



## AV Shuttle Deployment Lessons Learned

---

for the Smart Columbus  
Demonstration Program

FINAL REPORT | March 29, 2019



# Table of Contents

Chapter 1. Introduction.....	1
Chapter 2. Route Summary.....	3
Chapter 3. Lessons Learned .....	5
<b>3.1. Memorandum of Agreement .....</b>	<b>5</b>
<b>3.2. Collaboration .....</b>	<b>5</b>
<b>3.3. Communication.....</b>	<b>5</b>
<b>3.4. Contracting .....</b>	<b>6</b>
3.4.1. Amortization.....	6
3.4.2. Vendor payment process .....	7
<b>3.5. Finance .....</b>	<b>7</b>
<b>3.6. Licensing.....</b>	<b>7</b>
<b>3.7. BMV .....</b>	<b>7</b>
<b>3.8. Permits and Licensing .....</b>	<b>8</b>
3.8.1. City Licensing .....	8
3.8.2. PUCO.....	8
<b>3.9. Infrastructure .....</b>	<b>9</b>
<b>3.10. Testing .....</b>	<b>9</b>
3.10.1. Vehicle Equipment and Capabilities .....	9
3.10.2. Non-Disclosure Agreement .....	10
<b>3.11. Data .....</b>	<b>10</b>
3.11.1. API.....	10
3.11.2. Data Agreement.....	10
3.11.3. USDOT Grant.....	11
<b>3.12. Surveys.....</b>	<b>11</b>
<b>3.13. Safety .....</b>	<b>12</b>
3.13.1. Introduction Video .....	12
3.13.2. Tabletop Exercise.....	12
<b>3.14. Stop Locations .....</b>	<b>13</b>
<b>3.15. Stop surfaces.....</b>	<b>13</b>
<b>3.16. Route Length and Complexity .....</b>	<b>13</b>
<b>3.17. Alternate Routes .....</b>	<b>13</b>
<b>3.18. Signage.....</b>	<b>13</b>
3.18.1. Stops .....	13

- 3.18.2. Service Suspensions/Alterations ..... 14
- 3.18.3. Property Ownership..... 15
- 3.19. Pavement Markings ..... 15**
- 3.20. Parking and Storage ..... 15**
- 3.21. Field Operations Location ..... 16**
- 3.22. Vehicle Speeds ..... 17**
- 3.23. Communications ..... 17**
  - 3.23.1. Lead Entity..... 17
  - 3.23.2. Digital Communications ..... 17
- 3.24. Hiring..... 17**
- 3.25. Marketing ..... 18**
  - 3.25.1. Wrapping the vehicle ..... 18
  - 3.25.2. Naming the Route and Shuttles ..... 18
  - 3.25.3. Launch Week Events ..... 18

## List of Figures

- Figure 1: Route Map ..... 3
- Figure 2: Signage ..... 14
- Figure 3: Pavement Marking Removal..... 15

