Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

November 21, 2018
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

Contents

1 Introduction.........................................................................................................................................................3
  1.1 Purpose .........................................................................................................................................................3

2 System Description ............................................................................................................................................3
  2.1 Organizations ...............................................................................................................................................5
  2.2 Regulations ...................................................................................................................................................5
  2.3 Licenses and Permits .................................................................................................................................6
  2.4 Passenger Rights, Rules, and Responsibilities .........................................................................................6

3 System Operations and Management ........................................................................................................7
  3.1 Fleet Attendant Expectations ....................................................................................................................7
  3.2 Vehicle Maintenance and Safety Inspections .........................................................................................8
  3.3 Planned Route Change ..............................................................................................................................9
  3.4 Unplanned Route Change ........................................................................................................................10
  3.5 Snow Event ..............................................................................................................................................11
  3.6 Disaster Preparedness ...............................................................................................................................12
  3.7 Crash Response .......................................................................................................................................14
  3.8 Incident Response ..................................................................................................................................15
  3.9 Vehicle not Behaving as Expected .........................................................................................................16
  3.10 Public Inquiry to COTA Customer Service .........................................................................................17
  3.11 Child Policy ..........................................................................................................................................18

4 System Safety Tasks and Implementation ..................................................................................................18

5 Appendix: Scioto Mile Shuttle Tabletop Meeting Notes .........................................................................19
1 Introduction
The Standard Operating Procedures (SOPs) documented herein describe the processes for operational situations the Automated Shuttle Service on the Scioto Mile, known as the Smart Circuit, is likely to encounter during normal operations and in non-normal situations. SOPs are project-specific step-by-step instructions agreed upon by a project team to help project stakeholders complete routine, and at times complex, operations in a consistent and agreed-upon manner. The intent of SOPs are to ensure that all affected parties are aware of their roles, obligations, and responsibilities, and that tasks are completed efficiently and safely, while reducing the risk of miscommunication and failure to comply with all applicable laws, regulations, and agreements.

1.1 Purpose
The purpose of this document is to ensure the safe and efficient operation of the Smart Circuit in Downtown Columbus, Ohio. Project partners will make every effort to ensure the safety of passengers, staff, and other members of the public throughout the duration of this pilot project.

2 System Description
The Smart Columbus project team, which includes the Ohio Department of Transportation (ODOT), DriveOhio, the Columbus Partnership, the City of Columbus, and the Ohio State University (OSU), is deploying and evaluating automated shuttles against a variety of use cases in a series of two to three pilot projects. These SOPs relate to the first pilot project in the series, known as the Smart Circuit. The deployment location is the Scioto Mile in Downtown Columbus, Ohio, an area that includes COSI (Center of Science and Industry, a science museum and research center), Bicentennial Park, National Veterans Memorial and Museum, the Smart Columbus Experience Center, and other attractions. The project area and primary Smart Circuit route alignment are shown in the map in Figure 1.

The primary route alignment consists of a 1.5 mile, single-direction clockwise loop that operates on South Civic Center Drive, West Main Street, Belle Street, and West Broad Street, and crosses the Scioto River on the Main Street and Discovery (Broad Street) bridges. Beginning at the passenger stop at the Smart Columbus Experience Center, the shuttles travel south on Civic Center, turning right at Main Street. Traveling west on Main, shuttles make a passenger stop at Bicentennial Park before continuing west across the Main Street Bridge. Shuttles then cross Washington Street and make a slight right to travel north on Belle Street, making a passenger stop at COSI. From COSI, shuttles continue north on Belle across Broad Street, making a passenger stop at the National Veterans Memorial and Museum. The shuttles then turn around, heading south on Belle Street from the Veterans Memorial and turning left on Broad Street, traveling east on Broad across the Discovery Bridge. At Civic Center Drive, the shuttles turn right and travel south to complete the loop at the Smart Columbus Experience Center. Alternate route alignments, and the conditions under which they would be served, are described in the Planned Events Playbook.
This service is operated using three automated, electric vehicles on the route during operating hours, which are 6am to 10pm seven days a week with the exception of five holidays – New Year’s Day, July 3rd (the day of Columbus’s firework show, located in the Scioto Mile), Labor Day, Thanksgiving, and Christmas Day. The vehicles feature Level 4 automation, as defined by the Society of Automotive Engineers (SAE)\(^1\), and are propelled by electric motors powered by onboard, rechargeable batteries. The service provides the public with a transportation option for short trips where other modes are not currently available or convenient. Service operations are similar to that of a conventional fixed-route transit service, operating on a pre-determined route alignment with signed stops along the route for passengers to board and alight. Stop locations were selected based on convenience to nearby destinations, and have been reviewed for passenger and traffic safety as well as accessibility.

The success of this project will be looked at as a guide for the potential deployment of future automated vehicle (AV) operations in other parts of Columbus and elsewhere by verifying their ability to perform as intended and providing feasibility for their use in similar environments.

This project aims to support the following user needs:

- An educational rider experience for students, residents, and visitors who want to experience the technology as an extension of their visit at COSI or the Smart Columbus Experience Center

---

\(^1\) SAE has defined six levels of automation, from 0 to 5. Level 4 automation is known as high automation, where a vehicle is capable of performing all driving tasks under certain conditions. The vehicle operates under only these conditions, and there is a fleet attendant onboard to step in and control the vehicle if necessary.
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- A link for residents and visitors to travel between COSI, Veterans Memorial, Smart Columbus Experience Center, Bicentennial Park, and other area attractions
- A shuttle for Smart Columbus Experience Center and Bicentennial Park visitors who park near COSI and Veterans Memorial
- Connections to nearby transit services offered by COTA

2.1 Organizations
This project has engaged many local partners, including ODOT, DriveOhio, the Columbus Partnership, the City of Columbus, and OSU to plan, implement, and evaluate this project. Through a competitive process, this team procured a vehicle and service provider, May Mobility. Each project partner’s roles and responsibilities include:

- **ODOT**: As the state DOT and contract holder for the deployment, ODOT is a key Smart Columbus partner coordinating data management and availability, managing transportation policy developments, and assisting in the transferability and portability of the Smart Columbus Program to other Ohio cities and regions. It is also responsible for the management of the Smart Circuit service, through DriveOhio.
- **DriveOhio**: DriveOhio is an initiative supported by ODOT that aims to organize and accelerate automated vehicle and connected vehicle projects in the State of Ohio. DriveOhio and ODOT led the procurement of this service and are responsible for its management.
- **Columbus Partnership**: As a non-profit, membership-based Chief Executive Officer (CEO) organization representing 65 of Columbus’ leading businesses and institutions, the Columbus Partnership is the proxy for key private sector engagement on implementation of the Smart Columbus Program, and is a major funding partner for this project.
- **City of Columbus**: The City’s role is to manage the Smart Columbus Program, a large and diverse transportation technology deployment and data project, in a way that ensures successful implementation and builds sustainable solutions. The City will provide support services and facilitate the data exchange through the Smart Columbus Operating System.
- **OSU**: This university partner provides research and organizational support to the Smart Columbus Program, including through the Transportation Research Center and the Center for Automotive Research. It is providing research support for the Smart Circuit, including during the development of the passenger survey.
- **May Mobility**: A low-speed automated shuttle service provider, May Mobility is contracted to provide 12 months of service, including testing.

