
- Encourage transparent data sharing across member agencies
- Update the Traffic Impact Analysis (TIA) guidance to require the assessment of future technology impacts

STAKEHOLDER SURVEY

To supplement the in-person stakeholder meetings summarized in Appendix C, an online survey was created and administered through the platform Survey Monkey. The intent of this survey was to capture stakeholders who might not be able to attend the in-person meetings, prep those who were able to, and attempt to collect any relevant data that stakeholders might be able to share. The results of the online survey are summarized in **Table F-2**.

Table F-2. Online Stakeholder Survey Responses

Organization	Interests	Technology & Policy Changes	Partners	Other Comments
Embry-Riddle Aeronautical University	Spurring innovation and implementing autonomy into transportation	Currently working on connected/automated vehicle project	Department of Energy, General Motors, US Navy, US Army, FAA, FDOT	-
FDOT District 5	Increasing roadway safety, mobility, and Florida's economy	Recommends reviewing this website (http://www.cflsmartroads.com)	First Responders; Vehicle OEMs	-
Town of Pierson	Implications of shared vs private fleets	None	None	
VCARD	Implementing technology responsibly and sustainably	Big Data Analytics	-	Enthusiastic about TPO's proactive approach
Volusia County Sheriff's Office	Safety, community-building, law enforcement	Real time Crime Center; Laser mapping for crash reconstruction	Volusia County Traffic Engineering; FDOT; R2CTPO; CFIX	Commitment to collaboration and improvement
Volusia County Traffic Engineering	Creating a well-maintained transportation system	Florida legislatures approved AVs	Central Florida ITS Consortium	Recommends connecting with Turnpike and MetroPlan Orlando regarding their recent readiness work; Recommends reviewing Central's readiness survey
Votran	Incorporating mobile technologies into payment structure	Smartphone integration and contactless payment integration (connected technologies)	-	-
West Volusia Tourism Advertising Authority	Bolstering tourism opportunities	ADA Compliance (Website)	Daytona Beach Tourism Office; New Smyrna Beach Tourism Office; Volusia County	Grateful for inclusion in planning process

CONCLUSIONS

The transportation stakeholders within the River to Sea TPO planning region are interested in new technologies and supportive of their adoption and deployment.

Key barriers to deployment are:

- Limited communication across agencies and staff levels,
- A need for education on the costs and benefits of new technologies,
- A sustainable funding plan for operations and maintenance, and
- Updated policy that requires future planning to consider impacts of new technologies.

The River to Sea TPO can support technology development by addressing these barriers. Initial actions that the TPO can take include:

- Facilitating on-going technology discussions with diverse stakeholder groups.
- Sharing best-practices and example policy language with local agencies who want to develop flexible policy that can adapt to new technologies.
- Creating resources and educational opportunities for agency staff, management, and elected officials to learn about new technologies and to understand their benefits, costs, and limitations.
- Encourage data sharing and communication across member agencies by facilitating meetings and information-sharing opportunities.
- Updating the Traffic Impact Analysis (TIA) guidance to require the assessment of future technology scenarios and impacts.

APPENDIX G: AGENCY TRAINING NEEDS

As emerging technologies become entrenched in daily life, ensuring that agency staff have the knowledge, tools, training, and resources necessary to troubleshoot, problem solve, and provide the best service possible will be crucial towards the healthy functioning of the transportation network. This section details resource areas that will most likely require additional training for staff to harness the benefits of CAV technologies.

Scenario Planning: This exercise encourages creative, critical thinking amongst staff and draws on local knowledge, data analysis, demand modeling, and broader trends to identify possible outcomes along with strategies for mitigation or improvement on these conditions. FDOT outlines six scenarios for the future of automated, connected, electric, and shared-use technologies based on current trajectories:

- **Slow Roll (Minimal Plausible Change)** – Nothing beyond currently available technology and investments already in motion is adopted.
- **Managed Autonomous Lane Network (AV Lane Networks)** – Certain lanes become integrated with CV and AV – 50-60% of vehicles (75% of trucks) have automation capability for platooning in controlled settings.
- **Ultimate Driver Assist (Ultra-Connectivity)** – CV technology progresses rapidly, but AV stagnates – 85% of vehicles have V2X capability by 2035 due to NHTSA mandate allowing DOTs to manage congestion aggressively.
- **Niche Service Growth (High AV/CV in Certain Cases)** – Innovation proliferates, but only in special purpose or "niche" AV zones, including retirement communities, campuses, transit corridors, urban cores, and ports.
- **Competing Fleets (Automated TNC Fleets Compete)** – Automated TNC-like services proliferate rapidly, but do not operate cooperatively. VMT doubles due to induced demand and empty vehicle repositioning.
- **Robo Transit (Automated Mobility-as-a-Service)** – On-demand shared services proliferate and integrate with other modes via cooperative sharing, policies, and infrastructure.