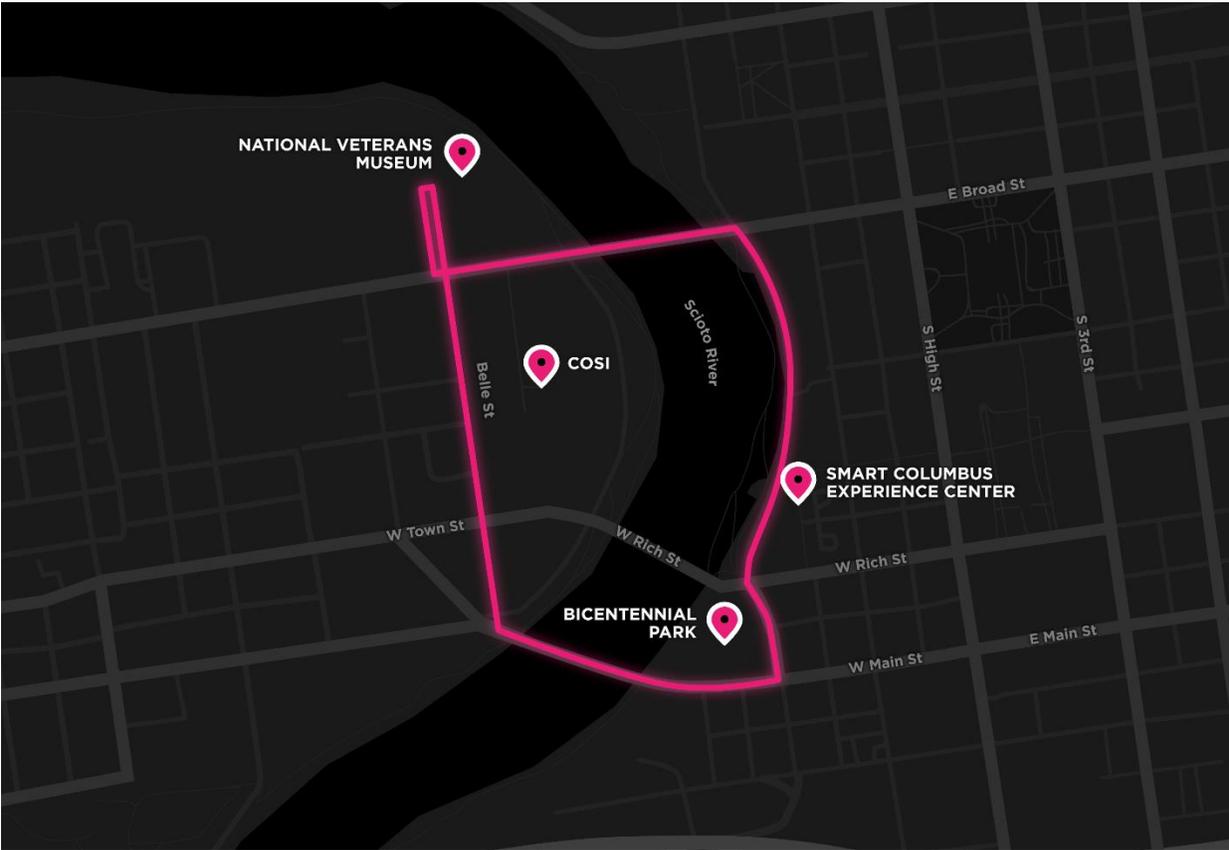
# Chapter 1. Introduction

The purpose of this document is to outline and document the many lessons learned through the first automated vehicle (AV) shuttle deployment in Ohio. This document was developed to inform others intending to deploy an AV shuttle of items of which to be cognizant and how to clearly identify the asks of the vendor and other involved stakeholders. All parties involved, both private and public sector, learned many valuable lessons about how to work with the other, what is important to the other, and how to align goals for a successful deployment.



# Chapter 2. Route Summary

The first AV shuttle route in Ohio traverses the Scioto Mile in downtown Columbus seven days a week from 6am to 10pm. The intent of the deployment is to test procurement methods, document the steps for deployment to aid others in the future, educate residents and visitors about autonomous vehicle technology, and to link educational and cultural assets located on the route for residents and visitors. The route, pictured below, has four stops (1) Smart Columbus Experience Center, (2) Bicentennial Park, (3) Center of Science of Industry (COSI), and (4) National Veterans Memorial & Museum (NVMM). The route selected was an ideal test case due to the low speed nature of the roads, the low risk of the deployment, and the low impact to riders if there are route disruptions.



Source: City of Columbus

Figure 1: Route Map



# Chapter 3. Lessons Learned

## 3.1. MEMORANDUM OF AGREEMENT

To deliver the CEAV projects, a Memorandum of Agreement (MOA) was executed between the City of Columbus, The Columbus Partnership, Ohio Department of Transportation / DriveOhio, and the Ohio State University. Each party had defined roles within the MOA and how each would provide support to the various projects expected to come out of the CEAV program. This group of partners is referred to as the project team throughout this document.

Having four parties adds complexity to the project since all have different motivations and outcomes desired. Initially the team experienced some disorganization rooted in the lack of a common understanding of mutual and unique priorities for each organization, but once defined roles and responsibilities were documented the project moved forward more smoothly. Beyond putting goals on paper, having a working session related to goals and responsibilities is recommended as that was a turning point in this deployment for this project's multiple stakeholders.

## 3.2. COLLABORATION

This deployment represented a lot of firsts for all parties involved, vendor included. The deployment was done on a very tight timeline and many people had to be involved in the process. Critical stakeholders that we involved in the process were:

- *Funders and Project Owners:* Ohio Department of Transportation, Columbus Partnership, and City of Columbus
- *Experts:* The Ohio State University and Central Ohio Transit Authority
- *Emergency Responders:* City of Columbus Department of Public Safety – Police and Fire
- *Route Partners:* Columbus Downtown Development Corporation (large land owner), COSI, NVMM, City of Columbus Department of Rec and Parks
- *Implementation Partners:* City of Columbus Department of Public Service, Public Utilities Commission of Ohio

We established a working group structure to keep partners apprised to project developments and to discuss critical decisions. It is important to have clear objectives for what is to be accomplished in these working groups and to ensure the chairs understand their responsibilities. Having city and state departments as well as the first responder community engaged was key. The vendor was not based in Columbus and it was important to ensure that the proper conferencing technology was working for all meetings to allow for substantial remote participation. In retrospect, we could have been able to give the vendor a better understanding of the expectation for its involvement in these forums.

## 3.3. COMMUNICATION

With many stakeholders involved, one of the biggest challenges early on was communication – communication between the project team and May Mobility as well as communication between the various stakeholders. Prior to the RFP, a project management structure had not been established. It was

created while the project was live, and as a result, created confusion about who was in charge and what decisions were being made, especially given the three-month selection-to-deploy timeline. For example, May Mobility expressed frustration that different members of the project team frequently requested intervention data, despite non-delivery being agreed upon in the MSA. The Columbus team got organized and did a few critical things to improve internal communications:

- Empowered a central project manager to serve as the primary interface with the vendor.
- Did a prioritization exercise with all local stakeholders where all needs were identified, and deliverables were prioritized for completion “before launch” and “after launch.” This resulted in one game plan that all parties were working against in the various meetings that needed to take place for launch.
- Aligned project management processes with that of the USDOT project team.
- Set up two calls per week between the principal representatives of the funders and May Mobility to discuss critical issues and progress that was being made.
- Set up project team meetings in advance of central committee meetings to get aligned on agendas and updates.
- Created a phone tree and articulated communications processes for various scenarios.
- Daily email updates from the PM to the Columbus team summarizing the conversations had, decisions made, and outstanding items needing to be resolved.