2.2 Regulations
The following regulations and policy guidance documents directed the development of these SOPs:

Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- Central Ohio Transit Authority (COTA) Operators Handbook and COTA Code of Conduct
- Smart Columbus Safety Management Plan (SMP)
- Smart Columbus Communications and Outreach Plan
- May Mobility First Responder Quick Sheet
- May Mobility Standard Operating Procedures
- Low-Speed Automated Shuttles: State of the Practice Final Report (developed by the U.S. Department of Transportation and Volpe National Transportation Systems Center)
- Mcity Driverless Shuttle: A Case Study

2.3 Licenses and Permits
The following licenses and permits are referenced in the SOPs as they are required to be completed by certain parties specified therein:

- State of Ohio Bureau of Motor Vehicle (BMV) Vehicle License Registration
- Public Utilities Commission of Ohio (PUCO) motor bus registration
- Attachment permits for sensing units on City infrastructure

2.4 Passenger Rights, Rules, and Responsibilities
All Smart Circuit passengers must adhere to the following list of acceptable behaviors:

- Do not interfere with the vehicle’s operations: Passengers should not try to “test” the automated system by intentionally behaving in a risky manner.
- Be ready for the ride: Passengers should be at the stop location before the vehicle arrives and begin to board immediately upon vehicle arrival. Headways on this route are short, so passengers should wait for the next vehicle if they are not already at the stop location when a vehicle is arriving, rather than running to catch it.
- Be considerate when interacting with the fleet attendant: While fleet attendants can respond to questions and interact with passengers to receive feedback, their most important responsibility is to monitor the operations of the vehicle to ensure they can step in promptly when necessary. Fleet attendants may abruptly end a conversation in the interest of safety, and passengers must allow them to do so.
- Be considerate of others: Loud and disruptive behavior is not permitted and offending passengers may be asked to leave the vehicle.
- Keep the vehicle clean: Passengers should maintain acceptable hygiene and not leave trash behind.
- The following activities are not permitted onboard the vehicle:
  - Smoking, including the use of e-cigarettes
  - Eating or drinking (any food brought on board must be completely covered)
  - Using drugs or alcohol
  - Possessing illegal weapons

\(^2\) The Executive Order can be found here: [http://governor.ohio.gov/Portals/0/%21%21%21EO%202018-04K%20%28Signed%205_9_18%29.pdf](http://governor.ohio.gov/Portals/0/%21%21%21EO%202018-04K%20%28Signed%205_9_18%29.pdf)
The fleet attendant and project team reserve the right to revoke the privilege of riding the Smart Circuit for any of the above reasons or in the interest of safety at any time. In addition, a passenger shall not ride further than one complete loop per trip and if a passenger lingers, he or she may be asked to depart the vehicle.

The primary shuttles are not currently accessible to some members of the public. An alternate vehicle will be dispatched when a request from an eligible passenger is received.

3 System Operations and Management

This section contains specific procedures for various scenarios the automated shuttle service may encounter during operations. Not all conceivable scenarios can be included in this document, and thus the focus is on situations that require action from multiple independent parties and situations with significant safety implications. A scenario summary, objective, process outline (an overview of the initiator and the communications trail), overview of roles and responsibilities (including which organizations they apply to), and a list of any related documentation is included for each scenario.

3.1 Fleet Attendant Expectations

The State of Ohio requires all automated vehicles to have a designated operator, referred to in these SOPs as a fleet attendant. May Mobility is responsible for hiring and training a sufficient number of fleet attendants to meet the expectations outlined in this section.

3.1.1 Objective

Ensure fleet attendants have the ability to act appropriately and respond quickly in any situations they are likely to encounter.

3.1.2 Process

1. May Mobility recruits, evaluates, and hires qualified candidates to serve as fleet attendants.
   a. All fleet attendants hired must comply with the requirements for a designated operator outlined in Executive Order 2018-04K, including having a valid driver’s license that is recognized by the State of Ohio.
2. May Mobility provides comprehensive training to newly hired fleet attendants.
   a. Training is conducted over the course of four weeks, and includes instruction on customer interactions, CPR, manual and autonomous driving (including on location), crisis management, and an introduction to May Mobility and its autonomous driving system.
   b. Fleet attendants are required to conduct a minimum number of hours of vehicle operations in automated mode (20) and a minimum number of hours of vehicle operations in manual mode (5). Fleet attendants must then demonstrate proficiency in these and other learned skills.
   c. Fleet attendants are also expected to serve as ambassadors for the City of Columbus, Smart Columbus, the Scioto Mile area, and the institutions and attractions served by the Smart Circuit. They are also expected to promote automated vehicle technology, to answer basic questions about the technology or direct members of the public to sources of further information, and to provide comfort for those that may be unfamiliar or unsure of the technology. Training therefore includes customer service skills and an overview of the technology to prepare staff to answer technical questions.
d. Training also includes guidance in the use of the radio and full understanding of the meaning of and response procedures for any emergency alerts and alarms.

3. Fleet attendants who have completed their training and meet all of May Mobility’s requirements are permitted to fill the role of designed operator, as defined in Executive Order 2018-04K.
   a. While the Executive Order contains a provision for testing without the designated operator being physically present in the vehicle, this will not be permitted during normal passenger service in the pilot period. Depending on vehicle performance, and with ODOT’s consent, a limited demonstration with a remote designated operator may be allowed without passengers present.

4. May Mobility conducts periodic (at least monthly) retraining of fleet attendants to introduce any new product features and to ensure skills are fresh. These in-person sessions also provide the opportunity for fleet attendants to share best practices with each other. Fleet attendants must also practice operating a vehicle in manual mode at least once a month (whether while the vehicle is in service or, if this situation does not arise, in a practice session).

5. If service is expanded or an employee leaves, May Mobility will be responsible for hiring, training, and certifying additional fleet attendant(s).

3.1.3 Roles and Responsibilities
Fleet attendants must comply with all passenger rights, rules, and responsibilities outlined in Section 2.4. They are also expected to comply with additional requirements, such as a prohibition on cell phone use while the vehicle is in motion, and a general avoidance of cell phone use while on duty, with the exception of emergency work calls, communications with Base Operations, and other work-related tasks for which the radio network is insufficient.

Fleet attendants must conduct pre- and post-shift safety inspections of the vehicle they are assigned to for that shift. While on route, they may not leave the vehicle unattended, and must enlist another staff member to attend their vehicle if they need to leave it for any reason. There will be an on-call fleet attendant for this purpose, to relieve the fleet attendants during their breaks and otherwise step in if needed.

3.1.4 Related Documentation
- Ohio Executive Order 2018-04K – Requirement 6 (requirements for designated operators)
- City of Columbus Department of Public Safety Vehicle for Hire Owner and Driver Application Information Sheets

3.2 Vehicle Maintenance and Safety Inspections
All May Mobility shuttles must receive routine safety inspections on a regular basis. The timing and findings of these safety inspections determine which preventative maintenance actions need to be taken. In addition, reactive maintenance is conducted if needed after a defect is found or a crash or incident occurs.

3.2.1 Objective
Maintain May Mobility shuttles in proper working condition and identify any minor defects before they are allowed to develop into major issues.
3.2.2 Process
1. May Mobility conducts and project partners witness on-site factory acceptance testing prior to vehicle delivery.
2. Fleet attendants conduct pre- and post-shift safety inspections of the vehicle they are assigned to for that shift. If they notice anything unusual, even a minor fault, they alert maintenance staff, who either fix the vehicle immediately (causing a minor delay or assigning the fleet attendant to a different vehicle) or clear the vehicle for service and fix the issue when it returns.
3. Maintenance staff conduct more in-depth safety inspections on a weekly basis.
4. If a vehicle malfunctions while in service, the fleet attendant ensures the vehicle is in a safe location, allows all passengers to alight when safe, and stays with the vehicle as maintenance staff are dispatched for reactive maintenance until such a time as the vehicle returns to operation, or the fleet attendant receives further instructions from Base Operations.