Travel Demand Modelling: As discussed in the 'Potential Impacts of Emerging Technology' section, travel demand modelling is undergoing rapid changes to encompass the variety of modes available and the differing impacts of each. TPOs can engage in trainings, update their models, and review existing policy and funding conditions to ensure the nimble-ness of their models as CAV technologies are introduced.

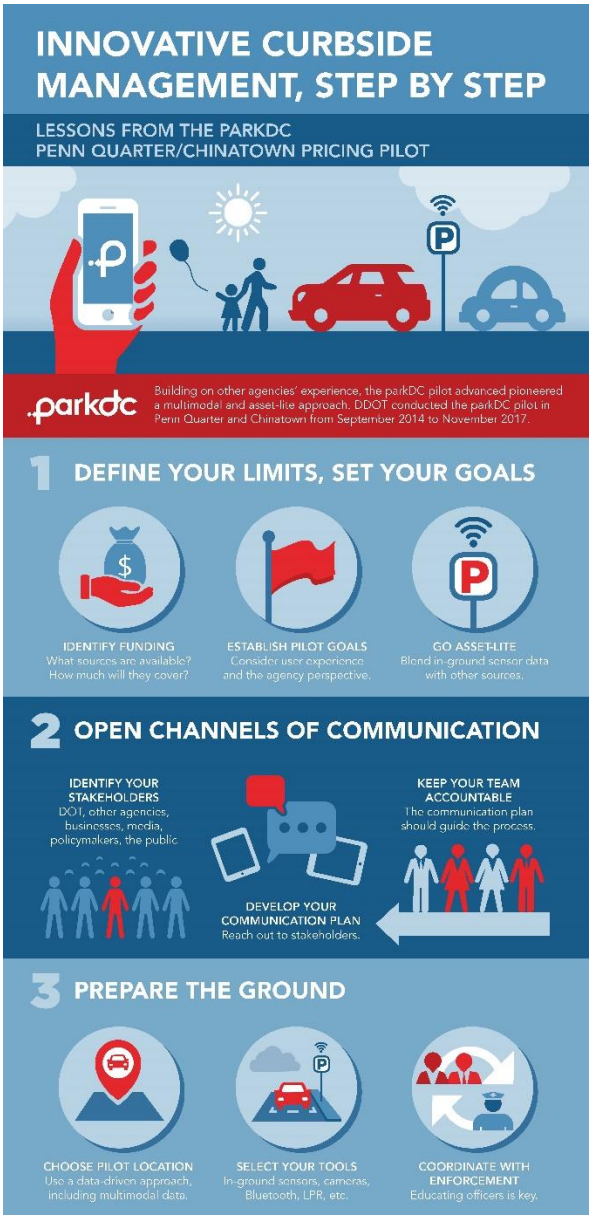
Smart Infrastructure: ITS, ATSPM, and advanced wireless communications: As the digital and physical backbone of the impending connected future, TPOs and city staff will require a working knowledge of signal and communications technologies to craft policy, troubleshoot issues, and strategize projects and investments.

Trainings, on-call expertise, and partnerships: Trainings, on-call expertise, and partnerships with providers will be important resources for an agency's toolkit.

APPENDIX H: INNOVATIVE CURBSIDE MANAGEMENT GUIDE

The District Department of Transportation (DDOT) also developed a step-by-step guide on Innovative Curbside Management, based on lessons learned from their parkDC pricing pilot in the Penn Quarter/Chinatown neighborhood. Based on the success of the pilot, DDOT decided to expand the pilot into additional neighborhoods that experience high parking demands and congestion related to vehicles circulating looking for available parking. The step-by-step guidance is provided in this appendix for reference.