As it relates to communications with May Mobility, the main point of contact was identified as the Vice President of Customer Success. Some communications related to operations were challenging under that model, as they seemed more appropriate to go to the site manager, who is local. Ultimately, this was resolved through the Standard Operating Procedures and the creation of a phone tree for events that identifies a local contact during specific events.

In the process of doing something for the first time, we realized that in-person communication is invaluable and if that isn’t an option, phone is the next best option. While May Mobility’s internal culture runs effectively on predominantly email communication, the best way to ensure communications were not misunderstood and the tone of requests was not misinterpreted, phone calls proved to be the most effective way to do business together.

## 3.4. CONTRACTING

### 3.4.1. Amortization

The RFP requested that vendors provide a cost estimate based on what it would cost for operating shuttles for a 12-month contract period, and also indicated the possibility that service could be renewed if third-party financing/sponsorship could be found. Additionally, the RFP sought to procure a turn-key solution where the vendor would manage the shuttle service and provide the necessary vehicles to operate. One proposer shared concern that the way the RFP was written may have been misinterpreted resulting in varied and inaccurate pricing. This concern brought to our attention identified that respondents could have responded with pricing that reflected one of two interpretations: (1) the respondent would buy the shuttle vehicles needed for the route through the awarded contract, but assumed they would remain in Columbus post-contract, therefore allocating the entire cost of the vehicle to proposed price; or (2) the respondent as the operator owned the vehicle and billed the cost of use for the vehicles into the proposed price. The RFP was seeking for pricing based on the latter option. This

scenario applies to the type of procurement used for the Scioto Mile deployment but can be applied to any procurement in that the language should be explicitly clear as to what is being procured.

### 3.4.2. Vendor payment process

Consistent with contracting and payment processes there needs to be a vendor setup in the ODOT shared services system. This process can take a few weeks and is necessary before the contract is setup in the accounting system. Be sure the vendor understands the importance of getting this done promptly. The process took longer than we expected because the vendor signed a lease, then applied for recognition as an Ohio operating company, then submitted to shared services.

<http://ohiosharedservices.ohio.gov/>

## 3.5. FINANCE

When considering the affordability of the project, be sure to include all project costs including those outside of the proposal. While the contract is likely the largest component of the project there are other aspects including marketing, infrastructure upgrades, event support, inspectors, etc. ODOT used the entire contract amount from its federal allocation, although some of the funding contribution was from another partner. If the other partner had agreed to give the contribution to ODOT at the beginning of the contract, then it wouldn't have used that allocation amount.

## 3.6. LICENSING

While recognizing that to operate a vehicle in the United States a license plate must be assigned, it was questioned early on if the license plates needed to be Ohio plates. The Bureau of Motor Vehicles (BMV) researched codes and laws, and the decision was made to have May Mobility acquire Ohio license plates – front and rear plates. This removed any ambiguity of operating in the state since there were local jurisdictional laws against operating a vehicle long-term in the state under foreign registration.

## 3.7. BMV

When DriveOhio went to the BMV with the May Mobility representatives, we got the title transferred and then went over to register the vehicle. There was a sheet explaining to the representative that we were coming. However, we were asked when the registration should expire? Our initial thought was that it should be a year from the day of the visit in December, but the representative said it's usually some other date like a birthday, but the company doesn't have a birthday. We then requested that the date be no earlier than the end of September which coincides with the end of the initial service period, so we wouldn't have to renew the registration during the first year. Initially the registration expiration was suggested to be the month of May. While the resolution met our needs, we were not expecting that to be a discussion item or negotiated going into the BMV.

With some preparation and identification of everything needed to complete registration between the applicant, the BMV, and the local office, the registration process can be quick and smooth and completed in one day. The high level of preparation reduced the time to complete and aided the process of registering multiple vehicles at a time. To aid in future registrations, the vehicle type was registered with the BMV as LS – Low Speed due to the operational characteristics of the AV shuttles provided by May Mobility (Polaris Gem e6 vehicles). Not all vehicles may qualify for this, but most of the small transit-type shuttles do qualify.

## 3.8. PERMITS AND LICENSING

### 3.8.1. City Licensing

Beyond the requirements at the state level, it is important to complete a deep dive into the city ordinances as well. Like other progressive cities, the City of Columbus has passed legislation to authorize licensure of microtransit operators, and the May Mobility vehicle fits within this definition. While pursuing this license, it was determined based on the number of passengers that the vehicle carries that if May Mobility registered with the Public Utilities Commission of Ohio (PUCO), it would not need to pursue licensure at the City level because the state's permit supersedes that of the City. As a result, May Mobility only needed to file to the PUCO. However, this instance may not apply to all vehicle types, so due diligence with local jurisdictions is important to keeping the process moving.