3.2.3 Roles and Responsibilities
Fleet attendants must conduct pre- and post-shift safety inspections of the vehicle they are assigned to for that shift. Maintenance staff are responsible for following up on any issues raised by fleet attendants during these safety inspections, as well as conducting their own inspections on a weekly basis.

3.2.4 Related Documentation
- Internal May Mobility maintenance procedures
- Internal May Mobility Standard Operating Procedures

3.3 Planned Route Change
Due to ongoing construction in the area and the occurrence of special events that are permitted to close roads along the primary route to vehicular traffic, four alternate route alignments have been proposed to allow service to remain in operation, at a reduced or limited level of access to destinations, when conditions require it. These four additional routes have been agreed upon with May Mobility and are defined in the Planned Events Playbook. Note that construction is expected to begin on Belle Street in May 2019 and at this point, Route 2 will default to the primary route and any alterations will shift away from Route 2 rather than from Route 1.

3.3.1 Objective
Continue to provide service during some special events by changing from a primary route to a pre-defined alternate route.

3.3.2 Process
1. For events already identified, procedures and proposed alternate routes are provided in the Planned Events Playbook.
   a. If an additional event is identified with more than one month’s notice, it is added to a revised version of the Playbook and distributed to all project parties.
   b. If an event is identified with one month to one week’s notice, a web conference is held within three business days of notification to outline and discuss route alterations. The agenda and process follow the one-month touch point meeting format (see Step 2), and seven-day and one-day meetings are also held.
2. One month in advance of any event (or as specified in Step 1b), all parties participate in a web conference to make all parties aware of the event, define a schedule, and begin to identify resources for during the event.
3. At least seven days before the event, all stakeholders participate in an in-person meeting to prepare for the event, set the schedule, and identify resources.
4. On the day before the event, all stakeholders participate in a web conference to ensure all resources were allocated and the agreed upon plan is ready to be implemented. Any last-minute changes can be communicated and coordinated at this time.
5. The route alteration is communicated through the Smart Columbus official Twitter feed (@SmartCbus) and the Smart Columbus Facebook page.
   a. Static schedule and route data, using General Transit Feed Specification (GTFS) or similar, is modified to enable the provision of accurate real-time vehicle location data, using Automatic Vehicle Location (AVL) or similar, to passengers.

3.3.3 Roles and Responsibilities
The Planned Events Playbook contains a list of known festivals, parades, and other events that are expected to impact Smart Circuit operations. The City of Columbus is responsible for updating this list as new events are identified or confirmed and communicating this information to the project team.
For events not already included in the Planned Events Playbook, the City will provide at least one week’s advance notice of when a detour route will be utilized. If an unforeseen event, such as a protest, is identified within one week of occurrence, efforts will be made as discussed in Section 3.4 to alter the route alignment. If that is not feasible within the allotted time, service will be suspended during the event.
Additional parties who are not major project partners may be involved in the communications chain for this procedure, including the Columbus Department of Recreation and Parks.

3.3.4 Related Documentation
- Scioto Mile AV Shuttle Planned Events Playbook

3.4 Unplanned Route Change
There may also be conditions that require an unplanned deviation from a route that was intended to be served on a particular day. This could be due to situations such as a water main break, a traffic crash blocking a lane or the entire road, or law enforcement activity.

3.4.1 Objective
Continue to provide service when a portion of the roadway along the route being served becomes inoperable.

3.4.2 Process
1. An obstacle or condition is blocking part of the roadway or is occurring near the roadway, making it difficult or impossible for the vehicle to safely travel along its normal route alignment or to safely stop to load and unload passengers at a stop location.
2. If it is possible for the vehicle to safely navigate around the obstacle on the same road, the fleet attendant either engages manual mode to do so or monitors the automated mode as it does so.
3. If it is not possible for the vehicle to safely navigate around the obstacle on the road on which the vehicle is assigned to operate, the fleet attendant uses the radio to contact a May Mobility supervisor to discuss the issue and to determine a course of action. Potential next steps include:
   a. Identifying an alternate route that could be served instead. Operations on the alternate route may require a higher level of engagement of manual mode by the fleet attendant,
particularly to travel to the alternate route. The fleet attendant will allow passengers to alight before proceeding if they would like to do so and can do so safely.
b. Allowing passengers to alight and temporarily suspending service.
4. If a route deviation or service suspension has occurred, it is communicated by May Mobility to ODOT and other project partners. The Smart Columbus team communicates the information to the public through its official Twitter feed and the Smart Columbus Facebook page.
a. Static schedule and route data, using GTFS or similar, is modified to enable the provision of accurate real-time vehicle location data, using AVL or similar, to passengers.
b. Temporary stop signage is deployed by May Mobility.
5. When the deviation is no longer necessary or service is no longer suspended, the vehicle returns to its original route and service characteristics. This change is again communicated through the Smart Columbus official Twitter feed and the Smart Columbus Facebook page.
a. Static schedule and route data is reverted back to normal.

3.4.3 Roles and Responsibilities
May Mobility is responsible for making all on-site determinations of route and stop conditions, modifying route alignments and stop locations or temporarily suspending service, informing ODOT and other project partners of route alignment, stop, or service changes and their expected duration, and deploying temporary signage at stop locations. The Smart Columbus project team is responsible for communicating route changes via Twitter and Facebook, and changing the GTFS. All project partners are responsible for responding to changes to real-world conditions in real time and for making decisions that prioritize safety while maintaining some flexibility in operating parameters. If service is suspended, May Mobility will complete an internal Stoppage in Service Report.

3.4.4 Related Documentation
- Scioto Mile AV Shuttle Planned Events Playbook

3.5 Snow Event
Central Ohio’s four-season climate provides an opportunity to test and operate automated vehicles in cold, icy, and snowy winter weather conditions. However, it is known that current vehicle capabilities are challenged by such environments. Therefore, in the interest of safety, the project team has agreed to define the conditions under which service can be suspended due to winter weather, and in particular a snow, ice, or freezing rain event.

3.5.1 Objective
Remove the vehicles from service and suspend operations if snowy weather conditions are not within a safe and manageable limit.

3.5.2 Process
1. A conference call will occur between May Mobility, ODOT, the City of Columbus, the Columbus Partnership, and other project partners the day before an expected major snow event. The call can be initiated by any partner if it believes conditions on the following day may be sufficient to warrant a service suspension.
a. In addition to the City of Columbus Smart Columbus staff, the City will also involve the Columbus Department of Public Service, including the Division of Infrastructure Management, to engage the process to prioritize snow removal along the planned route alignment for the following day.
2. The morning of the expected snow event, if a level 1, 2, or 3 snow emergency is announced by the County or May Mobility’s pre-defined weather threshold is met, Smart Circuit service is suspended. Even if these exact thresholds are not met, ODOT may direct May Mobility to suspend service. May Mobility may also request to suspend service if these thresholds are not met, and specify why it is not able to operate as planned. This request must be approved by ODOT in conference with other partners.
   a. Service suspensions can be full day, partial day, or until further notice.
   b. Any service suspensions are communicated through the Smart Columbus official Twitter feed and the Smart Columbus Facebook page.
   c. Service suspensions could also be due to other inclement weather, such as fog, heavy rain, or tornados, and could occur during any time of the year. In these cases, the procedure will be the same except for the snow removal process.
3. If these thresholds are not met and ODOT does not direct or May Mobility does not request otherwise (or the request is rejected), service proceeds as normal.
   a. Conditions are continued to be monitored and assessed, and the procedure may revert back to Step 2 if conditions worsen.
   b. If during service May Mobility experiences problems navigating the route, it may request a service suspension. ODOT may approve or reject the request to suspend service based on the additional information provided.
4. If May Mobility issues a request to suspend service and ODOT does not approve it, May Mobility reserves the right to still suspend service based on the decision of a supervisor or fleet attendant. Failure to operate service in such a case may impact payment. Operating in manual rather than automated mode during inclement weather is acceptable.