For more guidance, refer to the ITE *Curbside Management Practitioners Guide*:
https://www.ite.org/pub/?id=C75A6B8B-E210-5EB3-F4A6-A2FDDA8AE4AA



APPENDIX I: SAN FRANCISCO'S 10 PRINCIPLES FOR TNCs

In response to a quick increase in TNC use in the metropolitan area, San Francisco County Transportation Authority (SFCTA) has become one of the leading communities to study the impacts of Mobility as a Service (MaaS) and TNC companies specifically. In 2017, SFCTA published an overview of the TNC landscape in San Francisco city and county. The result of the study was the City of San Francisco's 10 principles for TNCs (SFCTA, 2017):

1. Safety
2. Transit
3. Equitable Access
4. Disabled Access
5. Sustainability
6. Congestion
7. Accountability
8. Labor
9. Financial Impact
10. Collaboration

The SFCTA report recommends that the City should:

- Proactively partner with TNCs to develop innovative solutions to the city's transportation needs.
- Collect and warehouse data on TNC activities.
- Collect sufficient permit fees to fully recover cost of regulation.
- Conduct a study to identify equity gaps in TNC services for low-income users.
- Pursue TNC pilot programs to better support public transit.
- Increase and improve enforcement to encourage safe operation.
- Develop a curb management strategy that allocates and prices curb access appropriately.

APPENDIX J: HOBOKEN, NJ RULES FOR E-SCOOTERS

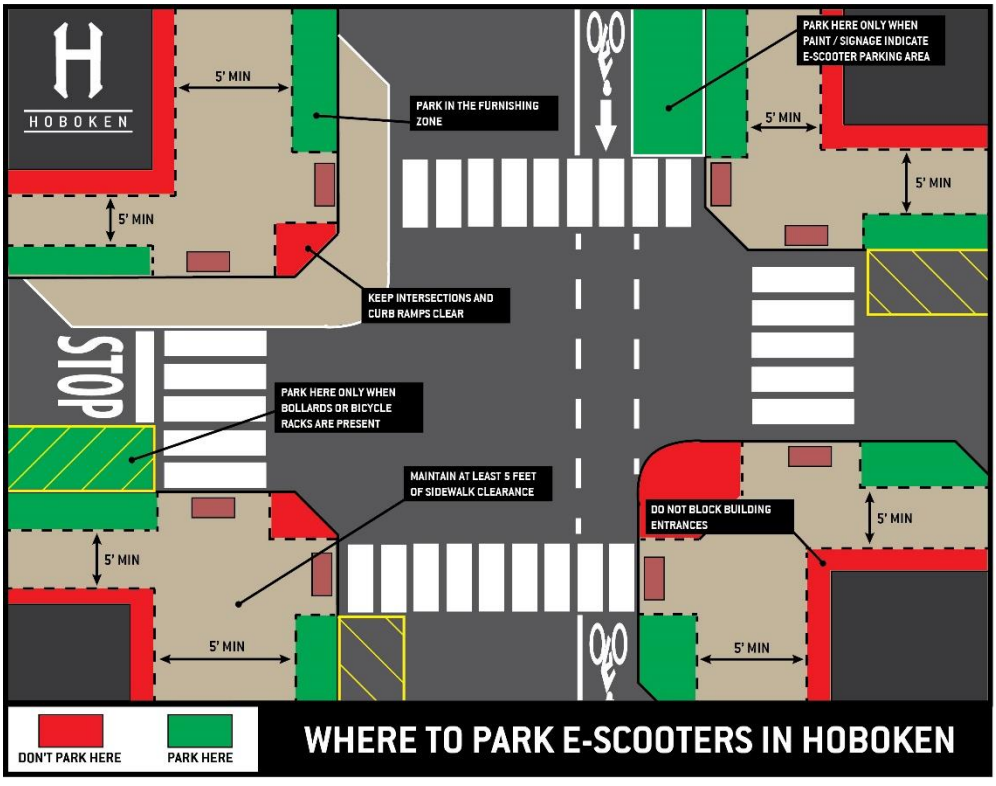
Hoboken, New Jersey ran a six-month e-scooter sharing pilot program from June-November 2019. The city provided guidance to users about the rules and regulations that apply to e-scooter use and the pilot at https://www.hobokennj.gov/resources/electric-scooters (Accessed April 26, 2020).

APPLICABLE RULES AND REGULATIONS

Several state and local laws govern electric scooter usage in Hoboken. Specifically, local ordinances regulate electric scooters in the following ways:

- **Where to ride**: E-scooter users are required to ride in the street and are permitted to ride in the city's bike lanes and on multi-use paths. All e-scooter users must yield to pedestrians and other slower-moving street users.
- **Where to park**: E-scooters must park at either bike racks or on the sidewalk in the furnishing zone (the area of the sidewalk closest to the curb that provides space for items such as bus shelters, benches, street trees, and utilities). The City, in partnership with electric scooter operators, is gradually implementing designated scooter parking areas in the street or daylighting space at inbound legs of intersections. ***Never park a scooter where it obstructs pedestrian access on sidewalks or at crosswalks.*** Any scooters parked in this area pose a safety hazard and limit mobility for pedestrians and people with disabilities and will be removed.
- **Riding on the sidewalk**: E-scooter users are prohibited from riding on the sidewalk.
- **Speed limits**: All e-scooters must obey a speed limit of 18 MPH.
- **Age restrictions**: All e-scooter riders must be 18 years or older.
- **One rider per scooter**: Only one person can ride an e-scooter at a time.
- **Rental restrictions**: The terms of agreements with e-scooter share companies (Lime) require that all rentals must be made by the rider of the scooter.