Having local governments with jurisdiction does give them some control of the project and its outcomes and not engaging early on in the project could lead to the potential for delay on the project. Being able to include any permits in the procurement documents will help any potential vendor set expectations going into the contract.

To aid in smoothing out the process from jurisdiction to jurisdiction, it could be beneficial to get legislation that enables a vendor to operate if registered with DriveOhio rather than navigating individual municipality laws and regulations. Another alternative would be to work out agreement with municipalities that allows a vendor to operate with the same registration.

### 3.8.2. PUCO

Based on the discussions with PUCO and confirmed by the City of Columbus, if the vendor is licensed through PUCO then City registration and licensing isn't needed. The PUCO license cost is \$30.00 per vehicle per year based on the vehicle that May Mobility deployed.

A USDOT Number assigned by the Federal Motor Carrier Safety Administration is needed as part of the PUCO licensure process. The data entered to obtain this number is made public due to the nature of the request. Unfortunately, this has created a nefarious scamming operation and the vendor was contacted asking for additional money shortly after the application was approved. Documentation of the incident is as follows:

*I just got off the phone with a USDOT representative. They are requesting further fees and requirements from us. I disclosed that we have Fleet Attendants, so they are requiring:*

- A. \$100 fee per FA
- B. A call-in interview from each FA with the qualification department
- C. Proof of physical from each FA

Thankfully, May Mobility contacted ODOT within minutes of receiving the call and through internal discussions with PUCO, it was determined that this was a false request. This lesson is being shared in hope that future vendors do not fall victim to this scam.

### 3.9. INFRASTRUCTURE

The RFP offered proposers the option to use Dedicated Short-Range Communication (DSRC) Roadside Units (RSUs) that were being installed as part of a vendor connected vehicle demonstration at the signalized intersections along the route. This provided an opportunity to test and leverage connected vehicle technology while also showcasing automated vehicle technology. May Mobility responded that it would utilize its own proprietary RSU and confirmed that through subsequent discussion. Following selection, it became clear that there was miscommunication about the term 'RSU'. Rather than a connected vehicle RSU, May Mobility was using what the project team now refers to as a road sensing unit to monitor the indications of traffic signals. This unit consists of a video camera, a 4G modem, and a backup battery, whereas a connected vehicle roadside unit consists of a wireless antenna connected and powered through an ethernet cable in the traffic signal cabinet.

Inherent to the automated functions and the technology, this unit proved to be a challenge for the public agencies involved in the project. The unit itself requires 120V power to recharge the batteries, and most of the power along the route is used by street lights and is 480V, with a few 240V secondary lines. The traffic signal cabinets had 120V power, but City policy wouldn't allow additional power connections within the cabinet that weren't related to signal operations due to the risk of power issues to the signal. In downtown Detroit, May Mobility's only other deployment at the time, 120V power was easily accessible and not an issue on its radar. However, in Columbus, costly, unbudgeted infrastructure modifications were needed to provide the necessary power for the May Mobility roadside units.

As a result, batteries for these units are manually changed out on a rather frequent basis by May Mobility while alternatives are being evaluated. When preparing a procurement document and reviewing proposals, all infrastructure impacts should be requested and clearly identified so all parties are aware of impacts for the deployment.

### 3.10. TESTING

#### 3.10.1. Vehicle Equipment and Capabilities

An important distinction for the type of contract procured was its requirement for a turn-key operation. In that arrangement, the risk of the deployment falls onto the vendor. Under such an arrangement, the input into the safety and operations of the vehicle from the project team should be limited to items of public safety and meeting deployment and operational goals. The RFP required automated functionality be demonstrated by the vendor prior to the completion of each stage of testing. The testing plans for each stage – Factory Acceptance, Preliminary Acceptance, and Final Acceptance – were provided by May Mobility prior to testing being conducted for review by the project team. Testing was also witnessed firsthand and questions were answered related to the tests, but the project team did not dictate how or what tests were performed. Testing is a learning opportunity and provides the ability to point out inconsistencies, should any be noted (none were during this initial deployment). The project team was impressed with May Mobility's testing and about the way it was conducted, giving the team confidence in the deployment.

It is important to identify that this method of witnessing and acknowledging the testing does not put the public at risk or reduce the safety of the system. The procurement intent expected the vendor to have professionals in the field of automation and the project team relied on their expertise at this stage in the technology. If, at any point, the project team felt that there was a safety concern, May Mobility would not have been permitted to proceed with the additional testing phases or permitted to proceed with the deployment.

### 3.10.2. Non-Disclosure Agreement

The vendor requested a Non-Disclosure Agreement (NDA) prior to the site visit to its facility and operations center. This was a complicated request since the NDA indicated we as visitors were considering doing business, whereas we had already signed a contract. It was also further complicated with four different companies or agencies being represented during the site visit and each one's legal department had different modifications that should be made to the NDA. As a turn-key solution, our team was not interested in the details of intellectual property, but a broad overview of the systems and process.