3.5.3 Roles and Responsibilities
May Mobility has the option to define an inclement weather threshold (such as snow depth on the roadway, visibility, or other physical limitations) at which it would suspend or limit operations or shift to manual mode, and can also define its response procedure. May Mobility is responsible for notifying the City of Columbus and ODOT in the event this inclement weather threshold is met. If service is suspended, May Mobility will complete an internal Stoppage in Service Report.

The City of Columbus has updated its snow removal policy to prioritize any roads along the route in order to maintain conditions at a level below this threshold whenever possible.

3.5.4 Related Documentation
- City of Columbus Snow and Ice Plan (https://www.columbus.gov/publicservice/Columbus-Snow/)

3.6 Disaster Preparedness
The Smart Circuit service operates in real-world conditions, and may be impacted by exceptional and/or hazardous environmental conditions beyond its control. Because this is a pilot project testing an emerging technology, it is not expected to be called upon to assist with transportation needs during a time of significant emergency, and is instead expected to suspend service until conditions return to a safe state.

3.6.1 Objective
Bring the system to a safe condition during an emergency situation outside the system’s control.
3.6.2 Process

1. A serious event external to the Smart Circuit, such as a tornado, major storm, terrorist attack or other security issue, occurs or is expected to imminently occur in or near the service area.
2. ODOT, in coordination with other partners, initiates a written or verbal directive to May Mobility to stop allowing passengers to board the vehicles immediately or at a specified time in the future.
3. May Mobility acknowledges receipt of this directive to ODOT and its partners.
4. The vehicles continue up to one full loop of the route to allow all passengers to alight at their intended destinations, and then the vehicles return to the storage facility. The fleet attendants may choose to switch to manual mode for this procedure if it is more efficient and/or safer to do so.
   a. If it is not safe for passengers to leave the vehicle, they may choose to return with the fleet attendant to the storage facility.
   b. If a full loop of the route is not possible, passengers may choose to leave the vehicle at any time or return with the fleet attendant to the storage facility.
5. If ODOT does not initiate a directive, May Mobility may request permission for one to be initiated. If permission is granted by ODOT, the procedure in Step 4 can begin immediately.
   a. ODOT may instead decide to hold the request until additional information becomes available, hold the request until a specified time in the future (i.e. begin procedure at a specified time when the severe weather event is expected to be within a reasonable distance), or reject the request if it does not believe it is a credible threat. In any of these events, May Mobility reserves the right to override the decision and begin the procedure in Step 4 immediately, but this may impact payment.
6. The initial directive shall either specify an expiration time (such as the time at which the severe weather event is expected to have passed through the area) with the option to extend it or be defined as “until further notice”. Any further notice is communicated through the same channel(s) as the initial directive.
7. While service is suspended, May Mobility, ODOT, and other project partners communicate the suspension to passengers through all possible channels, including the Smart Columbus official Twitter feed and the Smart Columbus Facebook page and by placing signage at slope locations if it is safe to do so.
   a. Communication to passengers should include recommended actions (i.e., hold in place, find shelter immediately, or recommendations on alternate travel modes such as nearby COTA routes).
8. When the directive is lifted, normal operations are resumed using the same procedure used to begin operations at the beginning of a service period (i.e. releasing vehicles at the specified headway).

3.6.3 Roles and Responsibilities
All project parties are responsible for monitoring area conditions and communicating as much information as possible with each other to ensure this procedure is initiated at the appropriate time. If service is suspended, May Mobility will complete an internal Stoppage in Service Report.

3.6.4 Related Documentation
- Smart Columbus Safety Management Plan
- May Mobility Safety Management Plan
3.7 Crash Response
COTA defines an accident as “an occurrence involving a COTA vehicle or facility, which results in death, injury or property damage”. The term crash has been used for this definition throughout this document.

3.7.1 Objective
Respond to a crash as quickly as possible to ensure any required support is provided, to minimize additional risks going forward, and to ensure a consistent communications chain and external message.

3.7.2 Process
1. A crash involving a Smart Circuit vehicle has occurred.
2. If a moving vehicle needs to be stopped, the fleet attendant or any first responders can pull up on the emergency hand brake.
3. The following three tasks are initiated within the first five minutes after the crash. The order of events and type of response may vary based on the type and scope of the crash.
   a. Collect details: The fleet attendant and/or remote May Mobility Base Operations staff assess and determine the severity of the crash.
   b. Respond to immediate needs: Any conditions requiring an immediate response, such as an injury or a vehicle located in an unsafe location, are reacted to by the fleet attendant and onsite May Mobility staff at Base Operations. Base Operations reaches out to first responders, if necessary. The fleet attendant removes passengers from the vehicle and to a safe location. The fleet attendant does not move the vehicle, as the vehicle's location may allow first responders and other stakeholders to obtain a better understanding of the situation. If the crash was a very minor fender bender with no injuries, the fleet attendant can move the vehicle, but should err on the side of choosing not to do so.
   c. Alert leadership: The fleet attendant uses Mumble to alert the May Mobility Site Supervisor and provide information on the location and nature of the crash and any injuries. The Site Supervisor alerts the May Mobility Customer Success team, ODOT, and other project partners, and may send a team representative to the scene to assist the fleet attendant. The crisis communication protocol is engaged. All external messaging is presented through a singular source. Other project partners should direct any media contact through this entity. This protocol applies to even the most minor crash.
4. The vehicle returns to the site base. Within 1 hour after the vehicle has returned to the base, May Mobility completes the following tasks:
   a. Create manuscript case for on-call engineer: Using an internal issue-tracking platform, information is provided to the on-call software engineer.
   b. Fill out incident report: Create an internal log of the incident.
   c. Offload logs: Collect data stored in the vehicle system for use by engineers to learn more about the incident on the vehicle side.
   d. Remove SD cards: Collect passenger-facing camera memory cards.

3.7.3 Roles and Responsibilities
The fleet attendant is responsible for ensuring the safety of passengers, self, and others involved. May Mobility Base Operations staff are responsible for reaching out to other project partners and first responders, if necessary. Both are also responsible for contributing to and completing an incident report, if required.

All project partners are responsible for ensuring there is a consistent external message, particularly in the immediate aftermath of the crash.
3.7.4 Related Documentation
- COTA Operators Handbook
- May Mobility First Responder Quick Sheet

3.8 Incident Response
COTA defines an incident as “an unusual occurrence involving a COTA vehicle or facility, not classified as an accident. Example: A verbal confrontation between an Operator and a customer or a fight between two customers.” This definition of an incident is used throughout this document.

3.8.1 Objective
Respond to an incident as quickly as possible to ensure any required support is provided, to minimize additional risks going forward, and to ensure a consistent communications chain and external message.

