



# Connected Electric Autonomous Vehicle (CEAV) Operational Concept

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for the Smart Columbus  
Demonstration Program

APPENDIX A – ALTERNATE USE CASE | May 19, 2020

Produced by City of Columbus

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# Chapter 1 Introduction

The COVID-19 pandemic that affected the United States in early 2020 had far reaching impacts to various industries including transportation and mobility. On March 18, 2020, City of Columbus Mayor Andrew Ginther declared a State of Emergency for the city that encouraged all employees to work from home, if able. On March 21, 2020, State of Ohio Governor Mike DeWine issued an Emergency Declaration that enabled the Department of Health to issue guidelines for private businesses regarding appropriate work and travel restrictions. As a result of these declarations, citizens of Columbus and the state of Ohio at-large were instructed to remain at home, only making necessary trips for specific reasons, such as food or essential travel. The Central Ohio Transit Authority (COTA) also requested that all trips on its buses be limited to essential travel and reduced the routes, frequencies, and operating hours.

Additional guidelines that stress the importance of “social distancing”, defined as maintaining six feet of separation from another person, and increasing the necessary sanitizing procedures have greatly limited the ability to accommodate passengers in the EasyMile EZ10 shuttles procured for the CEAV project. The shuttles have not been in active passenger service since the February 20, 2020 emergency stop that resulted in a passenger slipping from her seat. The shuttles continued to operate, however, completing testing and training runs with project staff only, until April 4, 2020, when all operations ceased due to the pandemic.

With the expectation that social distancing requirements will be in place for the foreseeable future, Smart Columbus consulted with its stakeholders to determine how a shuttle could otherwise be used to serve the immediate needs of the community consistent with the purpose set forth in the original Operational Concept. This Appendix outlines a proposed approach to help meet some of the identified needs, offering passenger-less operation, until social distancing guidelines are removed and the shuttles can return to normal operation.

## 1.1. PROPOSED USE CASE

From the Operational Concept, Section 2.1 Routes and Potential Use Cases identified the following localized goals for the CEAV solution:

- Connecting the community to jobs and services, including
  - Community centers
  - Opportunity centers
  - Food sources
  - Support services
  - Smart Mobility Hubs
- Improving safety and mobility of travelers by mitigating first-mile/last-mile/only-mile challenges

- Encouraging transit use by expanding locations served and implementing efficient schedules and integrated solutions
- Reducing traffic congestion and greenhouse gas (GhG) emission in the region

When the pandemic-related directives went into effect within the City, the on-site food pantry at St. Stephen's Community House shifted from a choice food pantry, where patrons would choose food from shelves to take home, to a pre-packaged system. This reduced the amount of contact with items and the number of interactions between users and employees of the food pantry. Those wishing to pick up these food boxes are still traveling to St. Stephen's, mostly by car, but several are still walking from nearby residences, and subsequently waiting in line for the box which can weigh as much as 40 pounds. Boxes are available for pickup three hours per day on weekdays, with Monday, Wednesday, and Friday hours of 12-3PM, and Tuesday and Thursday hours of 3-6PM. Those accepting the boxes are able to receive one box per week and the pickup is logged in an application St. Stephen's uses called Pantry Track.

St. Stephen's has indicated that it distributes an average of 140 boxes per day, with peak days reaching 170 boxes, and that the numbers have remained consistent throughout the pandemic. Engaging with our stakeholders, it was identified that the shuttles could be utilized to help distribute the food into the community, particularly the Rosewind neighborhood, a benefit to those with limited access to transportation and in alignment with the stay-at-home recommendations. The initial proposal is to distribute food boxes within the community from 12-3PM Monday through Friday. Three of the days would align with the food pantry's hours, and the other two days would precede the food pantry's hours and allow the operator to direct someone to the food pantry if the shuttle delivery runs out of food boxes. The boxes have dimensions of 16.5 inches (h), 20 inches (w), and 11.5 inches (d), so the shuttle can carry 40 boxes with the operator on board based on the dimensions and the weight.

The proposed use case satisfies three of the needs from the above list. First, it would connect the community to food sources by bringing the food to the community. It would help mitigate the first-mile/last-mile/only-mile challenges by transporting the food to the people and not the people to the food. Finally, it could reduce traffic congestion and GhG by using an electric vehicle to transport the goods and reduce the number of recipients at St. Stephen's waiting in line with the engine running.

The shuttle would operate on the existing approved route and would not require any modifications to begin service. The onboard operator will assume manual control at the intersection of Brooks Avenue and Chittenden Avenue, the southern traffic circle, at which point it will be redirected from a southern trajectory to a northern trajectory. This allows for the most direct route to the Rosewind northbound station. With this concept, it is not expected the shuttle will provide service to Linden Transit Center for the food delivery. The shuttle is anticipated to make one trip to the Rosewind station and remain for the duration of the delivery window. It will depart at approximately 11:30AM to arrive by noon. However, should the boxes be depleted during a delivery window, the shuttle can return to St. Stephen's to pick up additional supply if time allows. The decision to remain at the station rather than continuously circulate was coordinated with our stakeholders and all parties agreed that it would not be beneficial to have someone arrive as the shuttle is departing and have to wait for its return.