## 3.11. DATA

Clearly defining the desired data and format requested in the RFP proved to be an important learning lesson. The data intended to be collected through the first shuttle deployment is being delivered as requested, but it did require extra effort to get on the same page about the data sharing requirements and the transmission method of that data into the Smart Columbus Operating System (Operating System).

### 3.11.1. API

While not grant funded, this deployment is part of the Smart Columbus program, and as such, shall meet certain US DOT grant requirements, one of which was a critical pass/fail milestone of ingesting streaming data into the Operating System within two months of deployment. This functionality was to be done through an Application Programming Interface (API). The contents and design of the API schema required negotiation back and forth between the vendor and project team, but the milestone was successfully met.

Identifying the exact data requirements as well as the method and frequency of transmission will greatly aid in holding all parties accountable for the data delivery. This should be ironed out pre-request for proposal by the project team to ensure the procurement documents have the appropriate information.

### 3.11.2. Data Agreement

Data sharing with the selected vendor was an area of negotiation prior to signing its Master Service Agreement (MSA). One area in particular was May Mobility's indication in its proposal that it would not provide operator intervention data – when an operator disengages from autonomy – although it was explicitly requested in the RFP. From May Mobility's point of view, the amount of disengagements was an inappropriate measure of service performance and could result in fleet attendants being hesitant to intervene when they should. As a compromise, the project team collectively settled on May Mobility providing monthly reports that included a heat map indicating where disengagements were occurring and at what frequency. The map is to be coupled with a summary of the prevalent reasons why the disengagements were occurring.

In general, there was a lot of misunderstanding early on about what data was needed and for what purposes. With May Mobility's limited experience in working with the public sector and the project team's first time dealing with a start-up in the autonomous space, it became apparent that earlier conversations should have occurred to allow both parties to clearly articulate why certain data was important or sensitive to the long-term objectives of each entity. When resolution was struck on issues pertaining to data, it was those discussions that caused the breakthrough. From this point, we were able to agree more quickly on timelines and phased compromises to achieve a win-win for all involved.

### 3.11.3. USDOT Grant

As the winner of the U.S. Department of Transportation's Smart Cities Challenge, Columbus and its partners had funding obligations to meet that were promised as part of the challenge application. A request was made to US DOT to use this project as part of ODOT's cost share, and it was approved. Therefore, the project had requirements related to data with the US DOT Office of Secretary of Transportation that were pass/fail milestones.

While the project team thought the requirements were clear in the procurement documents related to data, they could have been better defined to ensure the appropriate data was received and could have better defined the method and frequency of transmission. A fully framed out table with the requirements should be provided in the future to assist in this requirement.

## 3.12. SURVEYS

This deployment was intended to inform a lot of learnings for all involved – and hearing from end users was of everyone's interest. The feedback from riders is a critical measure of success for the vendor's performance as well as to evaluate acceptance of the technology in general. To maximize rider participation and completion of the survey it was important that it be short in length, easy to take, and meaningful in question design. We also needed to comply with the requirements of USDOT while taking into account the desires of the vendor, funders, and local stakeholders.

To develop the survey, we looked to best practices from surveys developed for similar deployments and from other relevant research in the space. We also leaned on local experts from The Ohio State University and the Mid-Ohio Regional Planning Commission as well. Along the way, we had to make several important decisions that impacted the resulting approach. One of the more deliberated decisions was regarding the survey collection methodology; more specifically, should a rider take the survey on the shuttle or after completing the ride. If a rider takes the survey after he or she exits a shuttle, there is less of a chance that the rider completes the survey. The survey would also then need to be delivered electronically, which assumes riders have access to the requisite technology. If the rider takes the survey on-board, the rider would not fully experience the technology and likely be unable to adequately answer the questions without being rushed and could present a clunky user experience. Ultimately, it was decided that the survey would be promoted via a business card that riders would obtain onboard the shuttle that had a QR code for them to scan which would link them to the survey. This approach allowed riders to take it on their own terms, while aboard the shuttle or after their ride. To address the potential that a rider who wanted to fill out the survey couldn't due to lack of the technology access, riders could also complete the survey inside the Smart Columbus Experience Center (a stop on the route).

In developing the survey, we enlisted the help of our developers to build the form on the Operating System and also engaged the marketing and communications team to design the promotional cards, develop and disseminate talking points to people interacting with riders, and establish processes to ensure that the survey was effectively posted and distributed.

While we were developing a survey tool to meet the needs of the program, the project team became aware that May Mobility had its means for collecting rider feedback, which was via a paper form that contained two questions and was completed while aboard a shuttle. In an effort to not confuse riders or appear duplicative, we incorporated those two questions in the final digital survey. For the first month of operation there was a lack of clear direction by May Mobility to its fleet attendants and field team and as a result the program survey was not prominently placed in the vehicle or encouraged by its fleet attendants in the vehicle. This miscommunication was graciously rectified, and the one survey approach is being followed and monitored.