The use of helmets is strongly encouraged.



APPENDIX K: SPECIAL EVENT MULTIMODAL TRAFFIC MANAGEMENT FROM WASHINGTON, DC

In October 2019, Washington, D.C. hosted the World Series. D.C. already had several micromobility deployments, including docked and dockless bikeshare, e-bikes, and e-scooters. To accommodate the increased demand during the World Series, the District Department of Transportation (DDOT) developed guidance for taxi and rideshare pickup/drop-offs and for personal bikes, shared dockless bikes, and shared e-scooters. The publication is available on DDOT's website and is reproduced below for reference:

https://ddot.dc.gov/sites/default/files/dc/sites/mayormb/release_content/attachments/2019-World-Series-Community-Guide.pdf

MAJOR LEAGUE BASEBALL
2019 WORLD SERIES

The 2019 World Series between the Washington Nationals and the Houston Astros will draw large crowds to the neighborhood surrounding Nationals Park for home games and watch parties. Fans are strongly encouraged to utilize public transit or alternative forms of transportation to travel to and from the stadium area.

GAME SCHEDULE

Game 1 10/22 – Watch Party
Game 2 10/23 – Watch Party
Game 3 10/25 – Home Game
Game 4 10/26 – Home Game
Game 5* 10/27 – Home Game
Game 6* 10/29 – Away Game
Game 7* 10/30 – Away Game

*If necessary.

In the event of postponements or schedule changes by MLB, games may be played on 10/24, 10/28, or 10/31. Please check mlb.com for revised schedule.

Text NATS to 888-777
for free transit, safety, and weather alerts from District Government!

LEARN MORE:
SPORTSCAPITAL.DC.GOV

GETTING TO AND FROM NATIONALS PARK

METRO
The Navy Yard/Ballpark Station on Metro's Green Line is one block away from Nationals Park. This station will remain open 20 minutes after the game ends. Fans are encouraged to use the New Jersey Ave entrance when the game is over.

The Waterfront Station on Metro's Green Line is 0.9 miles away from Nationals Park. The Capitol South Station on Metro's Blue, Orange, and Silver Lines is 0.7 miles away from Nationals Park.

DC CIRCULATOR
The Eastern Market – L'Enfant Plaza Route (EMLP) provides direct access to Nationals Stadium. Service on this route will be extended until 1:00 a.m. for each home game during the series.

CAPITAL BIKESHARE
Capital Bikeshare will host a bike corral at First Street SE and N Street SE for each home game. The corrals will begin two hours before the first pitch and remain open until 30 minutes after each game ends.

METRO BUS
The 74, P6 Metro bus lines stop near Nationals Park.

RIDE SHARE PICK-UP/DROP-OFF ZONES
Fans using rideshare services should plan to use the pick-up/drop- off zones on K Street SE or L Street SE.

BIKE AND SCOOTER CORRALS
Dockless bicycle and scooter corrals will be available at the following locations: the corner of First Street SE and M Street SE; the 1100 block of First Street SE; the 1200 block of New Jersey Avenue SE; and, the corner of Tingey Street SE and Third Street SE.

Fans using personal bicycles should utilize the bike valet in the Nationals Park parking garage at First Street SE and N Street SE.

ON STREET MOTOR VEHICLE SHARING
Fans arriving to the stadium via car sharing or motor driven cycle (moped) should obey all posted parking regulations.

TAXIS
A temporary taxi stand will be in place along M Street SE between New Jersey Avenue SE and South Capitol Street SE for each home game.

WATER TAXIS
Water taxi service will also be available from Potomac Riverboat Company before and after each home game.