At this time, the service will be completed by one of the two EasyMile EZ10 shuttles in storage at St. Stephen's. Should the need for additional hours or vehicles arise, that will be evaluated by the project

team. This service will continue until social distancing guidelines are relaxed and passenger service can resume; this is not anticipated until at least September.

## 1.2. OVERVIEW OF USERS

The CEAV system is expected to affect and be affected by a variety of types of users. The revised user classes (as compared to Table 1-1 of the original concept) and the groups of people who comprise them, are presented in the following table.

**Table 1-1: Users and User Classes**

User Classes	Applicable Groups
CEAV Passenger	Area residents, employees, visitors, etc., some of whom have limited mobility and other disabilities
Food Pantry Staff	Volunteers and employees that collect food from the Mid-Ohio Food Bank and package the items into boxes for distribution to those in need of the food.
Food Pantry Patrons	Those residents of Franklin County that are eligible to collect one pre-packaged box once per week.

Source: City of Columbus

As noted, CEAV passengers are no longer part of this system concept, while the specific food pantry staff and patrons are added to the table.

## 1.3. PROCESS OUTLINE

Table 1-2 below identifies the proposed schedule to begin operations. The schedule is aggressive; however, it is expected that one to two previously trained operators will be hired to perform this work with one shuttle and no vehicle training will be required. Additional training will be needed to utilize the food pantry process and system, along with proper social-distancing and other COVID-19 protocols. Since passengers will not be aboard the shuttle, the implementation of the approved NHTSA mitigations to return to passenger service will not be required to be implemented prior to operation.

**Table 1-2: High-level Project Schedule**

Item	Date
Hire Operator(s)	June 8, 2020
Train Operator on Food Pantry Software	June 8-13, 2020
Begin Operations	June 15, 2020

Source: City of Columbus

At the beginning of the shift, the operator will secure the designated food boxes from the food pantry at St. Stephen's and load the shuttle in the garage where the vehicles are stored. The Operator will proceed to take the shuttle to the route and begin autonomous operation on the southbound portion of the route. At the intersection of Brooks Avenue and Chittenden Avenue, the operator will use the

remote control unit to put the vehicle on the northbound portion of the route and resume autonomous operations until the Rosewind northbound station is reached. At that station, the operator will stop the vehicle for the duration of the delivery window. When a patron arrives at the station, the Operator will check a valid ID and enter the information into Pantry Track on the tablet. If the patron is approved, the operator will distribute a box to the patron. Once the delivery window concludes, the operator will put the vehicle into autonomous operation and return to the garage at St. Stephen's.

## 1.4. OPERATOR AND PUBLIC PROTECTIONS

Given the COVID-19 threat, the following protections will be in place:

- The operator will be required to wear a mask during the following times:
  - When interacting with food pantry staff to collect and load the boxes.
  - While at the Rosewind northbound station distributing boxes and interacting with patrons.
  - While unloading the shuttle and returning the boxes to the food pantry staff.
- Hand sanitizer will be kept aboard the shuttle for the use of the operator and patrons who request it.
- The shuttle will be cleaned and sanitized at the conclusion of each shift. Following the cleaning, the operator will close the door to the vehicle before powering down so as to protect the integrity of the cleaning.
- Information disseminated to the community will request that patrons wear a mask when picking up a box and maintain six feet of separation.

# Chapter 2. System Concept

## 2.1. OPERATIONAL POLICES AND CONSTRAINTS

Section 2.3 of the Operational Concept identifies the overall project Operational Policies and Constraints. This section covers additional policies and constraints:

- On May 14, 2020, The National Highway Traffic Safety Administration (NHTSA) issued acceptance of the Return to Service Plan for EasyMile EZ10 Gen2 and EZ10 Gen3 Vehicles that was in response to the February 20, 2020 incident in Columbus. From February 25, 2020 until this letter, EasyMile was prohibited from taking passengers on any of its shuttles but could run testing and training operations. Once the mitigations in the May 14, 2020 letter are implemented, EasyMile can begin taking passengers. However, this concept does not intend to take passengers, so these mitigations do not need to be implemented prior to operation for this use case.
- The shuttles can perform autonomous operations on public roadways based on previous approvals from NHTSA on December 18, 2019 and January 22, 2020.
- The shuttles can perform autonomous operations on public roadways based on a previous approval from DriveOhio on February 4, 2020.
- During the COVID-19 pandemic, the local business, EmpowerBus, that provided the operators ceased operations. EasyMile has decided to directly employ operators and can respond to this concept in an expedited manner.

## 2.2. SUSTAINABILITY AND ADAPTABILITY

In Section 2.6 of the Operational Concept, it is identified that commercial CEAV vendors are striving to deploy more innovative and cutting-edge platforms and business models and that it could be possible to develop a different use case during the deployment. This concept satisfies the connection of goods and services to residents in opportunity neighborhoods and provides connections that do not currently exist to these goods and services. Further, the concept provides greater value to residents by keeping them at home or close to home during the pandemic. Highlighting the versatility of the shuttles traces back to the sustainability and adaptability of the project since adapting the service for current conditions can make it more sustainable.