3.8.2 Process
1. An incident involving the Smart Circuit has occurred.
2. The following three tasks are initiated within the first five minutes after the incident. The order of events and type of response may vary based on the type and scope of the incident.
   a. Collect details: The fleet attendant and/or remote May Mobility Base Operations staff assess and determine the severity of the incident.
   b. Respond to immediate needs: Any conditions requiring an immediate response, such as an injury or a vehicle located in an unsafe location, are reacted to by the fleet attendant and onsite May Mobility staff at Base Operations. Base Operations staff reach out to first responders, if necessary. The fleet attendant removes passengers from the vehicle and into a safe location, and if the vehicle itself was not involved in the incident and there are no injuries, moves the vehicle into a safe location out of the flow of traffic.
      i. If the incident involves unruly passenger behavior, any involved passenger(s) are asked by the fleet attendant to alight the vehicle at the nearest safe location. If the passenger(s) alight the vehicle as requested, the fleet attendant contacts May Mobility staff to report the incident and provides the dispatcher with further information on the incident when her or she returns to the garage at the end of his or her shift. If the passenger(s) will not alight the vehicle, or the fleet attendant believes that the passenger(s) have engaged in illegal behavior, the fleet attendant tells Base Operations to contact first responders (using code words if necessary).
      ii. If the event of a fire, May Mobility Base Operations staff contact first responders immediately. The fleet attendant evacuates all riders from the vehicle and uses the fire extinguisher located in the back of the vehicle.
      iii. If the incident involves issues with the lithium ion battery, the fleet attendant should first ensure all passengers have evacuated the vehicle and are a safe distance away before contacting first responders. In the event of a lithium ion battery fire, the fire extinguisher should NOT be used and instead the battery should be doused with a continuous stream of water if available to cool the battery down.
   c. Alert leadership: The fleet attendant uses Mumble to alert the May Mobility Site Supervisor and provide information on the location and nature of the incident and any injuries. The Site Supervisor alerts the May Mobility Customer Success team, ODOT, and other project partners, and may send a team representative to the scene to assist the
fleet attendant. The crisis communication protocol is engaged. All external messaging is presented through a singular source. Other project partners should direct any media contact through this entity. This protocol applies to even the most minor incident.

3. If the incident is due to an issue with the vehicle, the vehicle returns to the site base. Within 1 hour after the vehicle has returned to the base, May Mobility completes the following tasks.
   a. Create manuscript case for on-call engineer: Using an internal issue-tracking platform, information is provided to the on-call software engineer.
   b. Fill out incident report: Create an internal log of the incident.
   c. Offload logs: Collect data stored in the vehicle system for use by engineers to learn more about the incident on the vehicle side.
   d. Remove SD cards: Collect passenger-facing camera memory cards.

3.8.3 Roles and Responsibilities
The fleet attendant is responsible for ensuring the safety of passengers, self, and others involved. May Mobility Base Operations staff are responsible for reaching out to other project partners and first responders, if necessary. Both are also responsible for contributing to and completing an incident report, if required.

All project partners are responsible for ensuring there is a consistent external message, particularly in the immediate aftermath of the incident.

3.8.4 Related Documentation
- COTA Operators Handbook

3.9 Vehicle not Behaving as Expected
Whether due to hacking by an external entity or a sensor or system malfunction, a vehicle may begin to behave in an unexpected manner. The fleet attendant will respond to such a situation by first deescalating risk (i.e., shutting down the vehicle) and then communicating with first responders, May Mobility staff, ODOT, and other project partners.

3.9.1 Objective
Respond to unexpected vehicle behavior as quickly as possible to ensure any required support is provided, to minimize additional risks going forward, and to ensure a consistent communications chain and external message.

3.9.2 Process
1. A fleet attendant, passenger, or member of the public observes a vehicle not behaving as expected or behaving in an unsafe manner.
2. The fleet attendant performs any possible overrides and, when safe, contacts first responders.
   a. If the fleet attendant must focus on controlling the vehicle, he or she may request that a passenger or member of the public contact first responders, or others may do so independently.
3. Once the situation has reached a safe state, the fleet attendant engages passengers to determine whether any have been injured, and contacts first responders if a passenger has been injured or if the vehicle, other vehicles, or property has been damaged. The operator then contacts May Mobility staff to provide information on the situation.
a. If the vehicle has come to a stop, uninjured passengers who are able to alight the vehicle may do so. The fleet attendant may request that the passengers either stay or provide contact information to obtain additional information on the situation.

4. May Mobility staff contact ODOT and other project partners to inform them of the situation.
5. The crisis communication protocol is engaged. All external messaging is presented through a singular source. Other project partners should direct any media contact through this entity. This protocol applies to even the most minor situation.

3.9.3 Roles and Responsibilities
All project partners are responsible for ensuring there is a consistent external message, particularly in the immediate aftermath of the situation.

3.9.4 Related Documentation
• May Mobility First Responder Quick Sheet

3.10 Public Inquiry to COTA Customer Service
While the Smart Circuit is not a COTA service offering, because it is a form of public transit, members of the public may accidentally contact COTA when trying to contact the Smart Circuit. The following procedures are to be taken by COTA’s staff if such an inquiry is submitted through its Customer Service options, including by phone, in person, or online.

3.10.1 Objective
Clarify to COTA Customer Service staff the steps they should take if they receive an inquiry about the Smart Circuit.

3.10.2 Process
1. A member of the public or a Smart Circuit passenger contacts COTA Customer Service.
2. If the contact to COTA is determined to be related to a minor issue not requiring immediate action, such as a complaint, compliment, or lost and found inquiry, the caller is directed to Smart Circuit Customer Service.
3. If the contact to COTA is determined to be regarding a situation that requires an immediate response, such as a reported crash, COTA follows its regular emergency response protocols to elevate the situation as quickly as possible. It then reaches out to ODOT to alert it of the situation.

3.10.3 Roles and Responsibilities
COTA Customer Service is responsible for determining whether inquiries are urgent or can be passed on. May Mobility is responsible for communicating its contact information to COTA. The project team, including ODOT and May Mobility, are responsible for responding to the inquiries. Fleet attendants are responsible for informing passengers of the appropriate point of contact (i.e., Smart Columbus and/or May Mobility) to limit the incidence of comments and requests going to COTA.

3.10.4 Related Documentation
• COTA Operators Handbook
• Smart Columbus Communications and Outreach Plan
3.11 Child Policy
Due to the location of this service near COSI, families and groups with children may be interested in riding the vehicles. This should be accommodated when possible and safe.

3.11.1 Objective
Ensure that children can ride the Smart Circuit in a safe and legal manner.

3.11.2 Process
1. Passengers must be at least 18 years old to ride the vehicle without a parent or guardian. If an unaccompanied child looks younger than 18 years old, the fleet attendant will ask to see his or her license or ID to confirm he or she is at least 18 years old, and decline a ride if it cannot be proven he or she is over 18.
   a. If an unaccompanied child looks younger than 6 years old, the fleet attendant will report an unattended minor to Base Operations staff.
2. Children accompanied by a parent or guardian who look over the age of 6 can board the vehicle. An adult can accompany up to three children. An accompanying adult must sit in the back section of the vehicle with the child(ren).
3. If a child looks younger than 6, the fleet attendant will ask for the child’s age.
   a. If the child is at least 4 years old, the child will be admitted to ride.
   b. If the child is under 4 years old and the parent or guardian has a car seat, the child will be permitted to install the car seat and ride the vehicle. If the parent does not have a car seat, the ride will be declined.

3.11.3 Roles and Responsibilities
Passengers of all ages must comply with all passenger rights, rules, and responsibilities outlined in Section 2.4, and children must be supervised by accompanying adults. The fleet attendant may need to assist with boarding and alighting, as well as installation and removal of a car seat.

3.11.4 Related Documentation
- May Mobility Standard Operating Procedures

4 System Safety Tasks and Implementation
An SOP & Emergency Management Protocol Work Group has been assembled, and a series of weekly team meetings are being held from October 3, 2018 through December 19, 2018. These meetings will be reduced to monthly in 2019 through the duration of the pilot (until October 2019). The functions of the group are to:
- Develop emergency response protocols
- Develop an operations playbook
- Rehearse and train responders for potential scenarios
- Conduct testing and evaluation before launch
- Prepare route/roadways for deployment

These tasks have guided the development of the SOPs. Key responsibilities of this Work Group include developing and reviewing the SOPs to ensure the concerns and perspectives of all project stakeholders are considered.
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

Going forward, the procedures outlined in Section 3 will be agreed upon by project partners and posted in an accessible location. If additional scenarios are determined to be relevant, their details and procedures may be added to this living document.