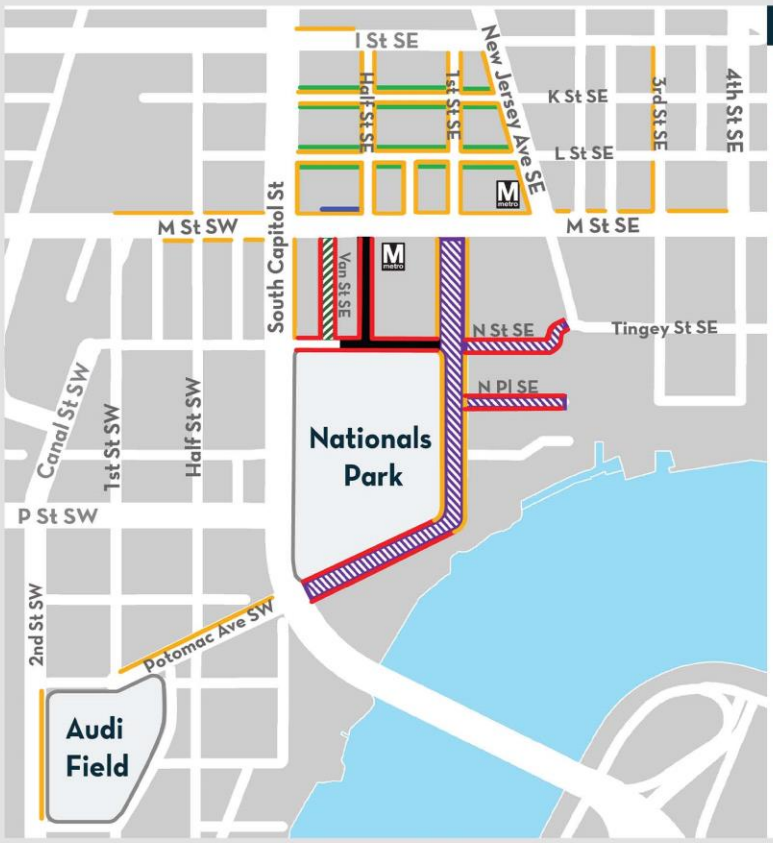
See back for more information about parking restrictions and road closures.

As of 10/21/19

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

MAJOR LEAGUE BASEBALL 2019 WORLD SERIES

PARKING RESTRICTIONS, ROAD ACCESS RESTRICTIONS, AND ROAD CLOSURES



LEGEND

- Rideshare Pick-up Area
- Taxi Stand
- Emergency No Parking Anytime
  October 25, 26, 27, 28
- Emergency No Parking Anytime
  October 22, 23, 24, 25, 26, 27, 28, 29, 30, 31
- Road Closed: 3 PM to Midnight
  October 22, 23, 25, 26
  Potential Road Closure:
  3 PM to Midnight
  October 24, 27, 28, 29, 30, 31
- Restricted Access: 3 PM to Midnight
  October 22, 23, 25, 26
  Potential Restricted Access:
  3 PM to Midnight
  October 24, 27, 28, 29, 30, 31
- Restricted Access: 3 PM to Midnight
  October 25, 26
  Potential Restricted Access:
  3 PM to Midnight
  October 27, 28

Road Access Restrictions

First Street SE, south of M Street SE, will be converted to one-way southbound operations, continuing west onto Potomac Avenue SE to South Capitol Street for each World Series home game and/or stadium watch party event.

The following streets will be restricted to local and event traffic for all home games and stadium watch parties beginning at 2:00 p.m. until approximately midnight:

- Van Street SE between M Street SE and N Street SE (access to residential parking garages will be permitted)
- N Street SE between First Street SE and New Jersey Avenue SE (access to parking lots will be permitted)
- Potomac Avenue SE from First Street SE to South Capitol Street SE

Parking Restrictions

Residents and visitors to the corridor between South Capitol Street to the 11th Street Bridge and between I-695/I-395 to the Anacostia River should expect significant impacts to on-street parking during the 2019 World Series. Motorists are encouraged to pay close attention to posted signage. Emergency No Parking restrictions will be in effect 24 hours a day beginning October 22 and will remain in place for the duration of the World Series for home games, unless otherwise signed.

Road Closures

The following streets will be closed to all motorized vehicles for all home games and stadium watch parties beginning at 2:00 p.m. and reopen at approximately midnight:

- Half Street SE between M Street SE and N Street SE
- N Street SE between the Nationals Park GEICO parking garage (at Van Street SE) and First Street SE
- N Place SE

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All modifications listed are subject to change for security purposes.

GOVERNMENT OF THE DISTRICT OF COLUMBIA
MURIEL BOWSER, MAYOR

RIVER TO SEA TPO
Transportation Planning Organization
VISION - PLAN - IMPLEMENT

June 2020