## 3.13. SAFETY

### 3.13.1. Introduction Video

In coordinating with emergency responders for the launch, it was recommended that we put an instructional video together for dissemination amongst all of the forces. The goal was to provide a five minute or less summary of the automated electric vehicle and what to expect when approaching it during an incident. Highlighting the differences between it and conventional vehicles was important for responders to understand. The video proved very important in that higher-ranking officials can send the video to subordinates or require its viewing within company training systems rather easily.

### 3.13.2. Tabletop Exercise

As part of the Standard Operating Procedures development, it was decided that all key stakeholders and the vendor should come together to discuss the document and to test the merits of the document through a tabletop exercise, a preparedness activity typically completed in incident and emergency response professions.

The stakeholders in attendance were as follows:

- Columbus Department of Public Service
- Columbus Department of Public Safety
- Columbus Fire
- Columbus Police
- May Mobility
- COTA
- Project Team – consultants, DriveOhio, Columbus Partnership

Seven scenarios were presented to the participants and discussion around how each would react and respond accordingly. The scenarios varied from weather conditions that worsened to a suspicious package left behind to dealing with a crash scenario. All parties had excellent input, and everyone participated. It was a successful exchange of information and the Standard Operating Procedures were updated following the meeting to reflect the minor adjustments that were discussed.

This event also highlighted how it is vital to have backup plans for all key events should there be a change. The tabletop exercise with the emergency responders was scheduled for November 14. The facilitator cancelled at 2 PM on the day prior to the event, which put the exercise in limbo. Through raising the issue with the project team, it was noted that a member of the team had previous experience with large event and emergency response planning, so the team member became a substitute for the facilitator, developed the material for the meeting, and the tabletop occurred as planned.

The tabletop exercise also yielded insight that informed crisis communications plans. The project team created messages that could be tailored to crisis situations and developed templates for statements or responses to situations identified in the table top. These messages and protocols were synchronized with communications protocols from May Mobility and the Department of Public Safety.

### 3.14. STOP LOCATIONS

When planning for the deployment, four locations of interest were identified. However, the exact locations of the stops at those locations were not refined and had to be done following the selection of the shuttle provider. Some issues arose internally where one of the stops wasn't placed in the preferred location due to potential interference with traffic signal operations and parking. It would have been preferable to have this process done prior to the selection of the vendor.

### 3.15. STOP SURFACES

The stop in front of COSI had to be placed twenty feet from a cross-walk by City law, but that location also was in a grassy area. The intent was to procure some non-slip matting for this location to solve the surface issue, similar to temporary field protection used for concerts in professional sports stadiums, but there were some risks and challenges with the procurement. While not having a solid surface seemed like an issue, it was noted that not all COTA stops are on sidewalk or hard surfaces, so this experience is not unexpected.

### 3.16. ROUTE LENGTH AND COMPLEXITY

When developing the route, the project team heard from many experts that keeping the route around two miles is best for the route's intended headways and number of stops. The selected route was 1.4 miles and, in this instance, that theory seemed to work well. There are some areas that are challenging for AV technology, but with a human operator on-board, there is no safety concern. Some of the proposals received identified the left turn out of the NVMM driveway as well as the U-Turn on the driveway to be of concern, but May Mobility did not share that concern and has been executing the maneuvers in autonomy.

### 3.17. ALTERNATE ROUTES

In a strong sign of foresight, the project team included several alternate routes in the RFP to account for expected construction, races, and festivals. The Scioto Mile is an active downtown area that draws a multitude of events throughout the year and being prepared for these scenarios was important. By identifying the alternate routes in the procurement, the expectations were clearly identified with the vendors, so the proposal and price could be adequately addressed. These routes were also intended to be used in the event of emergencies, such as crashes and road closures.

### 3.18. SIGNAGE

#### 3.18.1. Stops

With the current version of the Manual on Uniform Traffic Control Devices (MUTCD), there isn't a standard for AV Shuttle signs at the stop locations. The project team looked at various other deployments to see what signs were being used, including Mcity and Austin. The determination was that there wasn't a set standard and the signs being used didn't meet the needs of the program. Therefore, the team proposed to design its own signs.

There was a balance while designing the signs between meeting MUTCD requirements and functional requirements. Ultimately, the signs were proposed as vinyl instead of retroreflective sheeting at the suggestion of the City, so being confined to MUTCD requirements wasn't completely necessary. The team designed a sign to indicate that it was a shuttle stop location with the respective name of the stop, the hours of service, the frequency of the shuttle arrivals, and a map of the full route. Each stop was color coded to match with a pin on the route map below the sign to better aid visitors in the route orientation.

One shortcoming of the signs is the lack of retroreflectivity has made viewing the signs in the darker hours more difficult for users of the system.

It was determined that the main signs should not include Twitter handles, hashtags, or website domains. While complete MUTCD compliance was not achieved, these items were seen as counterproductive to the sign's function.



Source: City of Columbus

**Figure 2: Signage**

### 3.18.2. Service Suspensions/Alterations

Within the contract, there are times that the shuttle will not operate due to holidays or weather events or will operate on a slightly altered route due to festivals. This information needs to be communicated to potential riders physically on route as well as through digital media.