5 Appendix: Scioto Mile Shuttle Tabletop Meeting Notes
A tabletop exercise was conducted with project stakeholders on November 14, 2018. The exercise included seven scenarios, with additional time for discussion and questions. Notes from the tabletop are provided in this appendix.

Attendance:
- Cynthia Jones (DriveOhio), Peter Voderberg (DriveOhio), Erica Hawkins (ODOT), Andrew Dykman (May Mobility), Tara Lanigan (May Mobility), Amanda Silver (May Mobility), Tom Castle (May Mobility), Charles Edwards (COTA), Amanda Brooks (COTA), Yvette Greene (COTA), Cathy Collins (Columbus Public Safety), Ryan Lowe (Columbus Public Service), David Blair (Columbus Fire), Kevin Corcoran (Columbus Police Department, CPD), Christopher Meyer (CPD), Michael Springer (CPD), Brooke Wilson (CPD), Jennifer Fening (Columbus Partnership), Jeff Kupko (Michael Baker), Tom Timcho (WSP), Katie McLaughlin (WSP)

General Notes:
- Jeff and Cynthia provided an overview to the project and to today’s tabletop.
  - Process involved a competitive selection in July/August.
  - Have been working with May Mobility since mid-September.
  - Service will be available for passengers starting in early to mid-December.
- Several members of the team have already ridden the shuttle. It is capable of the essentials, such as lane keeping and signaling turns. It appeared to be really safe and was interesting.
- This project is an initiative of The Columbus Partnership and DriveOhio, an ODOT program created by Governor Kasich.
  - A project goal is to give people in the community something to ride in, experience, and base their opinions of AVs on.
  - Another goal is to give ODOT the opportunity to learn from the process and how this technology could apply to other use cases.
- The route is on Scioto Mile, serves the Smart Columbus Experience Center (on Civic Center Drive) and loops around the river.
  - The storage garage is just a couple blocks off the route.
- Want to ensure connections between May staff, transit operations staff, and first responders.
  - Also working on engaging the community in general, including the Mayor’s office.
  - Top priority for everyone is safety.
- Expectations for today:
  - Review draft standard operating procedures, identifying gaps and additional steps, and determining more information that needs to be exchanged.
  - Go through potential scenarios.
  - Allow people to meet and see each other face-to-face.
- As an icebreaker, went around the room and answered the question, “what do you think of autonomous vehicles?”
  - Lots of differing opinions around the room, mostly cautious optimism.
- Handed out a draft of the SOP, pictures of routes, and a communications tree.
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- Route 1 is the default through May 2019 or so, when Belle Street will go under construction.
- Route 2 will then become the new default.
- Routes 3-5 will be used depending on the type of special event (3 is for bridge impacts, 4 is likely for short-term impacts like a 5K, 5 is to connect people to other destinations within Franklinton).

- Cynthia is the primary point of contact for this project, Jeff is the secondary point of contact. May Mobility also has points of contact (supervisors, customer success team, etc.).
- CPD: How do the vehicles respond to emergency vehicles?
  - May: There are fleet attendants onboard, and in the event an emergency vehicle is nearby, they will drive manually. There will always be someone in the vehicle that can take over.

- May provided an overview of their operations.
  - Staff two site supervisors for each shift (mornings/evenings). Site manager’s shift will overlap with these, and they will be the main point of contact Monday through Friday.
  - Fleet attendants are going through their training right now. They are hourly workers that went through background checks and licensing checks. Training includes 4-5 weeks of lecture training as well as operating training.
  - The team uses mumble, a constant communications tool, between the fleet attendant and the base center.
    - Because of this May will always have an ear on the vehicle, as the system doesn’t require the fleet attendant to be responsive to respond.
  - Site managers and supervisors are dispatchers, fleet attendants are operators.
  - There will likely be many children riding due to the proximity to COSI.
    - The procedure is:
      - If somebody looks under 6, ask for their age.
        - If they are 4 and over they are allowed to ride.
        - If they are under 4 and have a car seat they are allowed to ride.
      - Have to be 18 to ride unsupervised.

Scenario 1:

- Scenario: May’s base center staff head something through the mumble headset system but aren’t sure what’s happened. No response yet from the fleet attendant.
  - Vehicle location: Rich Street and Civic Center Drive
- May: It’s not uncommon to lose communication with the fleet attendant. Mumble uses network connectivity, so it may have some static or loss of service. Because of this, they also have backup radios in each vehicle.
  - The first thing they would do is try the radio. If they can see the vehicle is moving, they may wait until it’s at a stop to do so.
  - They also have a base center staff member and a fleet attendant on-call, who can do additional tasks to monitor the vehicle. Could send them out with a phone to the vehicle that has stopped operating or lost communication.
- Scenario update: Have figured out that someone ran the red light by the bridge and t-boned the vehicle, hitting the passenger side. Two people in the vehicle have been injured and the door won’t open.
- May: The vehicles also have safety monitoring so they would probably know even before they hear from the fleet attendant that such a scenario has occurred.
First step would be to make sure the vehicle is in a safe location and that passengers who are not injured are out and dealt with immediately.
- The doors can always be opened from the inside.
- There will be keys in the emergency kits to open doors from the outside.
- Most of the time, all doors will be unlocked when operating.
- The site supervisor at the base center will then make some calls.
  - First call: 911, second call: Cynthia/Jeff, third call: Tom Castle/May Mobility
- CPD: Do you have cameras onboard?
  - May: We have external cameras that can be seen in real time, internal cameras where footage can be pulled from later.
- COTA: For whoever from May is calling 911, make sure they know the information 911 is going to ask.
  - May: Fleet attendants as well as dispatch are trained to provide the following information:
    - Location, description of event, number of passengers onboard, injuries if any, and whether any others were involved.
- Fire: Is there a way to remotely turn off a vehicle?
  - May: As a design principle, no, because someone smart enough could hack it.
  - However, the vehicles are not capable of going into autonomy unless they are on their route.
  - The standard is that if there is a crash, pull over, pull the emergency brake, and turn on the hazard lights.
    - The emergency brake is not connected to the electric system.
- Fire: Can the vehicles be put in neutral?
  - May: As long as the emergency brake is not pulled, you can push these vehicles to the side of the road.
- Fire: Severity of injuries will determine how quickly fire will be dispatched.
- CPD: Would prefer the vehicle not be moved until the police arrive, as this can help with investigations into what actually happened.
- CPD: Will somebody from the company be on site?
  - May: There will always be a leadership member on site, for any minor or major incident.
- Jennifer: If one vehicle is in an incident, are the other two stopped too?
  - May: Historically that’s not been the case.
    - If there’s an injury, service will be suspended. If it’s a minor fender bender, then the other vehicles will continue in service.
    - This decision also depends on whether there is more than one site supervisor on duty at the time.
    - Not really a clear threshold, just a judgement call.
- Scenario update: The vehicle caught fire based on the crash.
- May: Pull over vehicle, get everyone out of the vehicle, call base center operations.
  - If it’s a lithium ion battery fire, pump water on it at a continuous stream.
  - In it’s any other type of fire, there is a fire extinguisher onboard.
- Fire: If there’s any sort of a fire, staff and passengers need to get far away.
- May: What is the average response time?
  - Fire: From the time they are dispatched from the dispatch center to any place along the route would probably be 2 to 2.5 minutes. But this also depends on the time of day and what else is going on.
  - There are fire and police substations right along the route.
May: When the word May Mobility comes through on a 911 call, will the responder know it’s the autonomous shuttle vehicle? Will this get priority?
  - CPD: This goes back to the severity of the call and how many resources are tied up. For a minor fender bender, may take a few minutes. For a severe incident, it will be almost immediately.
  - Fire: Also almost immediately if the incident is severe. Say the autonomous/driverless shuttle and May Mobility on the call so they know. People downtown have already noticed it and know about it.
  - CPD has worked with Drive Ohio to create a video. They will probably put that video up on their intranet site, and an email linking to it will go out to the whole department.
    - All 1800 people will know about it within a week or so.