Overall project goals remain the same such as the need for the service to be accessible to all, including those with mobility challenges, hearing, vision, and cognitive disabilities, and those who do not own a credit card or smartphone.



# Chapter 3. System Analysis

As identified in Table 4-1 from the Operational Concept, there were ten different criteria for selection of the preferred route. Table 3-1 below identifies the six that directly apply to the proposed concept.

**Table 3-1: Draft Ranking Criteria for Selection of Preferred Route**

Criteria	Description
Smart Mobility Hub	The route provides a connection to a proposed Smart Mobility Hub as part of the Smart Columbus initiative.
Food and Service Access	The route connects to food and services needed within a community. The list includes: grocery store, bank, pharmacy, and food bank/pantry.
Neighborhood	The route connects to an opportunity neighborhood for increased mobility.
Route Navigation	The technology at the time of deployment will allow the route to be traveled.
Storage	The route provides a nearby facility for storage, maintenance, and charging of vehicles.
Alignment Considerations	The route satisfies an unmet transportation need rather than duplicating existing COTA service.

Source: City of Columbus

## 3.1. PERFORMANCE AND SYSTEM MONITORING

Section 4.2 of the Operational Concept identifies the data that will be used for performance and system monitoring. While most of the data will remain the same, passenger data will be removed and the number of food pantry boxes delivered will be collected in its place. The CEAV System Operator will report on the vehicle’s operation on a regular basis to be agreed upon in the service contract. The data that will no longer be collected is limited to the following:

- The number of riders, broken down by time-of-day and day-of-week, using door Automated Passenger Counter (APC) devices, video for automated passenger counting, or another solution as specified in the proposal, with geospatial information showing the location where riders boarded and alighted

The new data to be collected for performance and system monitoring is:

- The number of food pantry boxes carried in the shuttle and the number of boxes delivered to patrons on a daily basis.

All other data and performance monitoring will be the same.

Performing this concept allows for the project team to collect more operational data than is expected if the deployment is delayed until passenger service can resume, given the pandemic social distancing requirements. The performance measurement will be tweaked within the Opportunity measure to determine the success of the project in coordination with The Ohio State University (OSU).

# Chapter 4. User Requirements

At a high level, the required solution must be safe and accessible, and must satisfy the mobility needs of users. Table 4-1 provides additional requirements from those documented in Table 5-1 of the Operational Concept.

**Table 4-1: User Requirements**

User	Requirements
CEAV	- Needs to be able to transport goods (stop at designated locations, open and close doors, etc.) from one location to a designated drop-off point
CEAV System Operator	- Needs to be able to coordinate the hire of Operations Staff to perform the transportation of goods
Operations Staff	- Need to receive training in the Pantry Track system to validate eligibility of recipient of the goods - Need to be able to load and unload the vehicle with the goods
Food Pantry Staff	- Need to be able to train Operations Staff on the Pantry Track system - Need to be able to provide a dedicated number of boxes for delivery to the Rosewind station for pick-up
Food Pantry Patrons	- Need to be able to provide proof of residency in Franklin County - Need to be able to access the northbound Rosewind station to pick-up goods

Source: City of Columbus

## 4.1. OPERATIONAL/USER REQUIREMENTS

Operational requirements for the food pantry deployment, in addition to those outlined in the Operational Concept, will include:

- The deployment shall provide service during the hours of day and days of week with the highest expected demand for the goods.
  - Delivery of goods shall be monitored by day-of-week, and it is expected that operating hours could be shifted and/or shortened in order to better accommodate demand, considering vehicle capabilities.
  - Service may be suspended on major holidays as they align with the food pantry’s hours.
  - Any changes to service shall be communicated to the community by multiple modes of communication well in advance of the service change.
- The service shall be accessible to all residents and visitors who qualify to utilize the service.
- Onboard operators (“Operations Staff”) shall be properly trained with vehicle operation, the food pantry systems, and shall always be onboard a vehicle while it is in operation.
- Operations Staff plans to actively engage the community with satisfaction of the service. This will be accomplished through surveys of both patrons of the food pantry, and possibly other methods. Coordination will take place with OSU to ensure performance is measured. Soliciting the adequacy

of the operating hours will also be expected to inform the project team of the need to adjust those hours, if necessary.

## 4.2. DATA NEEDS AND INTEGRATION REQUIREMENTS

The CEAV System Operator will be required to continue to collect and transmit the data from Table 5-2 in the Operational Concept, except it is expected that ridership (stop-level boardings and alightings) will not be provided during this concept. The additional data expected in outlined in Table 4-2 below.

**Table 4-2: Proposed Data Needs**

<b>Data Type</b>	<b>Data</b>
Operational	Number of boxes transported
	Number of boxes delivered to patrons
Patron feedback (provided to Operations Staff)	Patron feedback on operating hours and location

*Source: City of Columbus*



THE CITY OF  
**COLUMBUS**<sup>\*</sup>  
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