With the unique nature of this emerging technology, providing as much information as possible for service suspension is important so that the general public does not infer that the suspension is safety or technology related. Therefore, the sign was designed to convey that stoppage underway is a planned suspension and the project team decided to include the website, so a potential rider could get more information.

One issue was the putting up and taking down of the signs with each holiday or event. Therefore, the project team decided to fabricate a folding sign so that the signs could be deployed with ease in the future. There was no installation oversight when the signs were installed, and it was installed with too many bolts, effectively attaching both sides of the fold to the post. Then the sign was removed by May

Mobility in error after the first holiday because it wasn't apparent that the sign could be folded. Finally, some added communication rectified the situation and the sign was deployed in a manner that can be folded and unfolded as proposed.

### 3.18.3. Property Ownership

While installing signs and other stop treatments, determining the property ownership and responsibility wasn't as straight-forward as anticipated. For the NVMM, the driveway was recently installed and was expected to be privately owned by the Columbus Downtown Development District (CDDC) who also owns the NVMM. As it turned out, through the process of creating a right-of-entry permit, the City had right-of-way along the roadway and into the walkway where the sign for the stop was to be installed. While this simplified the installation, some time was lost during the process.

In front of COSI, the curb space is controlled by the City, the park between the curb and COSI is controlled by CDDC, and COSI operates its own building. Therefore, the coordination to deploy a non-slip surface and finalize the exact stop location required discussions with Recreation & Parks, CDDC, and COSI. Multiple involved parties created some delays and uncertainty as to who could approve or disapprove of proposals.

## 3.19. PAVEMENT MARKINGS



Source: City of Columbus

### Figure 3: Pavement Marking Removal

One of the stop locations, the Smart Columbus Experience Center, was originally proposed to be located where passengers could board/alight on a concrete sidewalk. However, this location coincided with a lane-add taper and the presence of a double yellow line in the taper. The City of Columbus was not comfortable with making motorists choose between waiting behind a stopped shuttle and breaking the law by crossing the double yellow line. Therefore, the stop was temporarily relocated to a location where boarding/alighting would occur in grass. Coordination occurred between the City and ODOT forces and the double yellow line was removed, and one white skip mark was applied in its place, allowing for the legal passing of the stopped shuttle.

## 3.20. PARKING AND STORAGE

In the RFP, a location for charging and storage of the vehicles was offered along the route. May Mobility opted to forego that option because it preferred to have its operations center next to the charging location of the vehicles and it also had a concern with the grade entering the garage. As a result of May Mobility

needing to find an office location and a charging site, its facilities were not fully up and running at launch. The physical location and parking garage were secured on time but approvals by the landlord for May Mobility to install the requisite charging infrastructure was more challenging than anticipated. May Mobility turned to the project team for help in securing a back-up charging and storage location for launch and to help move conversations forward with the garage owner. We learned through follow-up with the garage owner that it had never installed charging infrastructure in any of its other downtown properties and wanted a thorough review of what it would take to install these devices and the potential impact to future charging installations before authorizing May Mobility's charging stations. The back-up facility provided was the garage that Smart Columbus uses for employee parking and where Smart Columbus has already installed electric vehicle charging for its own purposes. While short-term use could be granted through Smart Columbus' existing relationship, May Mobility needed it for two months and arrangement with the facility needed to be made outside the project team requiring May Mobility to pay for access.

May Mobility requires charging of its electric vehicles as well as a hard-wired network connection to upload data from the vehicles. The vehicles need to be charged on rotation every 2 to 4 hours. To accommodate these needs we added a network connection to the charging location in the garage. Additionally, we learned that any issues with access to the garage creates serious implications on service operations. For instance, on New Year's Eve, it was identified by the garage owner that the entrance gate was broken and that the garage would be closed at 2PM rather than leave the gate open through the holiday. This was an unplanned event and the project team and May Mobility tried to reach a solution that maintained operations, but unfortunately, there was no solution. Therefore, the project team agreed to suspend service at 2PM due to that access issue.

### 3.21. FIELD OPERATIONS LOCATION

Through the securing of facilities for storage and charging of the vehicles, it became apparent that this site should be as close as possible to the route, if not on the route. Fortunately, the back-up location was on the route and May Mobility successfully found a long-term location just blocks from the route. This minimizes fleet attendants walking between the route and the operations facility and allows for better access to break and restroom facilities. With the vehicles, it minimizes dead head miles and time, and allows for a quicker response to issues that occur on-route.

There is great value in proximity to the route location. Ideally the project manager will be located on the route as well to be able to observe the operations as a form of a quality check. Some of the items that were accomplished by frequent visits to the route were to:

- See the shuttles while they're at one of the stops
- Unlock the parking garage when key cards were accidentally deactivated
- Observe fleet attendant break time options
- Confirm service suspension signs are deployed to communicate accurately with riders

## 3.22. VEHICLE SPEEDS

When the vehicles first launched, there was some feedback from City personnel that the shuttle was operating too slow on Broad Street and Civic Center Drive; this was validated through some noticed queuing behind the vehicles. A speed comparison of a Fleet Attendant operating in manual mode versus vehicle autonomy indicated that the autonomy was capped at 20 MPH where the human typically operated the vehicle between 23-24 MPH. It was suggested that the vehicle speeds be increased, and May Mobility graciously complied with the request. The change in operating speeds has corrected the queuing behind the vehicles.