CPD: In the event of a collision where the autonomous shuttle is at fault, the fleet attendant will be treated like any other operator.

Jennifer: Is there anything else we can do to help prepare/inform fire/police officers, like come to a meeting to answer questions?
  - Fire: Probably not necessary. Could have a one-on-one with the downtown fleet.

CPD: If a scenario includes an injury, don’t pull over the vehicle.
  - If it’s a minor fender bender, you can move it over.
  - But for injuries, fires, etc. don’t move it. Do set the brake.

Cathy: May should share instructions on what they would say when calling dispatch.

Jennifer: It was agreed it would be helpful to say autonomous vehicle. The only challenge here is that the media is often listening to that dispatch and would pick up on it. Should still say it (safety is the top priority), just something to consider.

Fire: Does May Mobility have a PIO? Looking at corporate communications.
  - May has a marketing specialist and defined protocols.
  - Fire: Suggest that site supervisors have a way of contacting that media person.
  - Need to identify where Smart Columbus is the POI and where May Mobility is.
    - Validity of the route and the program vs. the technology.
    - Everything is under May’s insurance.

Jeff: Do we even need to say it’s May Mobility or an autonomous shuttle if it’s just a minor fender bender?
  - Do whatever is safest.

May: After the situation is resolved, will bring the vehicle back to the garage (manually driven or have it towed) and pull the logs.
  - Will complete an accident report and start an internal investigation.

May has the option to record audio alongside the video but don’t currently have it on due to the size of the logs.

Jennifer: May is a private company contracted to a public entity. Are logs subject to a public information request?
  - CPD: From the law enforcement end, it’s not until a public entity comes to ask for it. Would first ask May to hand it over, and if they won’t would subpoena it.
  - May: There would be records that become public. Would be able to say something like sensor data is proprietary, but video would not be. There are some exceptions to public record law.

CPD: This is something they deal with all the time, with tractor trailers for example (also private companies).

Jennifer: Just trying to anticipate what video footage may come out at some point.

CPD: People will try to test the company and will run out in front of the vehicle.
• **COTA:** We sometimes get video requests that aren’t related to a crash.
  - COTA has successfully educated riders and drivers that they are being recorded.
  - They get many requests for footage that doesn’t really have anything to do with COTA.
  - When that happens, they put a public records request in. As a general practice, if they have the footage, they provide it.

• **May:** What is COTA’s suggestion for how May should respond to such a request since they aren’t subject to open records requests?
  - COTA: Have to think about what you would want to do if someone did make a records request and you have the right footage available. Definitely recommend having someone from the legal department review the footage before releasing. Also recommend May ensures they have a good data retention policy.

**Scenario 2:**

• **Scenario:** Someone has boarded and is drunk and disorderly.
  - **May:** Will politely ask the person to leave the vehicle and will try to not escalate the situation.
    - Have codewords for fleet attendants to use with dispatch.
      - Dust is for a person is being disorderly.
      - Fiery dust is I need you on site right now, I need help.
    - Site supervisor may intervene or they may call 911.
      - Would ask the passenger to leave before escalating the situation.

• **Scenario update:** A key piece of information to relay to 911 in this case is that it’s route 5, so not where the vehicles normally are. The passenger is threatening violence.

• **COTA:** If an incident is that bad, you have to stop the vehicle.
  - At times, it makes sense to keep driving and not stop the vehicle (the person may get off at another stop). But sometimes it makes sense to stay put. You can even say the bus broke down.
  - The scale ranges and is fluid – when it gets to the point of threatening violence it’s best to stop the vehicle so you have an exact location. You may even go between jurisdictions if you continue to move.
  - May: Agreed, dispatchers would tell them to stop the vehicle in that case. The vehicles do not have numbers but they do have names which will be on the exterior. They also have license plates on the front and the rear.

• **May:** COTA said to tell the passenger the bus is broken down. How would that work?
  - COTA: I (Charles Edwards) drove for 10 years, and have dealt with many of these situations. Every situation is different. In some cases, you should just keep going and they’ll get off naturally. With the threat of physical violence, would generally recommend to not keep going. Hold the emergency break and get out of the vehicle. Give yourself an out – say dispatch told you something was wrong. People will know even less how these vehicles operate, so they’ll probably believe it.
  - May has a screen they could put on the front dashboard that could confuse people into thinking there’s a problem.

• **COTA:** Will there be public information messages as the vehicle travels through stops?
  - May: Fleet attendants will give passengers information on the next stop. They are local to Columbus, are also concierges.
  - COTA: If we know we’ll have a major event, we will put information out a few days before.
  - Columbus Partnership has developed a landing page for the route – with service alerts and other information they can broadcast out days in advance.
• May: As a general rule, if a passenger is threatening violence and won’t leave, they will call 911. Want to protect their employees and passengers.

Scenario 3:

• Scenario: A suspicious package was left behind in a vehicle.
  o Location: Broad Street between Vets and COSI.
• May: Pull over, contact base center staff who will call 911.
  o Do not touch it, wait for authorities to get there.
  o Need to tell fleet attendants how to identify a suspicious package.
• CPD: What do they say when they call 911? What if it is just someone has left a backpack?
  o The caller will ask what’s suspicious about it.
  o The likelihood of leaving a backpack behind is very high, the likelihood of an actual threat is very low.
• COTA: Works very closely with TSA for training on what’s unattended and what’s suspicious.
  o For example, if there are wires or obvious stains, it’s suspicious. Evacuate 300-500 feet away.
• CPD: Someone came into Nationwide Children’s Hospital, left a suspicious looking package and ran away. In that case, it was pretty obvious it was a suspicious situation. Alternatively, during an OSU football game, people sometimes hide backpacks they can't bring it in. They still run bomb dogs through the area, but these aren’really suspicious situations.
  o Context is important.
  o Have a shared understanding in what they consider suspicious.
  o COTA has that job too and they do that all the time, would be a good place to go to for guidance.
• CPD: Get calls daily downtown about unattended items. Highly recommend May gets with COTA to put a good protocol in place.
• One difference here: on a COTA bus, the unattended item could be in a far back seat. For May’s vehicles, because they are much smaller, a fleet attendant will be more likely to turn around and remind the people who are getting off to remember their bag. Intend to have an intimate experience with fleet attendants – they will have a conversation with almost every passenger.
• CPD: Vehicles hold 5 passengers and 1 fleet attendant, correct?
  o May: Correct.
• Jennifer: Another question here then is, how to people get reunited with their stuff?
  o May: Right now, in Detroit, are working with just one customer and have a centralized place to leave stuff. Have to come up with a different plan here.
  o There will be a hashtag and an email address that passengers can reach out to.
    ▪ There will be a meeting soon to determine how it’s branded, what’s Smart Columbus and what’s May Mobility.
  o Will also have a lost and found.
  o May: Would it make sense to have the lost and found at the Smart Columbus Experience Center since it’s along the route and people might intuitively go there anyway?
    ▪ Jennifer will look into whether that would be possible.