## 3.23. COMMUNICATIONS

### 3.23.1. Lead Entity

One of the MOU partners' primary objectives in deploying the Smart Circuit route is to expose the community to self-driving vehicle technology, so as to build trust in the technology. As the sponsor and local face of the deployment, it was important to the MOU partners that the project team lead the Communications strategy associated with the deployment. This came as a bit of a surprise to the May Mobility team, which had its own marketing objectives. As a result, clear delineation of marketing roles and responsibilities in future RFPs is recommended.

### 3.23.2. Digital Communications

Upon consultation with partners, the Columbus team decided it was best to have primary social media communications about the service come from the @SmartCbus social media handles, rather than to create route-specific (i.e. @SmartCircuit) channels. This was to avoid an unwieldy sprawl of project-based social media handles as Smart Columbus brings more projects or routes on line.

Smart Columbus and May Mobility agreed that Smart Columbus would monitor for social media comments tagging @smartcbus or #smartcircuit and May Mobility would monitor social media for comments tagging #maymobility.

Smart Columbus also built a digital landing page, [www.smartcircuitcbus.com](http://www.smartcircuitcbus.com), to host information on the route. It includes basic information and a map, ridership statistics and social media mentions of the shuttle, to help build trust via peer and influencer endorsements. The site was also built so the communications team could turn on a featured section of text in the event of an emergency.

## 3.24. HIRING

An idea that came out of the central committee planning for the shuttle deployment was for May Mobility to host a job fair to hire local employees. The short timeframe of the deployment didn't allow for this to occur as envisioned. Therefore, it is recommended that future deployments discuss the idea of a job fair as soon as possible following Notice to Proceed so that this event can be facilitated.

## 3.25. MARKETING

### 3.25.1. Wrapping the vehicle

In the RFP, it was identified that the vehicle wrapping design would be directed by the project team. May Mobility had a different interpretation of this and had strong opinions about the look of its vehicles as well as the real estate allocation that would be given for other logos. To align on design vision, the most effective way to communicate was in sharing visual mock ups of what each party was expecting. When we were clearly misaligned, the prioritization conversations and regular leadership calls proved effective to striking a compromise that all parties could live with.

### 3.25.2. Naming the Route and Shuttles

In order to succinctly and compellingly promote the vehicles, the team identified the need to brand the shuttle route. The team considered options including “Smart Scioto” and “Scioto Circuit,” but ultimately decided to not use a name that was tied to the route location, so that brand affinity for self-driving vehicles could potentially be conferred on future routes away from the Scioto Mile. Ultimately “Smart Circuit” was selected as the route name to convey both the new technology and the circular, limited distance of the route.

May Mobility has a convention of naming each of the vehicles that it deploys a name that starts with the letter M: Mimi, Myla, etc. The project team was not aware of this naming consideration at the time of engagement but accepted the naming convention for the individual vehicles.

### 3.25.3. Launch Week Events

#### 3.25.3.1. PARTNER PREVIEW EVENTS

The week prior to the launch of Smart Circuit, the project team hosted a series of Partner Preview events (events were each the same agenda, just hosted six different times to allow for small group discussion and scheduling flexibility). The purpose of the events was to “train the trainer” – to empower community leaders and influencers with the information they needed to answer constituent questions about the program. More than 100 partners attended the six events, and the event was recorded to share with partners who could not attend.

Agenda of the events included:

- Context on the MOU partners and their involvement in AV research
- Program objectives
- Information on how the route and vendor were selected
- A presentation from May Mobility on its experience and technology
- The project timeline and criteria for evaluating its success
- A ride aboard the shuttles before they opened to the public

The events helped the project team create advocates for self-driving vehicle technology capable of answering questions from multiple stakeholders the team may not engage directly. It also helped to seed positive social media coverage of the shuttle from preview attendees.

### 3.25.3.2. MEDIA LAUNCH

The shuttle sponsors also planned a media event to preview the shuttle to local media and offer them their first rides. The team invited media to interview spokespeople from Columbus City Council, the Columbus Partnership, DriveOhio and May Mobility and to take a ride aboard the shuttle.

The team received a second wave of media interest during the weekend lead-up to the opening of the shuttle, and a third pass on opening day (a Monday). A reporter from the 10TV, the local CBS affiliate, was the first rider aboard a shuttle. In addition to training official spokespeople, the team learned that the shuttle operators should also be prepared to talk to media, as some reporters arrived on site to ride the shuttle unannounced.

It is important to identify any events, such as partner previews or media days, in advance and include them in the procurement documents or the executed contract. Otherwise, there are risks to changes and adjustments in scope and price. Building an overall plan then filling in as time approaches will minimize conflict and help communicate the entirety of the approach to the program.



THE CITY OF  
**COLUMBUS**<sup>\*</sup>  
ANDREW J. GINTHER, MAYOR