Scenario 4:

• Scenario: A bicyclist cut in front of a vehicle from the bicycle lane without looking and was hit (or hit the vehicle).
• May: Will pull over to the side, assuming nobody inside the vehicle was hurt, and reach out to dispatch.
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- CPD: Don’t move the vehicle. Police will want to come out and take measurements.
  - If you have passengers who were witnesses, ask them to stick around or ask them for their name and phone number in case somebody from the police department wants to contact them and they have to leave.
- COTA: Will fleet attendants have accident packets or witness cards?
  - May: Right now, they have physical incident reports onboard each vehicle for fleet attendants to fill out on paper.
- Fire: Blocking the street is just a fact of life, would recommend not pulling the vehicle over.
  - For May’s benefit, from a legal liability perspective, as others can make up stories.
  - If there are no injuries, if it’s a fender bender, move to the side of the road. But otherwise do not.
  - Would rather mitigate the traffic problems that lose that evidence.
- COTA: Agreed, do not move if there is an injury. Could allow passengers to stay in the vehicle if it’s safer than getting out in traffic.

Scenario 5:

- Scenario: Heavy rains have moved into the area, visibility is low and there is ponding on the roadway.
- May: Call would immediately go out to switch to manual mode. Even if we trust the system, we trust the fleet attendants more.
  - Jennifer: Is that automatic when there’s rain or is there a threshold?
    - May: Right now, it’s automatic – if it’s raining, we’re in manual mode.
- May: Extreme weather response is to switch to manual mode, then ensure the safety of riders.
  - Where and whether passengers are dropped off will depend on what the safest place they can bring them to is. If a passenger says, “I want to stop here”, they will let them off anywhere along the route. They can also bring them back to the garage if they want (it’s safe underground).
    - In Detroit, have not yet broken protocol for where to drop people off, and don’t expect to in Columbus either as the stops are so close together.
  - If a passenger missed their stop and the shuttle is going back to the garage, would let them get off elsewhere.
    - Passenger policy is that everybody gets one loop around, but that would not be enforced in this case.
- May: There will be situations where it’s safer for the vehicles not to be running. Will use communication channels to broadcast out that service is suspended in these cases.

Scenario 6:

- Scenario: Weather isn’t great and the vehicles are driving through some snow. There are about 3” of slush on the roadway.
  - Note that the route is a priority snow removal location.
- May: 3 inches of slush is pretty significant, might just not feel comfortable operating at all in those conditions.
- CPD: What are the technical limitations?
  - May: Since it’s not a full car, and is not made to go on highways, it is lighter than a full car. One limitation is traction.
  - Don’t have a solid number on where to draw that line, would probably be triggered by discomfort on the part of the fleet attendant.
- CPD: How do the vehicles navigate?
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- May: Navigation is not based on a vision system. The vehicle has a pre-created map of the area that uses the lidar systems onboard.
  - The vehicle matches what it has against that, using sensors.
  - The vehicle knows to a millimeter degree, and would be able to tell where the lane markings are even if the pavement is obscured.
- Detection is mostly based on vertical objects that aren’t as subject to snow or similar. If there is enough snow to obscure those, they would definitely be switching to manual driving.

- City: There are different priorities for plowing streets. Route 1 is priority 1. Routes 2, 3, 4, and 5 are all priority 2 so they may be less likely to be plowed as quickly.
  - Note that some of the alternate routes do not take the construction that Route 2 is for into account.
  - Columbus has different levels of snow emergency, level 3 is you can’t be on the road except emergency personnel. Contract has wording that May doesn’t need to run during level 1, 2, or 3 snow emergencies.
    - Note that this scenario is before a level 1 snow emergency is called.

- COTA: What about four days later, when roads are cleared but the stops are covered in snow, and people are essentially diving into vehicles from the stops.
  - May: Have thought about hiring people to help clear snow. Have some very chipper people who work with them who may volunteer to help clear the stops.
  - Have shovels and salt back at the garage to help clear sidewalks and stop locations, only have 4 stops so it shouldn’t be too much of a challenge.

- Situation update: Vehicle lost traction on the main street bridge. There hasn’t been a crash, there are no injuries, but the vehicle can no longer move.
  - May: Keep the vehicle where it is. If passengers aren’t willing to wait until the next shuttle comes around, they can get off and walk.
    - Radio the next shuttle, have them pick up the stranded passengers.
    - Would send out the technician to get the vehicle back running.
    - This would be the call to cease operations.
    - With any stalled vehicle the last resort is towing.
  - CPD: Is there any special way the vehicles can be towed?
    - May: There are special procedures for towing since it’s not a normal vehicle, both because it’s light duty electric and to not to hurt the sensors. Would send someone out from May to assist the tow driver. Can get a pre-canned protocol out to CPD.
      - CPD: What sort of a tow truck would be sent out would depend on the severity of the incident.

- Situation update: Note that this bridge has a separated sidewalk so it would be difficult for people to walk away.

Scenario 7:

- Scenario: Water main break. Vehicles are blocking the roadway.
  - Location: Civic Center Drive in front of the Supreme Court of Ohio.
- May: Could have fleet attendants manually take over for this part of the route, drive over a block and then back on Town, returning to the stop right outside the Smart Columbus Experience Center (initially to get people off and then to switch to an alternate route).
- Jennifer: Would signage go out to tell people about the route change?
  - May: In a scenario like this where we could have a section manually driven but could still service all stops, then would that be preferable to switching to an alternate route?
Standard Operating Procedures
Scioto Mile Automated Shuttle Service – Smart Circuit

- Jennifer: Think that if there’s no prior notice, would rather have the stops all be serviced even if it limits autonomy.
- Cynthia: If it’s unplanned, whether it’s less autonomous because of that isn’t really an issue, would rather service passengers in an expected way.

- COTA: What’s the process of identifying a new route?
  - May: Wouldn’t really be done by the fleet attendants themselves, though they may provide advice since they know the area really well. Would ultimately be determined by base center staff.

Open Discussion/Questions:

- Cathy: Is this the safety plan, or is that covered by this?
  - Jeff: This is part of the safety plan but that’s a separate document. May also has an internal document to help mitigate safety risks.
  - May: That document is ultimately in draft form, Cynthia and Jeff have copies but haven’t distributed it more broadly.
  - Cathy: As the licensing is going through, may request a copy of that before licensing is complete.
- CPD: Still have many questions about the hardware/software and how that works in the context of an incident investigation. Right now, this is a theoretical process. Want to know about weights, center of gravity, what data is being collected, etc.
  - Will reach out to May to set up a discussion – May has set up a general inbox for the Columbus project so everyone in the company can see it.
- COTA: Question on procedure for 311 calls.
  - Jennifer and Jeff are working on it, it’s still in draft form. Will be provided to COTA when it’s complete.
  - Anything outside of emergency calls will have a suggested contact, usually Jennifer.
- May: What is the volume of calls you receive to COTA’s customer service line, so they know what to expect?
  - COTA: Would have to talk to the customer service director to get an exact number. Know it’s been declining, people are more apt to check the website. Probably around 1,500 – 2,000 per day.
    - Includes complaints, route information, general information on COTA.
  - May: Will have physical feedback forms in each vehicle that also include an open-ended question for suggestions for improvements.
- COTA: What software is May using for headway and operations management?
  - May: The software system is entirely internally built, operated, etc.
  - Headway management, due to the size of the route, is not too big of a challenge.
    - Have three vehicles on the route moving as often as they do.
- COTA suggests having restrooms near the dwell locations for the fleet attendants.
  - May plans to have 5-hour shifts for fleet attendants, with a halfway break where the on-call fleet attendant relieves them so they can use the bathroom and get a snack.
- COTA can send May a packet with the witness cards for after incidents.